DANMARKS OG GRØNLANDS GEOLOGISKE UNDERSØGELSE RAPPORT 2002/113

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MINISTRY OF THE ENVIRONMENT

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Contents

Abstract

A large number of intrusions and magmatic complexes were emplaced in East Greenland during and after the Palaeogene break-up in the North Atlantic. Ultramafic, gabbroic, dioritic, monzonitic, granitic, syenitic, ultramafic alkaline, and carbonatite-related complexes are represented. The intrusive complexes host a wide range of mineralisation types. Two of the mineralisations, the Malmbjerg porphyry molybdenum deposit and the Skaergaard PGE-deposit, have the potential to be “world class” deposits.

Geological and exploration information for the Paleaogene intrusions can be found in publications, internal reports, company reports and unpublished material in the archive of the Geological Survey of Denmark and Greenland (GEUS). This report is a guide to the information on the Palaeogene intrusions and complexes in East Greenland. It includes introductions, short descriptions and metadata for all regions and intrusive complexes in East Greenland in the form of data sheets. The data sheets are introductions to the regions and intrusive complexes and not full accounts.

The data sheets give for each intrusion or complex: 1) a unique numerical code, 2) the name of the intrusion or complex, 3) the petrological type and the mineralisations of each complex, 4) a geographical location, 5) the main reference(s), 6) a list of published and unpublished topographic maps, 7) a reference to a satellite scene available from GEUS, 8) a list of aerial photographs, 9) a list of published and unpublished geological maps, 10) information on geophysical investigations and maps, 11) information on hyperspectral data, 12) metadata for geochemical maps, 13) a short geological description, 14) metadata for petrological information, 15) metadata for geochemical investigations, 16) a record of exploration activity, 17) some information on exploration results, 18) comments and recommendations, 19) pointers to sources for further information and 20) references to published and unpublished papers and reports, including non-confidential company reports.

Introduction

The report gives an introduction to the geological and exploration information for the Palaeogene intrusions and intrusive complexes in East Greenland between 66 and 75^{o}N. The information is given in the form of data sheets.

The East Greenland volcanic rifted margin developed during and after the opening of the North Atlantic under the influence of the ancestral Icelandic mantle plume (e. g., Saunders et al., 1997).

The plume is regarded as responsible for the development of a triple junction at the Kangerlugssuaq fjord (Brooks, 1973). Continental break-up and initiation of seafloor spreading resulted in the coast parallel dyke swarms and coastal flexures along the present-day coast to the SSW and E of Kangerlussuaq (e. g., Myers, 1980). Magmatic activity is recorded from 61 to 13 Ma ago.

The more than 6 km thick flood basalts of the Blosseville Kyst formed mainly during the early stages of the magmatism 61-54 Ma ago. Defined plateau basalt formations can be followed throughout the province and even to the Faroe Islands (Larsen et al., 1999). Except for minor amounts of early enriched tholeiitic picrite lavas and depleted MORB lavas, the plateau basalts are entirely dominated by evolved iron and titanium-rich tholeiitic composition (e. g., Larsen et al., 1989). Inland, away from the continental margin more alkaline lavas including melanephelinitic lavas overly the tholeiitic plateau basalt formations.

Intrusive complexes were emplaced between c. 55 to 25 M ago. Mafic intrusion are mainly emplaced between 55 and 50 Ma ago, whereas felsic intrusions formed over an at least 25 Ma long period mainly after the onset of seafloor spreading in the North Atlantic (Gleadow & Brooks, 1979, Tegner et al., 1998 and for further references Nielsen, 1987).

Exploration has been limited to a number of intrusions and complexes. Two large deposits with a potential for being ”world class” have been studied in detail. The Skaergaard palladium deposit is an example of stratiform ”Skaergaard-type” mineralisations (Andersen et al., 1998) in mafic intrusions and complexes of continental rift environments. In several of other mafic intrusions along the East Greenland volcanic rifted margin (e. g., Deer 1976) have sub-economic PGE mineralisations been observed (e. g., Bird et al., 1995 and Arnason & Bird, 2000).

The Malmbjerg porphyry molybdenum deposit (Harpøth et al., 1986) is, as other molybdenum and vein mineralisations along the east coast of Greenland (e. g., Geyti & Thomassen, 1984) best compared to classic porphyry mineralisation of continental collision environments. Along the East Greenland volcanic rifted margin the porphyry-type mineralisations are related to the post-rifting felsic magmatism. The felsic magmatism was the product of variable degrees of interaction between volatile and alkali-enriched mafic melts and upper crust (e. g., Nielsen 1987). In this respect the East Greenland felsic complexes with porphyry-type mineralisation may be compared to intrusive complexes in collision environments.

Despite the significant amount of geological investigation and exploration many intrusions and intrusive complexes are still only superficially known. Even the main lithological variation and the age of many complexes is not well-established and entire subprovinces (e. g., the Kialineq region) are only know from reconnaissance investigations.

Intrusions and magmatic complexes

The intrusions in East Greenland cover a very wide range of lithologies and compositions.

Mafic intrusions

Classic tholeiitic intrusions like the Skaergaard intrusion (Wager and Brown, 1968 and Irvine et al., 1998) belong to a main group of tholeiitic gabbro intrusions, some of which have subordinate proportions of ultramafic components (e. g., Bernstein et al., 1992). All the tholeiitic gabbro intrusions and complexes have their own characteristics, which reflect differences in both the composition of primary mantle derived tholeiitic melts and processes en route to their upper crustal magma chambers. The tholeiitic intrusions and complexes represent both continental type mafic intrusions (e. g., Skaergaard intrusion, see references above) and replenished ocean floor-type tholeiitic gabbro complexes (e. g., Kap Edvard Holm Complex, Bernstein et al., 1992). Most of the tholeiitic intrusions and complexes formed between 55 and 50 Ma ago. It should be mentioned that investigations of lava and sill composition trougfhout East Greenland (Momme et al., 2002) show that all tholeiitic melts are relatively rich in PGE and not significantly depleted by sulphur saturation en route to the surface.

Felsic intrusions

The second main group of intrusions are dominated by quartz syenite, monzonite and granite with subordinate proportions of silica undersatured nepheline syenite. Many of these complexes have a close association to basic melts such as silica undersaturated or oversaturated trachybasalts and silica oversaturated trachyandesites (Nielsen, 1987). To many felsic complexes are associates dikes composed of commingled basic and felsic melt or small mafic intrusions. Another characteristic is that many of the felsic complexes are related swarms of dykes including peralkaline alkali-rich tinguaite dykes and veins. The felsic complexes formed from c. 55 to at least 25 Ma ago (see, e. g., Nielsen 1987).

Isotopic investigations demonstrate basement interaction between many of the primary magmas and crustal reservoirs (see review, Nielsen, 1987). This is of importance for the mineralisation processes (e. g., Jensen, 1998). Interaction with basement derived material or melts can lead to saturation in sulphur in basic magmas and metals contained in basement lithologies such as metasediments can be re- deposited in mineralisations of the felsic intrusions.

Carbonatite related intrusions

The third main type is carbonatite-related intrusion or complexes formed from melanephelinitic melts. Only one major intrusive complex of this type is recorded. The Gardiner complex is *c.* 55 Ma old. Nephelinitic magmatism is quite wide-spread in the inland regions along the volcanic rifted margin (Nielsen, 1994 and Bernstein *et* al., 2000).

The data sheet

The Paleaogene magmatic intrusions and complexes in East Greenland are described from north to south in ”data sheets”. The intrusions and complex are not evenly distributed along the volcanic rifted margin. The clusters of intrusions and complexes are often referred to as ”centres” or ”districts”. In this report the intrusions and complexes are referred to regions 1-12, figs 1-4. Regional introductions and orientation maps are found in data sheets 2.0, 4.0, 5.0, 6.0 and 8.0 to 12.0.

The data sheets for the 69 intrusions and complex of Palaeogene age are identified by a numerical code. The code consists of two numbers: a region code (1 to 12) and the number for the individual intrusion or complex magmatic body within regions, f. ex., the information on the Skaergaard intrusion in the Kangerlussuaq region (region number 9) is summarised in data sheet 9.1. (see list of contents).

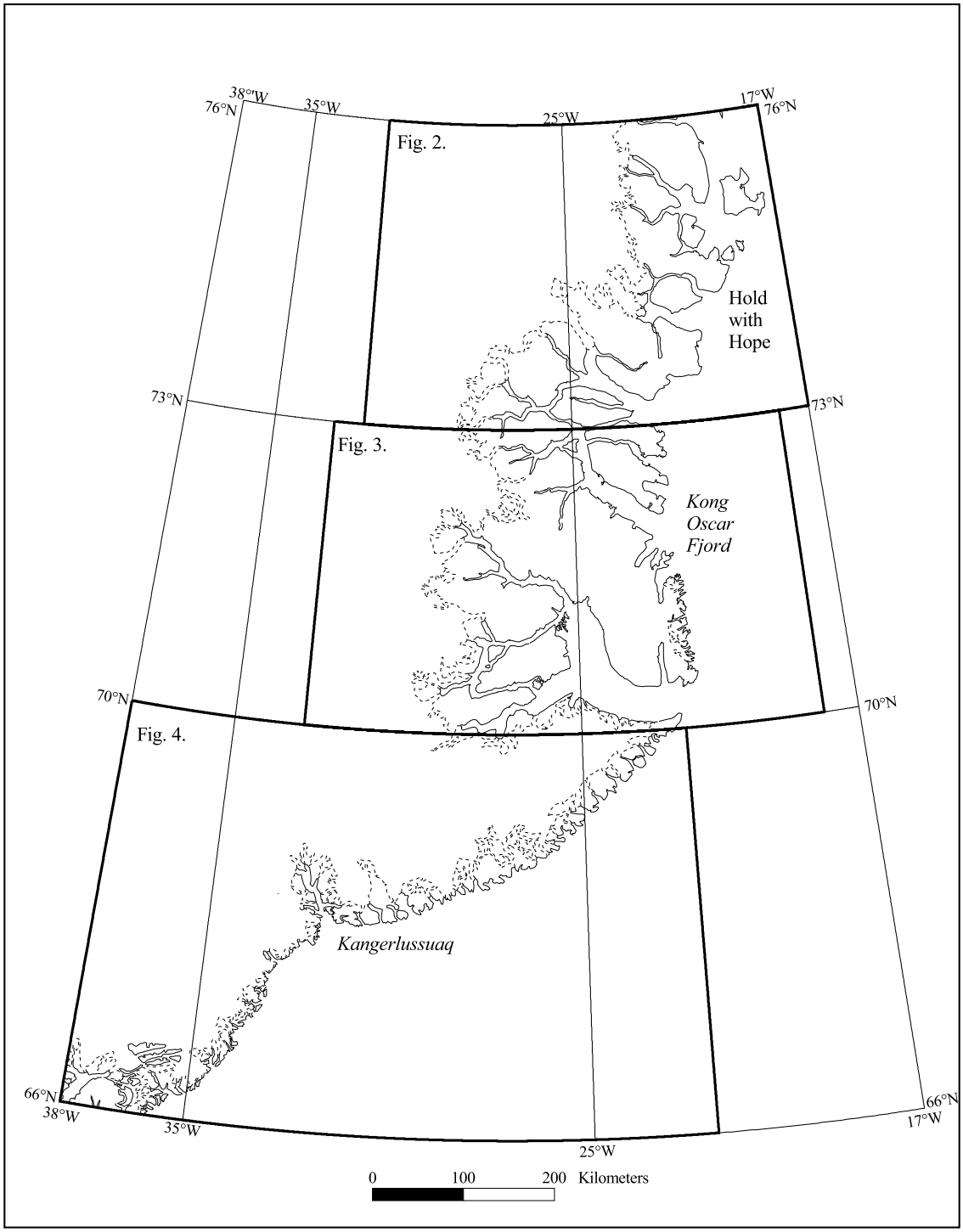

Fig. 1: East Greenland 66 - 76° N

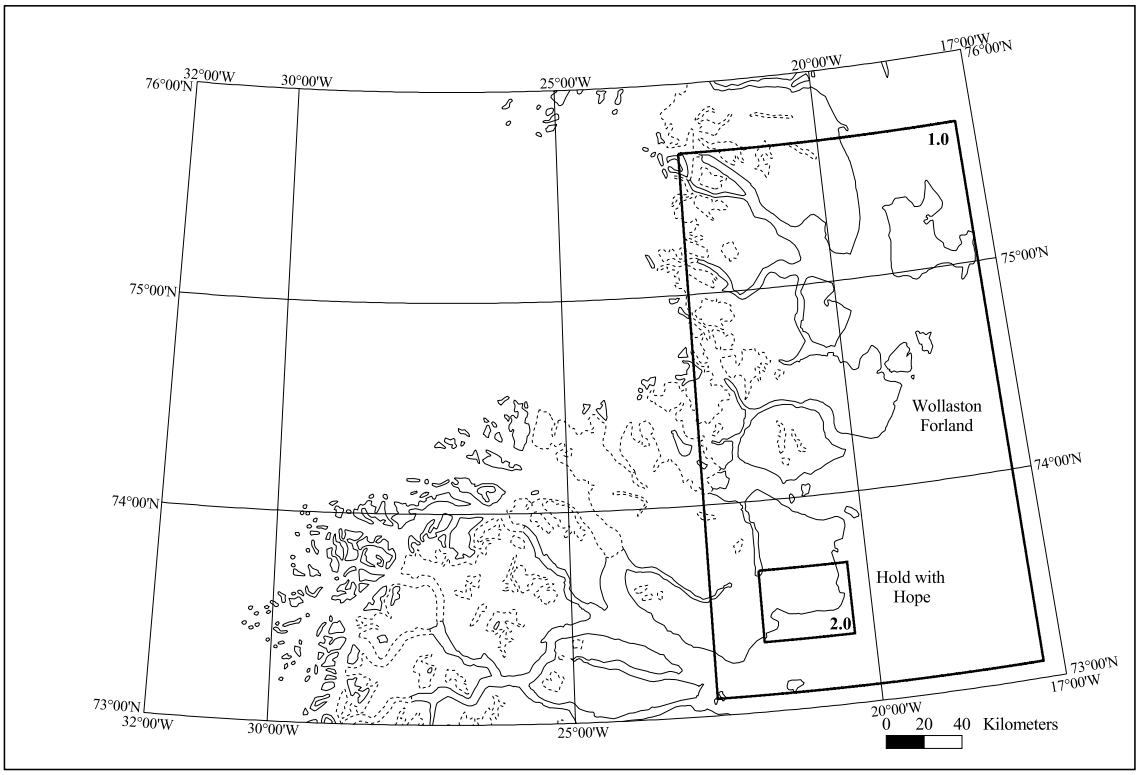

Fig. 2: East Greenland 73 - 76° N. Regions are indicated.

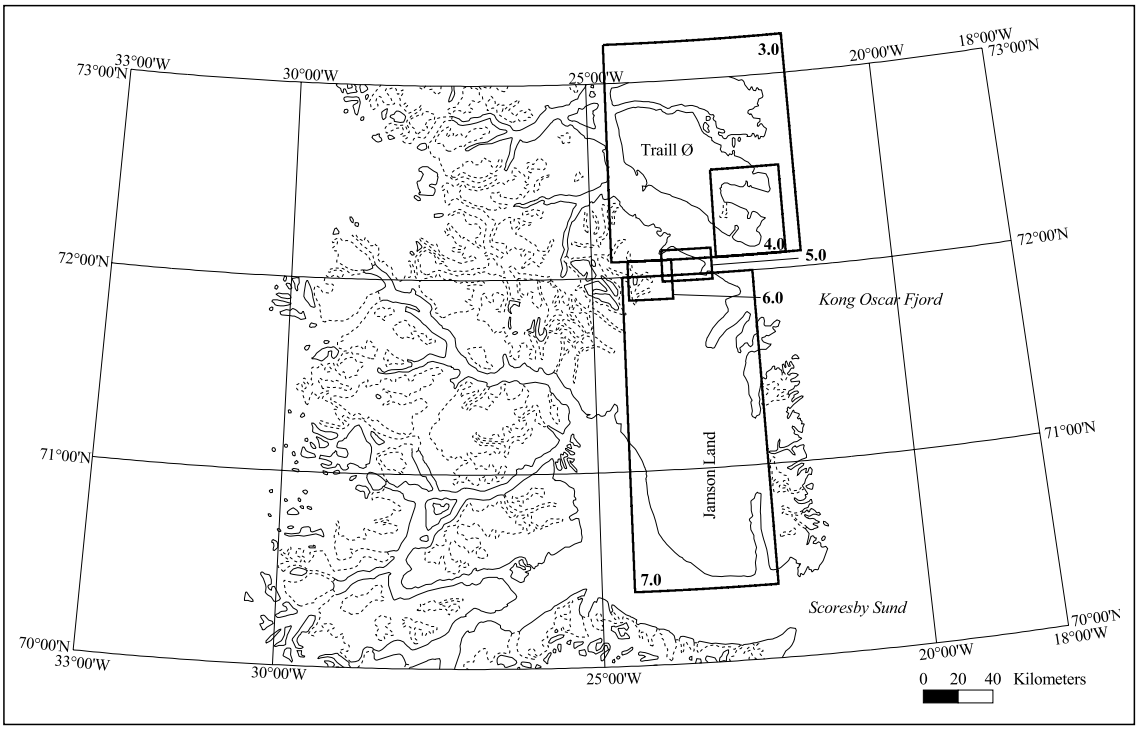

Fig. 3: East Greenland 70 - 73°N. Regions are indicated.

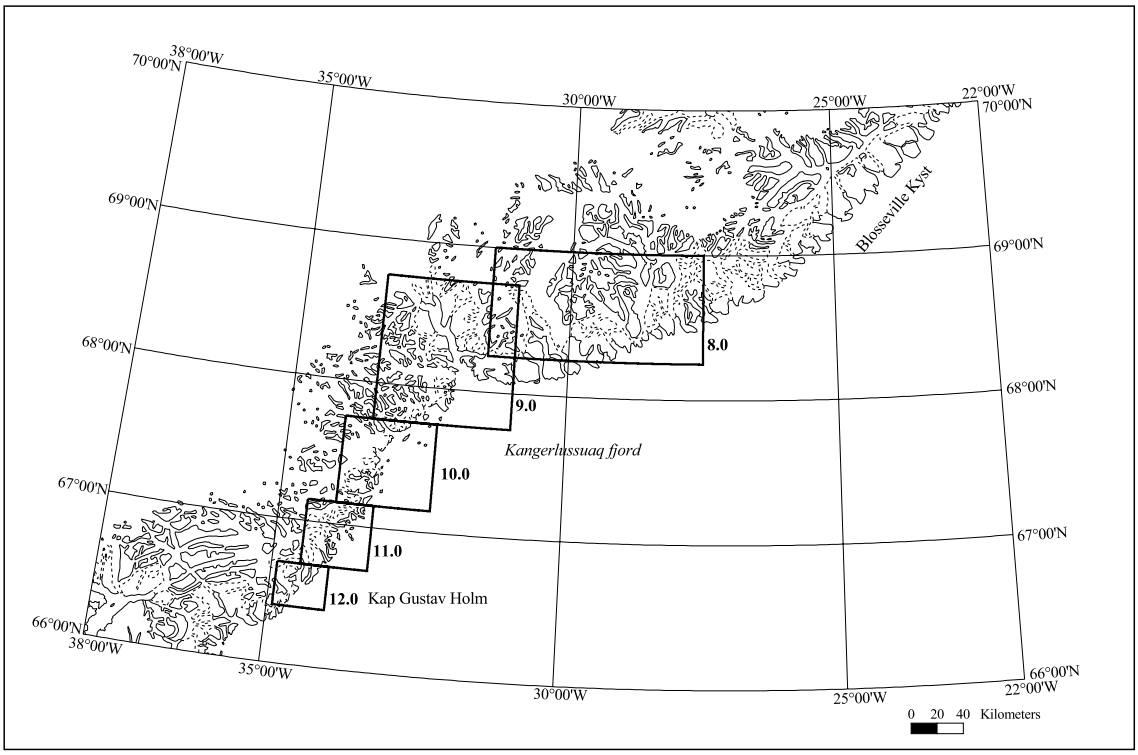

Fig. 4: East Greenland 66 - 70° N. Regions are indicated.

Inventory of a data sheet

Data sheet number	See definition above.
Name	See section below.
Short characteristic	Type of complex and mineralisations.
Location:	The location is given in the form of the geographical co-ordinates for a single point within the intrusion/complex or within macrodykes. The co-ordinates have been read from the topographic maps published by National Survey and Cadastre Denmark; KMS, formerly GI) in the scale 1:250 000.
Main references:	References to the most useful general introduction (s) and description (s).
Topographic maps:	Topographic maps available from National Survey and Cadastre Denmark (KMS, formerly GI) and the Geological Survey of Denmark and Greenland (GEUS).
Landsat image:	Landsat images available from GEUS.
Aerial photographs:	Aerial photographs available from KMS and from GEUS.
Geological maps:	Geological maps sheets available from GEUS, publication maps and in some cases maps open company reports and unpublished maps.
Geophysical maps:	Geophysical maps available from GEUS.
Geochemical maps:	Geochemical maps and data for such maps available from GEUS and in open company reports.
Short description:	Short geological description based on published and unpublished information.
Petrography:	Metadata for petrographic descriptions of the magmatic rocks.
Geochemistry:	Metadata for whole rock major and trace element analyses.
Exploration activity:	Summary of exploration activity.
Exploration results:	Short summary of exploration results.
Comments and company recommendations:	only if available.
Further information:	Organisations and individuals that can be contacted for further information and unpublished data.
References:	A selection of literature references. For the least known oc

	currences of magmatic rocks virtually all references are given. For well-described occurrences only a selection of references are given. A full list of company reported can be obtained from GEUS on request.
Compiler:	The name of the compiler of the data sheet.
Date:	Date for the most recent up-date of the data sheet.

Spelling of names for intrusions and complexes.

Intrusions and magmatic complexes in East Greenland are not always referred to by the same name and the spelling can - and does - quite often vary. In the data sheets is generally adopted the name used in the main reference(s). That is in general the name given in the first descriptions of the intrusion or complex. Exception to this is, f. ex., the Forchammer pluton (data sheet 4.2) which is now currently referred to as the Kap Simpson complex.

The spelling of names of magmatic rock occurrences based on geographical place names follows in general the spelling in the 1:250 000 topographic maps published by National Survey and Cadastre Denmark (KMS). The currently official spelling is ***not*** used for most names of intrusions and complexes, as virtually all of these have been named and described before the introduction of the now official spelling. The rational for this is that the first recorded names are “formation names”. In table 1 some of the intrusions and complexes where mistakes can occur are listed.

Table 1. *Some intrusions and complexes where mistakes in names can occur.*

Name used in this report	Other used names
<u>Region 4: Traill Ø</u>	
Kap Simpson complex	Forchammer Pluton
<u>Region 5: Anarctic Havn</u>	
Theresabjerg complex	Theresabjerg composit intrusion
<u>Region 6: Werner Bjerge</u>	
Werner Bjerge complex	Werner Bjerge alkaline Massif
<u>Region 8: Blosseville Kyst</u>	
Borgtinderne complex	Bortinderne intrusion
Lilloise complex	Lilloise alkaline gabbro complex
<u>Region 9: Kangerlussaq</u>	Kangerdlugssuaq
Skaergaard intrusion	Skærgårdsintrusionen and Skærgårds Intrusionen
Kangerdlugssuaq complex	Kangerdlugssuaq Alkaline Intrusion and Satellite intrusions
Kangerdlugssuaq Alkaline Intrusion	Kangerdlugssuaq intrusion

(Kangerdlugssuaq) Augite Syenite intrusion	Augite Syenite
(Amdrup Fjord) Biotite Granite intrusion	Biotite Granite
Kap Edvard Holm Complex	Kap Edvard Holm layered intrusion
Kap Edvard Holm Intrusion	Kap Edvard Holm (gabbro)
Kontaktbjerg Breccia complex	Kontaktbjerg Breccia Zone, Kontaktbjerg hybrid rocks
New name:	
Cirque 1320 complex	
Region 10: Nualik	
Pátûlâjivit gabbro	Pâtûterajivit
Region 11: Kialineq (trad. name)	Kialeq (map sheet name)
Ikâsangmit complex	Ikerasangmuit, Ikerasangmiut, Ikasangmiit
Bjørn intrusion	Bjørn Syenite
Qajarsak granite	Matikalaq intrusion
Nûk diorite	Nûk breccia complex (Nûk at Piliarpe bay)
Aliuarssik intrusion	Auluiartik Granite
Place names	
Pilagpik (island)	Don Ø
Nûluk	Nûk (at Pueratse bay).

Intrusion, intrusive complex and complex: definitions

In the literature “intrusion” and “complex” have often been used arbitrarily. They are regarded as descriptive adjectives. In the present report “intrusion” refers to a succession of magmatic rocks formed by a single pulse or very homogeneous intrusive bodies, as opposed to “complex” that refers to magmatic rock occurrences formed by several, possibly, related intrusive bodies.

The distinction between “intrusion”, “complex” and in one case ”diatreme” is in many cases not easily made. In this report the use of these descriptive adjectives is based on the subjective understanding of the genesis of the complex and the relationship between the different parts of the intrusive body or bodies. The descriptive adjectives are as a rule spelled with small letters (e.g., Skaergaard intrusion). Exceptions to this (see data sheet 9.0) are:

Kangerdlugssuaq Complex

Kangerdlugssuaq Alkaline Intrusion

Kap Edvard Holm Complex

Kap Edvard Holm Intrusion

Two intrusions are identified by the rock they are composed of. More specific names would probably have been appropriate and the names of these magmatic rock occurrences are modified as shown:

Biotite Granite = (Amdrup Fjord) Biotite Granite (Data sheet 9.20)

Augite Syenite = (Kangerdlugssuaq) Augite Syenite (Data sheet 9.15)

Errors, omissions and corrections

The data sheets are an introduction to the Palaeogene intrusions and complexes in East Greenland and the available published and unpublished information. The information summarised in the data sheets represents a condensate of the vast information in the literature and the subjective understanding of the compiler of the data sheets. It is the intension to update the data sheets as new information becomes available.

There may be omissions, errors and a need for correction. All comments are welcome and can be directed to: Geological Survey of Denmark and Greenland, att: T.F.D. Nielsen, Øster Voldgade 10, DK-1350 Copenhagen K, Denmark (tfn@GEUS.dk).

NOTE: The Geological Survey of Denmark and Greenland cannot accept any responsibility for any errors or omissions or consequences thereof in the text itself or if material (aerial photographs, maps, publications, etc.) are ordered on the basis of this report.

Abbreviations

A number of abbreviations are used in the data sheets:

GEUS:	Danmarks og Grønlands Geologiske Undersøgelse (Geological Survey of Denmark and Greenland).
KMS:	Kort og Matrikkelstyrrelsen (National Survey and Cadastre Denmark).
GRF:	Greenland Report File (in GEUS archive).
ppm:	Parts per million
ppb:	Parts per billion

Acknowledgements

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The data Sheets

1. Sills in NE Greenland from 73 to 76° North

Basaltic sills.
No mineralisations of significance recorded.

Location:	East Coast of Greenland between 73 and 76°N.
Main references:	Noe-Nygaard (1976), Hald (1978), Upton *et* al. (1984b).
Topographic maps:	1:250 000 KMS: 73Ø1 Hold with Hope, 74Ø1 Wollaston Forland, 74Ø2 Clavering Ø, 75Ø1 Hochstetter Forland and 75Ø2 Kong Wilhems Land. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat image:	TM path-row 229-007.
Aerial photographs:	1:150 000 KMS flight line 888Q, nos 482–504. KMS flight line 888R, nos 984–1005. KMS flight line 888S, nos 1034–1079. KMS flight line 888T, nos 1087–1130. KMS flight line 888U, nos 1139–1168. KMS flight line 888V, nos 1173–1190. KMS flight line 888W, nos 1196–1206. MS flight line 888W, nos 1024–1026.
Geological maps:	Regional map: 1:500 000, sheet 11 Kong Oscar Fjord (Geological Survey of Denmark and Greenland, 2001). Publication map: Koch & Haller (1971), Upton & Emeleus (1977), Upton *et* al. (1980) and Upton *et* al. (1984b). Unpublished field maps: Upton & Emeleus 1976: (GEUS archive map no. 73Ø1 4a).
Geophysical maps:	GEUS: Aeromagnetic Map of Greenland, sheet 4 (69° - 74°N, 19° - 27°W); 1:1 000 000 (Geological Survey of Greenland, 1988). GEUS: Aeromagnetic Map of Greenland, sheet 5 (69°30'–78°00'N; 12°00' –24°00'W); 1:1 000 000 (Geological Survey of Greenland, 1988).

Hyperspectral data: None.

Geochemical maps: Geochemistry of heavy mineral samples in Harpøth et al. (1986). For Hold With Hope: Rose et al. (1998b, Appendix 3D).

Short description: Remnants of the Tertiary flood basalts province occur throughout the region. In most coastal regions are Cretaceous to Palaeogene sediments below the flood basalts intruded by basaltic sills. Isolated basaltic units in some areas may be lavas or sills. Information is for some of these occurrences sparse. This does not reflect the volumetric importance of sills. Large volumes of basaltic magma is hosted in the sill complexes. Sills are exposed on Shannon Ø, Kuhn Ø, Wollaston Forland including Sabine Ø and Lille Pendulum Ø, Clavering Ø, the eastern part of Hudson Land, Hold with Hope, the eastern part of Gauss Halvø and a number of smaller islands. The best review is given by Noe-Nygaard (1976).

The majority of the sills are basaltic, but alkaline varieties are described from several locations. Few detailed studies have been made. Sills are in all cases described in relation to more detailed investigations of flood basalts or intrusive centres. Picritic sills in the central areas of Hold with Hope have attracted special interest (Rose *et* al. 1998b,).

Further information in Noe-Nygaard (1976). More detailed studies for Giesecke Bjerge area, Gauss Halvø (73^{o}25'N, 22^{o}10'W) are presented by Hald (1978) and for Hold with Hope (73^{o}45'N; 21^{o}W) by Rose *et* al. (1998b).

No mineralisations of significance have been reported to be related to the sills.

Petrography: For Hold with Hope: Rose *et* al. (1998b, short descriptions in appendix 2-1). For Giesecke Bjerge: Hald (1978) and regionally: Upton *et* al. (1980 and 1984a). Additional information in Noe-Nygaard (1976).

Geochemistry: For Hold with Hope: Whole rock major and trace element information in Rose *et* al. (1998b, Appendices 3A-3C). For Giesecke Bjerge: Hald (1978) and Upton *et* al. (1984a) and miscellaneous: Noe-Nygaard (1976) and references therein.

Exploration activity: ***1997***: The only exploration activity directed towards sills was conducted in 1997 by INCO Ltd. (Rose *et* al., 1998a and b).

Exploration results: The exploration for possible PGE mineralisations was directed toward olivine-rich sills in the sediments below the plateau basalts of Hold with Hope in the northern part of the Tertiary flood basalt province. The exploration showed that picritic to basaltic sills have elevated PGE concentrations, but no mineralisations were identified.

Comments and company recommendations: All sill areas have not be subjected to focused exploration, but for the Hold with Hope area Rose *et* al. (1998b) state*:* "Although there is a limited potential for finding magmatic sulphide deposits in the geological setting seen at Hold with Hope; massive sulphide mineralised intrusions are probably not exposed at the current erosion level".

Further information: GEUS.

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Compiler: T.F.D. Nielsen.

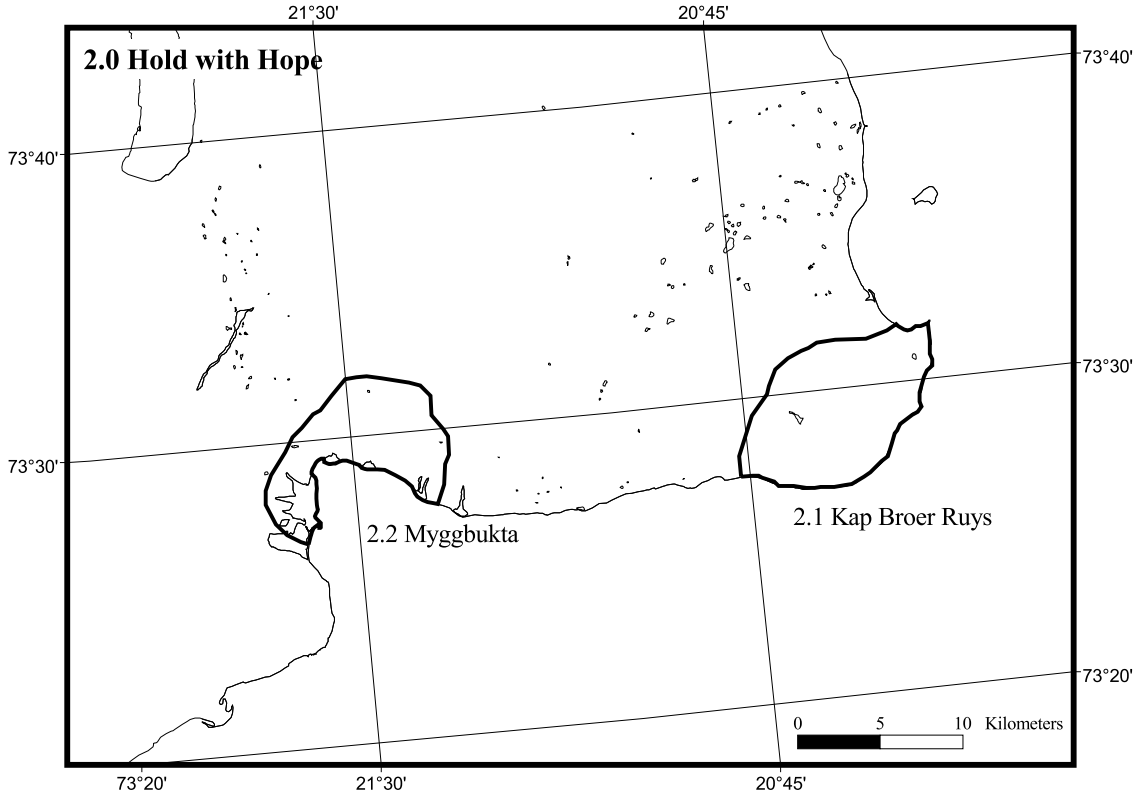
Date: 2001-30-11.

2. Region 2: Intrusive complexes on Hold with Hope

The plateau basalts and the magmatic complexes on Hold with Hope, in Giesecke Bjerge and on Wollaston Forland constitute most of the exposed northern part of the Palaeogene igneous province in northern East Greenland (see review by Noe-Nygaard, 1976). Different parts of the region are described by Upton & Emeleus (1977), Hald (1978), Upton et al. (1980) and Upton et al. (1984a and b).

On Hold with Hope Jurassic to Cretaceous sediments are overlain by plateau basalts divided into ”Lower Series” of tholeiitic lavas and an Upper ”Series” of contaminated tholeiites and mildly alkaline to alkaline lavas. The sediments are intruded by a suite of Palaeogene sills, including picrite sills. The latter have attracted some exploration interest.

The roof zone of two intrusions - the Myggbukta intrusion and the Kap Broer Ruys intrusion - are located on the south shore of Hold with Hope. In the Myggbukta intrusion are exposed basaltic to granitic dykes and plugs of the Myggbukta complex. The aeromagnetic anomaly related to the Myggbukta intrusion can be followed into the sea to the south of Myggbukta. Zones of hydrothermal alteration have been the targets for exploration.



At Kap Broer Ryus erosion has not exposed the intrusion. Mesozoic sediments in roof of the intrusion are altered by hydrothermal activity and intruded by dykes and sheets of a

wide compositional range. Areas of hydrothermal alteration have been the targets for exploration.

Thomassen (1990) delineate the two complexes on Hold with Hope as targets for gold exploration, but no economically significant mineralisations have been recorded (Brown, 1996).

References

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Noe-Nygaard, A. 1976: Tertiary igneous rocks between Shannon and Scoresby Sund, East Greenland. In: Escher A. &Watt, W.S. (eds): Geology of Greenland, 386-402. Copenhagen: Grønlands Geologiske Undersøgelse.

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Upton, B.G.J.; Emeleus, C.H. & Macintyre, E.M. 1984b: Myggbukta and Kap Broer Ruys: the most northerly of East Greenland Tertiary centres (?). Mineralogical Magazine 48, 323-343.

2.1 Kap Broer Ruys complex

Roof zone of intrusive complex.
Gold-bismuth anomalies and widespread tourmaline.

Location:	73°30'N; 20°33'W.
Main references:	Upton *et* al. (1980) and Upton *et* al. (1984b).
Topographic maps:	1:250 000 KMS: 73Ø1 Hold with Hope. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat image:	TM path row 229-008.
Aerial photographs:	1:150 000 KMS flight line 888S, nos 1077–1079. KMS flight line 888T, nos 1087–1089. 1:50 000 KMS flight line 872H, nos 429–434. KMS flight line 872J, nos 485–490.
Geological maps:	Regional map:1:500 000, sheet 11 Kong Oscar Fjord (Geological Survey of Denmark and Greenland, 2001). Publication map: Koch & Haller (1971), Upton & Emeleus (1977), Upton *et* al. (1980, 1984b). Unpublished field maps: Upton & Emeleus (1976, GEUS archive map no. 73Ø1 4a).
Geophysical maps:	GEUS: Regional magnetic anomaly map no. 5 (69°30'–78°00'N; 12°00' –24°00'W); 1:1 000 000 (Geological Survey of Greenland, 1988).
Hyperspectral data:	None.
Geochemical maps:	Geochemistry of heavy mineral samples is reported in Harpøth et al. (1986).
Short description:	The Kap Broer Ruys area consist of Cretaceous sediment and Palaeogene flood basalts over a shallow level intrusive centre. The proximity of the intrusive centre is indicated by struc

tural features, intrusion of granophyre and felsite sheets into the sediments just below the sediment-lava interface and widespread hydrothermal alteration in a semi-circular area 12 km across. The most detail geological descriptions are given by Upton & Emeleus (1977), Upton *et* al. (1980 and 1984b). Upton *et* al (1984b) give an age of 46-48 Ma.

The high silica felsites are suggested to be contaminated fractionation products from an unexposed mafic complex.

Perography: Bäckström (1901), Nathorst (1901), Tyrrel (1932), Noe-Nygaard (1976) and Upton *et* al. (1984b).

Geochemistry: Upton *et* al. (1984b).

Exploration activity: ***1976****:* Mineralisations at Kap Broer Ruys were investigated by Grønlands Geologiske Undersøgelse (Nielsen & Johansson, 1977).
1986: Information compiled by Harpøth *et* al. (1986). See also company report by B. Thomassen (1984).
1995: Tertiary Gold Ltd. investigations (Brown, 1996).
1997: Inco investigations report (Rose *et* al., 1998b).

Exploration results: Harpøth *et* al. (1986) identifies three types of mineralisation:

(a) mineralisation of pyrrhotite or magnetite as layers or lenses in host sediments with minor pyrite, chalcopyrite, sphalerite and ilmenite;
(b) Hydrothermal mineralisation with intense pyritisation and bleaching of argillized hosts rocks cut by rare quartz-pyrite and fluorite veins. Pyrite dessiminated in host rocks and in amygdales together with magnetite, ilmenite and minor pyrrhotite, sphalerite, cobaltite and arsenopyrite.
(c) Tourmaline-bearing hornfels breccia in boulders of unknown origin. May contain fluorite and bismuthinite (5-10%).

Limited information in Nielsen & Johansson (1977) with max. 1500 ppm antimony, 200 ppm silver and 0.6 ppm gold. B. Thomassen (1984) reports one pan sample with 0.14 ppm gold and from southern Hold with Hope whole rock samples with up to 0.5 ppm gold. Brown (1996) notes zones anomalous in Au.

Comments and company recommendations: No significant mineralisation has been reported.

Further information: GEUS: B. Thomassen.

References:

Research papers and descriptions:

Bäckström, 1901: See Nathorst (1901).

Harpøth, O., Pedersen, J.L., Schønwandt, H.K. & Thomassen, B. 1986: The mineral occurrences of central East Greenland. Meddelelser om Grønland, Geoscience **17**, 139 pp.

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Upton, B.G.J. & Emeleus, C.H. 1977: The Tertiary geology of Hold with Hope, northern east Greenland. Rapport Grønlands Geologiske Undersøgelse **85**, 115-121.

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Company reports:

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Rose, N.M., Lightfoot, P.C., Golightly, J.P. & Makela, E.F. 1998a: Inco Ltd – northeast Greenland Project: Report on the 1997 regional reconnaissance activities (prospecting license no. 22/97). Inco Ltd internal report, 12 pp. (See Rose *et* al., 1984b)

Rose, N.M., Lightfoot, P.C., Golightly, J.P. & Makela, E.F. 1998b: Inco Ltd – northeast Greenland Project: Report on the 1997 regional reconnaissance activities (Exploration license no. 22/97). Inco Ltd internal report, 16 pp. (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 21554)

Thomassen, B. 1984: Gold indications in central East Greenland 66^{o} – 74^{o}30' N. Lat. Unpublished NM-Note **2/84**, 34 pp. Copenhagen: Nordisk Mineselskab.

Compiler: T.F.D. Nielsen.

Date: 2001-11-27.

2.2 Myggbukta complex

Roof zone of shallow level intrusion, caldera.
Minor gold mineralisation.

Location:	73°30'N; 21°33'W.
Main reference:	Noe-Nygaard (1976), Upton *et* al. (1980), Upton *et* al. (1984b) and Harpøth *et* al. (1986).
Topographic maps:	1:250 000 KMS/Geodætisk Institut: 73Ø1 Hold With Hope. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat image:	TM path row 229-008.
Aerial photographs:	1:150 000 KMS flight line 888R, nos 987–990. 1:50 000 KMS flight line 872G, nos 417-419. KMS flight line 872H, nos 438–442. KMS flight line 872J, nos 476–482.
Geological maps:	Regional map sheet: 1:500 000, sheet 11 Kong Oscar Fjord (Geological Survey of Denmark and Greenland, 2001). Publication maps: Koch & Haller (1971), Upton & Emeleus (1977), Upton *et* al. (1980) and Upton *et* al. (1984b). Unpublished field map: GEUS archive map no. 73Ø1 4a (Upton & Emeleus, 1976).
Geophysical maps:	GEUS: Aeromagnetic Map of Greenland, sheet 4 (69° - 74°N, 19° - 27°W); 1:1 000 000 (Geological Survey of Greenland, 1988).
Hyperspectral data:	None.
Geochemical maps:	Geochemistry of heavy mineral samples in Harpøth et al. (1986).
Short description:	Top of differentiated subvolcanic complex. Includes both volcanics and intrusive stocks. The complex is only partially ex

posed over an ellipsoidal area app. 8 x 5 km on the hillsides N, NE and E of Myggbukta radio station. The complex is dominated by basic volcanics, unified under the term ”The Central Series”. They range from picritic to basaltic compositions with subordinate felsic extrusives. The extrusives are intruded by mainly basic stocks. One differentiated stock comprises coarse to medium grained ferrogabbro and ferrodiorite with thin sheets of more evolved compositions, including potassic rhyolite. Trachytic lavas, ignimbrites and agglomerates occur in some areas. Volcanics are in areas cemented by hematite and calcite.

Upton *et* al. (1984b) give a suite of ages for Myggbukta from 48.8 +/- 1.1 Ma to 24.4 +/- 1.3 Ma.

Petrography: Upton *et* al. (1984b).

Geochemistry: Upton *et* al. (1984b).

Exploration activity: Mineralisation was recorded during the regional mapping and geological investigation of central East Greenland by led by L. Koch (Koch & Haller, 1971). The complex was evaluated by Geyti (1982). See also Rose *et* al. (1998) and Thomassen (1984).

Exploration results: The Central Series are affected by intense propylitic alteration characterised by epidote, chlorite, calcite and quartz and locally veins containing pyrite, hematite and fluorite. Alteration is in some areas pervasive and very intense.
Felsite veins may contain sulphides and a scree returned 0.26 ppm gold (Harpøth *et* al., 1986). Brown (1996) notes zones anomalous in Au.

Comments and company recommendations: No significant mineralisation has been observed. B. Thomassen (1984) identifies gold anomalous area # 17 in the Muyggbukta complex on the basis of analyses of whole rock and pan samples.

Further information: GEUS: B. Thomassen.

References: Research papers and descriptions:

Harpøth, O., Pedersen, J.L., Schønwandt, H.K. & Thomassen, B. 1986: The mineral occurrences of central East Greenland. Meddelelser om Grønland, Geoscience **17**, 139 pp.

Koch, L. & Haller, J. 1971: Geological map of East Greenland 72^{o} – 76^{o}N. Lat. (1:250 000). Meddelelser om Grønland **183**, 26 pp.

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Upton, B.G.J. & Emeleus, C.H. 1977: The Tertiary geology of Hold with Hope, northern east Greenland. Rapport Grønlands Geologiske Undersøgelse **85**, 115-121.

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Company reports:

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Geyti, A. 1982: Geological reconnaissance for porphyry-type mineralizations in 1981. Hudson Land, Hold with Hope, Bontekoe Ø, Scoresby Land, and Traill Ø. Internal NM-report **4/81**, 57 pp. (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20724).

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Thomassen, B. 1984: Gold indications in central East Greenland 66^{o} – 74^{o}30' N. Lat. Unpublished NM-Note **2/84**, 34 pp. Copenhagen: Nordisk Mineselskab A/S.

Compiler: T.F.D. Nielsen.

Date: 2001-11-29.

3. Sills in central East Greenland

Subalkaline and alkaline basaltic sills.
No mineralisation is reported.

Location:	East coast of Greenland between 72 and 74°N.
Main references:	Noe-Nygaard (1976), Hald (1996) and Price *et* al. (1997).
Topographic maps:	1:250 000 KMS: 72Ø1 Kap Parry, 72Ø2 Kong Oscars Fjord, 73Ø1 Hold with Hope and 73Ø2 Ymers Ø. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat image:	TM path rows: 227-009 and 229-010.
Aerial photographs:	1:150 000 KMS flight line 888N, nos 380–395. KMS flight line 888P, nos 1318–1334. KMS flight line 888Q, nos 507–524. KMS flight line 888R, nos 980–983.
Geological maps:	Regional map: 1:500 000, sheet 11 Kong Oscar Fjord (Geological Survey of Denmark and Greenland, 2001). Publication map: Koch & Haller (1971), Upton & Emeleus (1977), Upton *et* al. (1980) and Upton *et* al. (1984a).
Geophysical maps:	Aeromagnetic Map of Greenland, sheet 4 (69° - 74°N, 19° - 27°W); 1:1 000 000 (Geological Survey of Greenland, 1988).
Hyperspectral data:	None.
Geochemical maps:	Geochemistry of heavy mineral samples in Harpøth et al. (1986).
Short description:	The coastal regions between 72 and 73°N are characterised by very significant volumes of basaltic melt emplaced as sills. The most useful overview is given by Noe-Nygaard (1976) and Hald (1996). The sills are in general hosted by and subconcordant with the Mesozoic sediment of the East Greenland Basin on the eastern tip of Ymers Ø, the eastern parts of Geographical Society Island and Traill Ø.

The sills vary in thickness from less than 1 m to 250 m, but thicknesses between 20 and 30 m are common. Aphyric to plagioclase phyric tholeiitic varieties dominate. Alkaline mafic sills occur as a subordinate type throughout the region and include ankaramite and nepheline tephrite (Noe-Nygaard, 1976).

Age determinations in Price *et* al. (1997) suggest the main suite of tholeiite intrusions to be *c.* 54 Ma old. Alkaline intrusions have been dated to *c.* 36 Ma.

Petrography: Noe-Nygaard (1976), Hald (1996) and Price *et* al. (1997).

Geochemistry: Noe-Nygaard (1976), Hald (1996) and Price *et* al. (1997).

Exploration activity: No exploration activity has been directed towards the sills of the coastal region between 72 and 74°N.

Exploration results: None.

Comments and company recommendations: All basaltic magmas in East Greenland investigated to date show no depletion in PGE and have the capability to form sulphide related PGE deposits. No systematic investigations for sulphide mineralisations with PGE have been conducted in the sill regions in central East Greenland between 72° and 74°N.

Further information: Geologisk Museum, Copenhagen: N. Hald.

References:

Research papers and descriptions:

Hald, N. 1996: Early Tertiary lavas and sills on Traill Ø and Geographical Society Island, northern East Greenland: petrography and geochemistry. Bulletin of the Geological Survey of Greenland 171, 29-43.

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Upton, B.G.J. & Emeleus, C.H. 1977: The Tertiary geology of Hold with Hope, northern east Greenland. Rapport Grønlands Geologiske Undersøgelse **85**, 115-121.

Upton, B.G.J.; Emeleus, C.H. & Hald, N. 1980: Tertiary volcanism in northern East Greenland: Gauss Halvø and Hold with Hope. Journal of the Geological Society of London **109**, 21-49.

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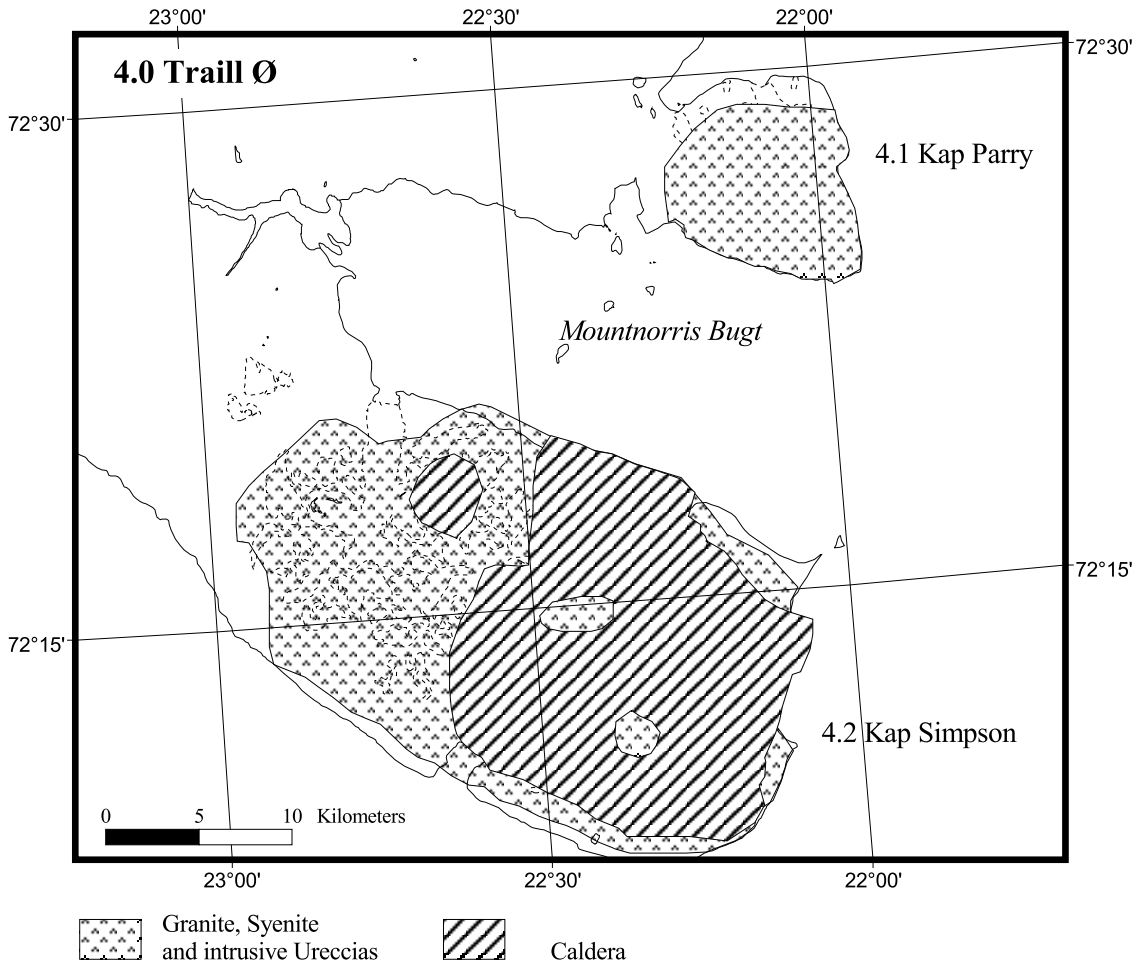
Compiler: T.F.D. Nielsen.

Date: 2002-01-08.

4. Region 4: Traill Ø intrusive complexes

Parts of two felsic sub-volcanic intrusive complexes are exposed on the headlands of eastern Traill Ø. They are emplaced into Mesozoic to Palaeogene sediments (Price *et* al., 199x) and predated by Paleaogene basaltic dykes and sill complexes. Only the uppermost parts of the complexes are exposed. Reviews have been published by Noe-Nygaard (1976) and Nielsen (1987).

Both complexes are characterised by ring structures and intrusive plugs (Engell, 1975) and Schaub (1938 and 1942), which in some areas are accompanied by intense dessiminated sulphide mineralisation and areas of intense iron oxide straining. Although traces of mineralisation and areas of intense hydrothermal alterations are very extensive in both complexes, no major deposits have been found in the surface exposures (Harpøth *et* al., 1986). Analogies have been made to the Werner Bjerge complex and the possibility for stockwork molybdenum mineralisation has been suggested. Minor mineralisations with the characteristics of porphyry molybdenum deposits have been described from the Kap Simpson intrusion (Geyti, 1982).



The aeromagnetic maps and the field relations at Kap Parry suggests that only the north-western quarter of a circular intrusion is exposed above sea level. By contrast, most of the Kap Simpson intrusion is exposed on land. An older sequence of subvolcanic intrusives and large rafts of Mesozoic sediments subsided inside the walls of a caldera that was later surrounded by a nearly complete ring dyke of granites (T. Tukiainen and T.F.D. Nielsen, pers. comm., 2001).

The aeromagnetic maps suggest that yet another intrusive complex exist in the sea floor just east of Kap Simpson. Some of the granites on the point of Kap Simpson may be related to this second intrusion (T.F.D. Nielsen, pers. comm., 2002).

References

Engell, J. 1975: The Kap Parry complex, central East Greenland. Rapport Grønlands Geologiske Undersøgelse **75**,103-106.

Geyti, A. 1982: Geological reconnaissance for porphyry-type mineralizations in 1981. Hudson Land, Hold with Hope, Bontekoe Ø, Scoresby Land, and Traill Ø. Internal NM-report **4/81**, 57 pp.

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Schaub, H.P 1942: Zur Geologie der Traill Insel (Nordost-Grönland). Eclogae Geologicae Helvetiae **35**, 1-54.

4.1 Kap Parry complex

Subvolcanic felsic complex.
Extensive hydrothermal alteration and minor sulphide mineralisation.

Location:	72°26'N, 22°05'W.
Main references:	Engell (1975) and Schaub (1938, 1942).
Topographic maps:	1:250 000 KMS: 72Ø1 Kap Parry. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request. 1:20 000 GEUS archive: Hard copy is available. The map covers the area 72°23'N to 72°30'N and 21°55'W to 22°25'W. (Aerokort, 1974).
Landsat image:	TM path row: 227-009.
Aerial photographs:	1:150 000 KMS flight line 888Q, nos. 516–518. 1:50 000 KMS flight line 854G, nos. 6051–6055. KMS flight line 854H, nos. 6020–6025.
Geological maps:	Regional map: 1:500 000, sheet 11 Kong Oscar Fjord (Geological Survey of Denmark and Greenland, 2001). Publication map: Koch & Haller (1971), Schaub (1942), Engell (1975). Unpublished field maps: All data in published maps.
Geophysical maps:	GEUS: Aeromagnetic Map of Greenland, sheet 4 (69° - 74°N, 19° - 27°W); 1:1 000 000 (Geological Survey of Greenland, 1988).
Hyperspectral data:	None.
Geochemical maps:	Geochemistry of heavy mineral samples in Harpøth et al. (1986).

Short description:

Subvolcanic, felsic complex over major magnetic anomaly centred at sea just S of Kap Parry. The exposed and unexposed complex would be semi-circular and *c.* 20 km in diameter. The exposed plutonics and breccias are believed to represent the north-western quarter of the felsic roof of a major complex. The contact to Mesozoic sediments is not well defined and characterised by intrusive sheets, ring dikes and breccia zones. An underlying mafic complex is assumed due to the marked magnetic anomaly.

Following Engell (1975) the exposed magmatic formations are dominated by breccias, alkali-syenite and alkali granites. Due to the harsh climatic conditions most surface exposures are frost shattered. The plutonics and breccias are cut by related silicic and later, basaltic, dikes.

The complex post-dates the regional swarm of basaltic sills. Rex *et* al. (1979) gives a K-Ar age of *c.* 40 Ma (see also *"Further information"*).

Petrography:

Descriptions by Tyrrell (1932) and Engell (1975).

Geochemistry:

Few analyses in Tyrell (1932). Unpublished major element data by GEUS (Engell, 1975, special search is required).

Exploration activity:

Kap Parry has been visited on a number of occasions, but exploration has been limited to reconnaissance. Very prominent rust zones towards and beyond the margin of the intrusion appear related to sulphide mineralisation in and along the margins of late felsic veins and dikes (GEUS: T. Tukiainen and T.F.D. Nielsen, pers. comm., 2002).
1996: Tertiary Gold. Remote sensing and fieldwork (Brown, 1996).

Exploration results:

Harpøth et al. (1986) report anomalous Nb in pan samples (>5000 ppm). Brown (1996) notes zones anomalous in Au.

Comments and company recommendations:

No recommendations are given.

Further information:

GEUS: T. Tukiainen and M. Lind.
Århus Universitet: C. Tegner (unpublished Ar-Ar age determinations).

References:

Research papers and descriptions:

Engell, J. 1975: The Kap Parry complex, central East Greenland. Rapport Grønlands Geologiske Undersøgelse **75**, 103-106.

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Koch, L. & Haller, J. 1971: Geological map of East Greenland 72^{o} – 76^{o}N. Lat. (1:250 000). Meddelelser om Grønland **183**, 26 pp.

Noe-Nygaard, A. 1976: Tertiary igneous rocks between Shannon and Scoresby Sund, East Greenland. In: Escher A. &Watt, W.S. (eds): Geology of Greenland, 386-402. Copenhagen: Grønlands Geologiske Undersøgelse.

Rex, D.C., Gledhill, A.R., Brooks, C.K. & Steenfelt, A. 1979: Radiometric ages of Teriary salic intrusions near Kong Oscars Fjord, East Greenland. Papport Grønlands Geologiske Undersøgelse **95,** 106-109.

Schaub, H.P. 1938: Zur Vulkanotektonik der Inseln Traill und Geographical Society (Nordostgrönland*).* Meddelelser om Grønland **114**(1), 29-44

Schaub, H.P 1942: Zur Geologie der Traill Insel (Nordost-Grönland). Ecologae Geologiae Helvetiae **35**, 1-54

Tyrrell, G.W. 1932: The petrography of some Kainozoic igneous rocks, and the Cape Parry alkaline complex, East Greenland. Geological Magazine **69**, 520-527.

Company reports:

Brown, M.A. 1996: Geological fieldwork, infra-red spectral assay results from the Kap Simpson, Kap Parry, Mygg-bukta and Kap Broer Ruys igneous complexes in East Central Greenland, 50 pp. Internal report. Tertiary Gold Ltd. (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 21465).

Compiler: T.F.D. Nielsen.

Date: 2002-01-09.

4.2 Kap Simpson complex

Major intrusive complex with caldera sequence and extensive hydrothermal alteration. Polymetalic mineralisation in veins and hydrothermal areas, including base metals, molybdenum, fluorite and niobium-REE.

Location:	72°14'N, 22°30'W.
Main references:	Schaub (1938 and 1942), Noe-Nygaard (1976) and Harpøth et al. (1986)
Topographic maps:	1:250 000 KMS: 72Ø1 Kap Parry. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat image:	TM path row: 227-009. Remote sensing investigations by Conradsen *et* al. (1982), Thyrsted & Friedman (1982) Conradsen & Harpøth (1984).
Aerial photographs:	1:150 000 KMS flight line 888P, nos 1330–1334. KMS flight line 888Q, nos 519–524. 1:50 000 KMS flight line 854D, nos 6122–6128. KMS flight line 854E, nos 6112–6119. KMS flight line 854F, nos 6064–6072. KMS flight line 854G, nos 6057–6063. KMS flight line 854H, nos 6017–6019.
Geological maps:	Regional map: 1:500 000, sheet 11 Kong Oscar Fjord (Geological Survey of Denmark and Greenland, 2001). Publication map: Koch & Haller (1971), Schaub (1942), Paar & Punzengruber (1970) and Harpøth, et al. (1986).
Geophysical maps:	GEUS: Aeromagnetic Map of Greenland, sheet 4 (69° - 74°N, 19° - 27°W); 1:1 000 000 (Geological Survey of Greenland, 1988).
Hyperspectral data:	Hyperspectral data from project Hypergreen in a 4km wide SE-NW band from 72°07'N, 22°15'W to 72°22'N, 22°45'W.

Geochemical maps: Geochemistry of heavy mineral samples in Harpøth et al. (1986).

Short description: The Kap Simpson complex, previously also known as the “Forchammer Pluton”, occupies most of the peninsula between Mountnorris Fjord and Kong Oscars Fjord in SE Traill Ø.

From east to west the complex is exposed over more than 20 km which makes the Kap Simpson complex one of the largest exposed felsic complexes of the Palaeogene of East Greenland. With reference to the magnetic map (Aeromagnetic Map of Greenland, sheet 4) the exposures only represent part of a major intrusive complex continuing further east under the sea. The magnetic anomalies may suggest that the exposed complex is one of two intimately related intrusive centres.

The western part of the exposed complex is composed of a variety of plutonic granites and syenite whereas the eastern part is composed of a caldera sequence named the ”Dreibuchten Zone”. The caldera sequences is almost entirely surrounded by intrusive sheets and ring dikes of granite and syenite. The host rocks are hornfelsed Mesozoic sediments intruded by felsic sheets and dikes.

The complex post-dates the regional swarm of basaltic sills. Rex et al. (1979) gives a K-Ar age of c. 38 Ma. See also “Further information”.

The Dreibuchten Zone is dominated by felsic breccias and extrusives including quartz porphyries and rhyolitic flows, hypabysal porphyritic trachytes, syenites and granites and large rafts of the regional Mesozoic sediments. All of these are intruded by stocks of syenite and granite porphyries and cogenetic felsic dykes, some of which are best described as oversaturated tinguaites Leaching and hydrothermal alteration is widespread and has led to spectacular colour anomalies. Later basaltic dykes are fresh apart from alteration along fractures and joints.

The sedimentary rafts in the Dreibuchten Zone are up to >1 km in surface extend and >30 m thick (open). They are exposed in river gorges in large parts of the Dreibuchten Zone and include hornfelsed and mineralised, black shales and siliciclastic sediments. The rafts are only weakly deformed. The relative volume of rafts may be significant.

The western part of the complex is alpine and dominated by an suite of coarse grained intrusive unites of granite and sy

enite. Based on the given references, the ring dykes surrounding the Dreibuchten Zone and the plutonic granite and syenites in the west are believed to be related plutonism. The Dreibuchten Zone would then represent an early succession volcanic, sediment and vent facies subsided into the central part of the complex over the major, possibly mafic intrusive body at depth. Such a body is indicated by a marked magnetic anomaly.

A granitic intrusive body exposed on the eastern shore just north of Kap Simpson proper may relate to the large magnetic anomaly off shore.

The hornfeldsed sediment along the margin of the exposed complex and the marginal parts of the plutonic syenites and granites in the western part of the complex are intruded by suites of felsic dykes and veins, some of which are mineralised (niobium and tantalum).

Petrography: Petrographic descriptions of the main lithologies are given by Reinhardt (in Schaub, 1942).

Geochemistry: No modern geochemical investigations have been published.

Exploration activity: ***1955-1981***: The Kap Simpson complex has due to the spectacular colour anomalies been investigated in a number of field campaigns, none of which have shown any significant mineralisations. The earliest investigations were conducted during the regional investigations (Schaub, 1938 and 1942). Focused exploration was conducted from 1955 to 1981 by Nordisk Mineselskab A/S and Amax (Geyti, 1982). The older of these investigations were general exploration, mainly for vein-type deposits, whereas the later investigations evaluated the potential for large Mo-type deposits. An extensive summary is given in Harpøth *et* al. (1986) and includes a number of references to exploration reports.
1996: Tertiary Gold. Rempote sensing and fieldwork (Brown, 1996).

Exploration results: Harpøth *et* al. (1986) reviewed the mineralisations and distinguish 4 main types of mineralisation: (1) molybdenum; (2) fluorite; (3) base metal and (4) niobium-REE mineralisations.

(1) Apart for local high concentrations of molybdenum in fluorite veins (up to 645 ppm Mo), no significant molybdenum mineralisation has be located in exposures.

(2) Fluorite mineralisation is widespread and include in Fluoritdal a massive vein >0.3 m in width and 250 m along strike.
(3) Base metal mineralisations occur as veins in fault planes and mylonite zones, mainly in the contact zone along the shores of Kong Oscar Fjord. Two small massive sulphide veins have been located in mylonized shale in Føndal. One is 20 m long and 2 m wide and contains 30-50% sulphide. The mineralogy includes: calcite, galena, chalcopyrite, sphalerite, pyrite and minor fluorite. The second vein is 30 m long and up to 0.5 m wide with a similar paragenesis.
(4) Niobium-bearing samples originate from several localities. Only at the north-western margin of the complex, in Bjørnedal, has *in situ* mineralisation been observed. The niobium-bearing phases (see Harpøth *et* al. for summary) are hosted in late silicic veins. Whole rock samples returned up to: 3.2% Nb, 3% REE, max. 0.15% Be, max. 0.3% Y, max. 0.35% Zn and max. 0.3% Ba. Loose blocks with Nb up to 0.3% have been samples at three other locations in Forchammerdal and at Langgletscher. The potential for Nb (and Ta) mineralisation is not well investigated.

In addition, Thomassen (1984) identifies the eastern part of Kap Simpson complex as gold anomalous area #5 based on a pan sample with 0.13 ppm and whole rock samples with an average of 0.5 ppm Au. Brown (1996) notes zones anomalous in Au.

Comments and company recommendations:

No significant mineralisations have been located in the Kap Simpson complex despite the extensive hydrothermal alteration including silicification, argillisation and pyritisation. Based on the widespread fluorite mineralisation and the trace amounts of molybdenum the complex may have a potential for a deep-seated stockwork Mo mineralisation. The potential for niobium and tantalum and for gold mineralisations is not established.

Further information:

GEUS: T. Tukiainen and T.F.D. Nielsen.
Københavns Universitet: C.K. Brooks.
Århus Universitet: C. Tegner (unpublished Ar-Ar age determinations).

References:

Research papers and descriptions:

Conradsen, K. & Harpøth, O. 1984: Use of Landsat multispectral scanner data for detection and reconnaissance mapping of iron oxide staining in mineral exploration, central East Greenland. Economic Geology **79**, 1229-1244.

Harpøth, O., Pedersen, J.L., Schønwandt, H.K. & Thomassen, B. 1986: The mineral occurrences of central East Greenland. Meddelelser om Grønland, Geoscience 17, 139 pp.

Koch, L. & Haller, J. 1971: Geological map of East Greenland 72^{o} – 76^{o}N. Lat. (1:250 000). Meddelelser om Grønland **183**, 26 pp.

Noe-Nygaard, A. 1976: Tertiary igneous rocks between Shannon and Scoresby Sund, East Greenland. In: Escher A. &Watt, W.S. (eds): Geology of Greenland, 386-402. Copenhagen: Grønlands Geologiske Undersøgelse.

Reinhard, M. 1942: Petrographische Beschreibung der gesteine der Traill Insel. In Schaub, H.P. (ed.): Zur Geologie der Traill Insel (Nordost Grönland). Ecologae Geologiae Helvetiae **35**, 49-54.

Rex, D.C., Gledhill, A.R., Brooks, C.K. & Steenfelt, A. 1979: Radiometric ages of Teriary salic intrusions near Kong Oscars Fjord, East Greenland. Papport Grønlands Geologiske Undersøgelse **95,** 106-109.

Schaub, H.P. 1938: Zur Vulkanotektonik der Inseln Traill und Geographical Society (Nordostgrönland*).* Meddelelser om Grønland **114**(1), 29-44.

Schaub, H.P 1942: Zur Geologie der Traill Insel (Nordost-Grönland). Eclogae Geologiae Helvetiae **35**, 1-54.

Company reports:

Brown, M.A. 1996: Geological fieldwork, infra-red spectral assay results from the Kap Simpson, Kap Parry, Myggbukta and Kap Broer Ruys igneous complexes in East Central Greenland, 50 pp. Internal report. Tertiary Gold Ltd. (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 21465).

Conradsen, K., Gunulf, J., Harpøth, O. & Nilsson, G. 1982: The application of remote sensing in mineral exploration. Part 1. Internal report Department of Matematical Statistics and Operations Research (IMSOR). Copenhagen: Technical University of Denmark, 175 pp.

Geyti, A. 1982: Geological reconnaissance for porphyry-type mineralizations in 1981. Hudson Land, Hold with Hope, Bontekoe Ø, Scoresby Land, and Traill Ø. Internal NM-report **4/81**, 57 pp. (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20724).

Paar, W. & Punzengruber, K. 1970: Der Forchammerpluton, Traill Ø, Ostgrönland. Internal NM-Report **7/69**, 31 pp. (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20749).

Thomassen, B. 1984: Gold indications in central East Greenland 66° – 74°30' N. Lat. Unpublished NM-Note **2/84**, 34 pp. Copenhagen: Nordisk Mineselskab.

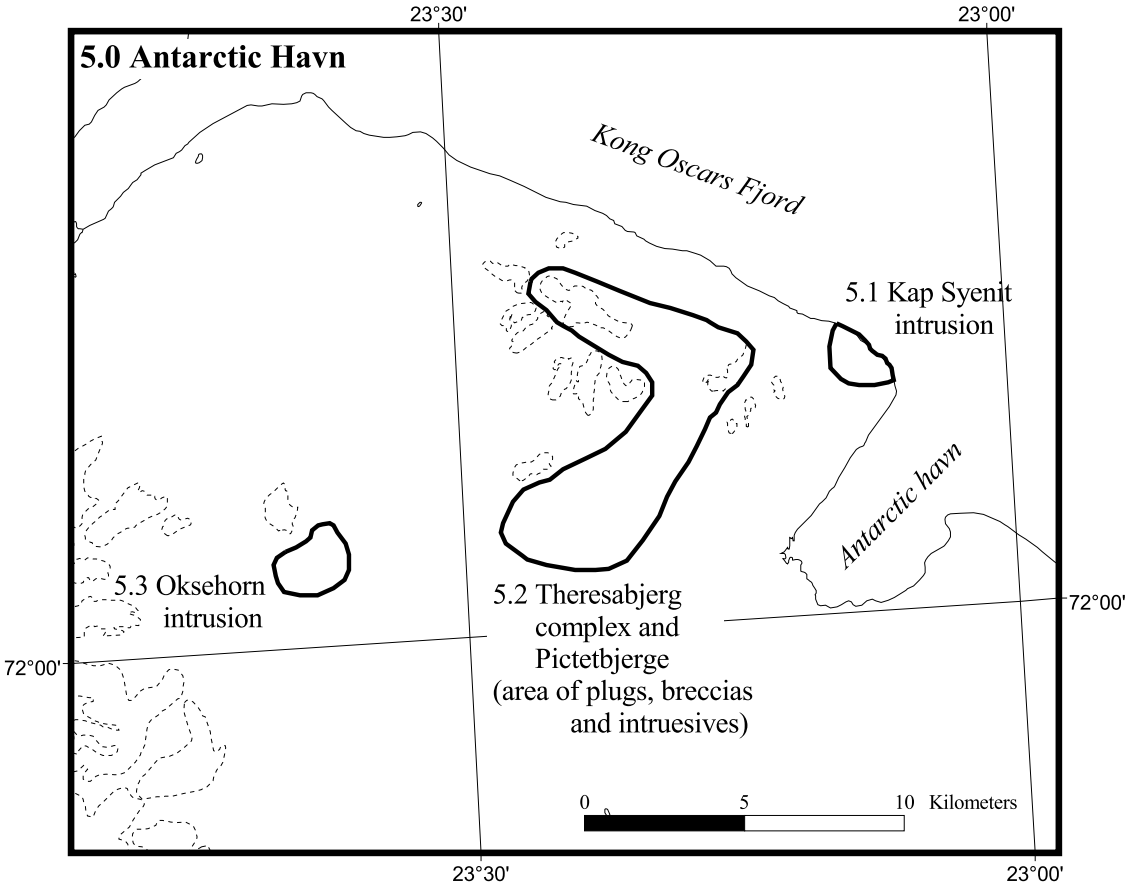
Thyrsted, T. & Friedman, A.L. 1982: Airborne remote sensing in East Greenland. Final report. Copenhagen: The Geological Survey of Greenland. (Unpublished report), 130 pp.

Compiled by: T.F.D. Nielsen.

Date: 2002-01-10.

5. Region 5: Antarctic Havn subvolcanic complexes

The subvolcanic complexes of the Antarctic Havn region are the roof zones of extensive intrusive complexes along a SW-NE lineament from Werner Bjerge (region 6.0) through Antarctic Havn to the Kap Simpson and Kap Parry complexes on Traill Ø (region 4.0). The extensive unexposed complexes are well-illustrated in AEM geophysical surveys (Stemp, 1998). Two main intrusive centres, The Theresabjerg Centre and the Oksehorn Centre are identified. Both centres are 20 km or so in diameter. Preliminary geophysical modelling (T.R. Rasmussen, GEUS, pers. comm. 2001) suggests the main intrusive complexes at a depth of *c.*1 km.



All three complexes are characterised by stocks of mainly syenite and alkali granite. A detailed account is published by Kapp (1969) and the region is reviewed by Noe-Nygaard (1976). The occurrence of gabbros and a large proportion of breccias in the Theresabjerg complex and the strong magnetic anomalies suggests the hidden intrusive complexes to be dominated by mafic – rather that felsic - plutonics and that felsic melts – at least in part – form by fractional crystallisation from the mafic parental melts.

The alkaline nature of the parental mafic melt is indicated by the occurrence of feldspathoidal lithologies and late tinguaitic dykes. Dykes, including nodule-bearing lamprohyre dykes, post-date the intrusives.

Minor skarn mineralisation is described from the margin of the Oksehorn intrusion. Extensive areas of hydrothermal alteration in the Theresabjerg complex have been investigated, but no significant mineralisations have been observed to date.

References

Kapp, H. 1960: Zur Petrologie der Subvulkane zwischen Mesters Vig und Antarctic Havn (Ost-Grönland). Meddelelser om Grønland **153(2),** 203 pp.

Noe-Nygaard, A. 1976: Tertiary igneous rocks between Shannon and Scoresby Sund, East Greenland. In: Escher A. &Watt, W.S. (eds): Geology of Greenland, 386-402. Copenhagen: Grønlands Geologiske Undersøgelse.

Stemp, R.W. 1998: Airborne electromagnetic and magnetic survey of the northern Jameson Land area, central East Greenland. Danmarks og Grønlands Geologiske Undersøgelse Rapport **1998/18**, 30 pp.

5.1 Kap Syenite intrusion

Small syenite intrusion
Homogeneous with no significant mineralisation

Location:	72°03'N, 23°06'W.
Main reference:	Kapp (1960).
Topographic maps:	1:250 000 KMS: 72Ø2 Kong Oscars Fjord. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat image:	TM path row: 229-009 and 227-009.
Aerial photographs:	1:150 000 KMS flight line 888N, nos 374–375. KMS flight line 888P, nos 1334–1335. 1:50 000 KMS flight line 873U, nos 346-349. KMS flight line 873V, nos 315-318.
Geological maps:	Regional map: 1:500 000, sheet 11, Kong Oscar Fjord (Geological Survey of Denmark and Greenland, 2001). Publication maps: 1:50 000 in Kapp (1960).
Geophysical maps:	Aeromagnetic Map of Greenland, sheet 4 (69° - 74°N, 19° - 27°W); 1:1 000 000 (Geological Survey of Greenland, 1988). GEUS: Magnetic and AEM maps and data. Standard dataset area G (Stemp, 1998).
Hyperspectral data:	None.
Geochemical maps:	Geochemistry of heavy mineral samples in Harpøth et al. (1986).
Short description:	Roofed, syenite stock exposed on the shore of Kong Oscars Fjord just west of the mouth of Antarctic Havn. The exposure is *c.* 1.5 times 1 km in area and from sea level to *c.* 700 m a.s.l. in the steep wall to the fjord. The intrusion is composed

of rather homogeneous, medium to coarse grained grey syenite with minor quartz.
The Mesozoic host sediments are metamorphosed at the sharp intrusive contact. (Kapp 1960, Noe-Nygaard, 1976). No radiometric age is known, but the complex is believed to be penecontemporaneous with the Theresabjerg subvolcanic complex, i.e. *c.* 30 Ma.

Petrography: Kapp (1960).

Geochemistry: Kapp (1960).

Exploration activity: Regional sampling of hydrothermaly altered material by Paar (1975).

Exploration results: No significant hydrothermal alteration or mineralisation have been recorded.

Comments and company recommendations: No exploration is recommended.

Further information: GEUS: T. Tukiainen.

References:

Research papers and descriptions:

Harpøth, O., Pedersen, J.L., Schønwandt, H.K. & Thomas-Greenland. Meddelelser om Grønland, Geoscience **17**, 139 pp.

Kapp, H. 1960: Zur Petrologie der Subvulkane zwischen Mesters Vig und Antarctic Havn (Ost-Grönland). Meddelelser om Grønland **153**(2), 203 pp.

Noe-Nygaard, A. 1976: Tertiary igneous rocks between Shannon and Scoresby Sund, East Greenland. In: Escher A. & Watt, W.S. (eds): Geology of Greenland, 386-402. Copenhagen: Grønlands Geologiske Undersøgelse.

Paar, W. 1975: Babingtonit in einer skarnartigen Kontaktparagenese vom Oksehorn, Ostgrönland. Der Karinthin, Austria **72/73**, 169-175

Stemp, R.W. 1998: Airborne electromagnetic and magnetic survey of the northern Jameson Land area, central East Greenland. Danmarks og Grønlands Geologiske Undersøgelse Rapport 1998/18, 30 pp.

Compiler: T.F.D. Nielsen.

Date: 2001-11-27.

5.2 Theresabjerg complex

Complex subvolcanic system
Extensive hydrothermal alteration

Location:	72°02'N, 23°25'W.
Main references:	Kapp (1960).
Topographic maps:	1:250 000 KMS: 72Ø2 Kong Oscars Fjord. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat image:	TM path row: 227-009 and 229-009.
Aerial photographs:	1:150 000 KMS flight line 888N, nos 374-376. KMS flight line 888P, nos 1334-1336. 1:50 000 KMS flight line 873U, nos 346-349. KMS flight line 873V, nos 315-318.
Geological maps:	Regional map: Regional map: 1:500 000, sheet 11, Kong Oscar Fjord (Geological Survey of Denmark and Greenland, 2001). Publication maps: 1:50 000 in Kapp (1960).
Geophysical maps:	Aeromagnetic Map of Greenland, sheet 4 (69° - 74°N, 19° - 27°W); 1:1 000 000 (Geological Survey of Greenland, 1988). GEUS: Magnetic and electromagnetic maps and data. Standard dataset area G (Stemp, 1998).
Hyperspectral data:	None.
Geochemical maps:	Heavy mineral samples reported in Harpøth et al. (1986).
Short description:	The petrographic variation is significant and as the only subvolcanic complex in the Antarctic Havn area the Theresabjerg complex covers the entire suite from gabbro and diorite to alkali granite. Several types of syenite represent the main volume of exposed intrusive material.

Reviews are given by Noe-Nygaard (1976) and Harpøth *et* al. (1986)

The complex post-dates the regional swarm of basaltic sills and is younger than *c.* 50 Ma. The complex is believed to be broadly contemporaneous with the Werner Bjerge complex, i.e. around 30 Ma old. (see also *"Further information"*).

Petrography: Kapp (1960).

Geochemistry: Kapp (1960).

Exploration activity: Exploration activity is reviewed by Harpøth et al. (1986). Extensive areas of hydrothermal alteration in Slugtdal and throughout the complex have prompted several investigations for base metal, molybdenum, etc. The results are reported by Frisch *et* al. (1970); Geyti (1977) and Schassberger & Spieth (1978).

Exploration results: Anomalous values for base metals, but no significant mineralisation has been reported. Exploration results are summarised in Harpøth et al. (1986).

Comments and company Recommendations: Comment: The shear size of the area and the extent of hydrothermal alteration do not exclude the existence of exploration targets.

Further information: GEUS: T. Tukiainen and B. Thomassen.
Københavns Universitet: C.K. Brooks.
Århus Universitet: C. Tegner (unpublished Ar-Ar age deternations).

References:

Research papers and descriptions:

Harpøth, O., Pedersen, J.L., Schønwandt, H.K. & Thomassen, B. 1986: The mineral occurrences of central East Greenland. Meddelelser om Grønland, Geoscience **17**, 139 pp.

Kapp, H. 1960: Zur Petrologie der Subvulkane zwischen Mesters Vig und Antarctic Havn (Ost-Grönland). Meddelelser om Grønland **153**(2), 203 pp.

Noe-Nygaard, A. 1976: Tertiary igneous rocks between Shannon and Scoresby Sund, East Greenland. In: Escher A. & Watt, W.S. (eds): Geology of Greenland, 386-402. Copenhagen: Grønlands Geologiske Undersøgelse.

Stemp, R.W. 1998: Airborne electromagnetic and magnetic survey of the northern Jameson Land area, central East Greenland. Danmarks og Grønlands Geologiske Undersøgelse Rapport 1998/18, 30 pp.

Company reports:

Frisch, W., Heinricher, G.M, Kutchera, S & Heyrowsky W. 1970: Montangeologischer Bericht über die Gebiete Skeldal, Hinks Land, Charcot Land, Pictet Bjerge, Nathorst Land. Internal NM-Report **2-8/69**, 58 pp. (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20745).

Geyti, A. 1977: Geological field report. Amax-Nordisk Mineselskab A/S. Joint venture 1977. Internal NM-Report 7/77, 12 pp. (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20773).

Schassberger, H.T. & Spieth, V. 1978: Molybdenum exploration in NE Greenland 1977 (AMAX). Internal NM-Report **MB-1977**, 9 pp. (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20150).

Compiler: T.F.D. Nielsen.

Date: 2002-07-24.

5.3 Oksehorn intrusion

Roofed syenite intrusion
Skarn mineralisation at contact

Location:	72°01'N, 23°38'W.
Main reference:	Kapp (1960), Harpøth *et* al. (1986).
Topographic maps:	1:250 000 KMS: 72Ø 2 Kong Oscars Fjord. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat image:	TM path row: 227-009 and 229-009.
Aerial photographs:	1:150 000 KMS flight line 888N, nos 374-375. 1:50 000 KMS flight line 873V, nos 323-325.
Geological maps:	Regional map: Regional map: 1:500 000, sheet 11, Kong Oscar Fjord (Geological Survey of Denmark and Greenland, 2001). Publication maps: 1:50 000 in Kapp (1960).
Geophysical maps:	Aeromagnetic Map of Greenland, sheet 4 (69° - 74°N, 19° - 27°W); 1:1 000 000 (Danmarks og Grønlands Geologiske Undersøgelse, 1988). GEUS: Magnetic and AEM maps and data. Standard dataset area G (Stemp, 1998).
Hyperspectral data:	None.
Geochemical maps:	Geochemistry of heavy mineral samples is reported in Harpøth et al. (1986).
Short description:	The Oksehorn intrusion is exposed in an area *c.* 2.5 times 2 km in the Oksehorn peak area. The roof of Triassic sediments is preserved above 800 m a.s.l. The main, and lower part of the exposures are composed of syenite (*ne*-normative). The

upper parts are composed several intrusive units of syenite porphyry and dark coloured syenite, minor areas of volcanic breccias and metamorphosed host rocks.

No radiometric age is known, but the complex is believed to be penecontemporaneous with the Theresabjerg complex, i.e. c. 30 Ma.

Petrography: (Kapp, 1960).

Geochemistry: (Kapp, 1960).

Exploration activity: Skarn mineralisation at contacts recorded by Kapp (1960) and investigated by Paar *et* al. (1972 and 1975). Mineralisations are reviewed by Harpøth *et* al. (1986).

Mineralisation: A horizon 1 to 2 m thick contains 0.1 to 0.2 massive magnetite-rich layers in a host of calcareous Triassic sediments. The mineralisation can be followed over 20 m along strike. The mineralisation contains minor pyrite and chalcopyrite.

Exploration results: Geochemical anomalies are reported by Paar *et* al. (1972) and Paar (1975). The results are reviewed by Harpøth *et* al. (1986) and include: lithium (300 ppm), beryllium (30 ppm) and minor copper, molybdenum and tin.

Comments and company recommendations: None.

Further information: GEUS: T. Tukiainen and B. Thomassen.

References: Research papers and descriptions:

Harpøth, O., Pedersen, J.L., Schønwandt, H.K. & Thomassen, B. 1986: The mineral occurrences of central East Greenland. Meddelelser om Grønland, Geoscience **17**, 139 pp.

Kapp, H. 1960: Zur Petrologie der Subvulkane zwischen Mesters Vig und Antarctic Havn (Ost-Grönland). Meddelelser om Grønland **153**(2), 203 pp.

Noe-Nygaard, A. 1976: Tertiary igneous rocks between Shannon and Scoresby Sund, East Greenland. In: Escher A. &Watt, W.S. (eds): Geology of Greenland, 386-402. Copenhagen: Grønlands Geologiske Undersøgelse.

Paar, W. 1975: Babingtonit in einer skarnartigen Kontaktparagenese vom Oksehorn, Ostgrönland. Der Karinthin, Austria **72/73**, 169-175

Stemp, R.W. 1998: Airborne electromagnetic and magnetic survey of the northern Jameson Land area, central East Greenland. Danmarks og Grønlands Geologiske Undersøgelse Rapport **1998/18**, 30 pp.

Company reports:

Paar, W., Tichy, G. & Faupl, P. 1972: Montangeologischer Bericht über die Prospektionsgebiete Werner Bjerge süd und Ost Wegener Halvø. Internal NM-Report 7/71, 49 pp. (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20761).

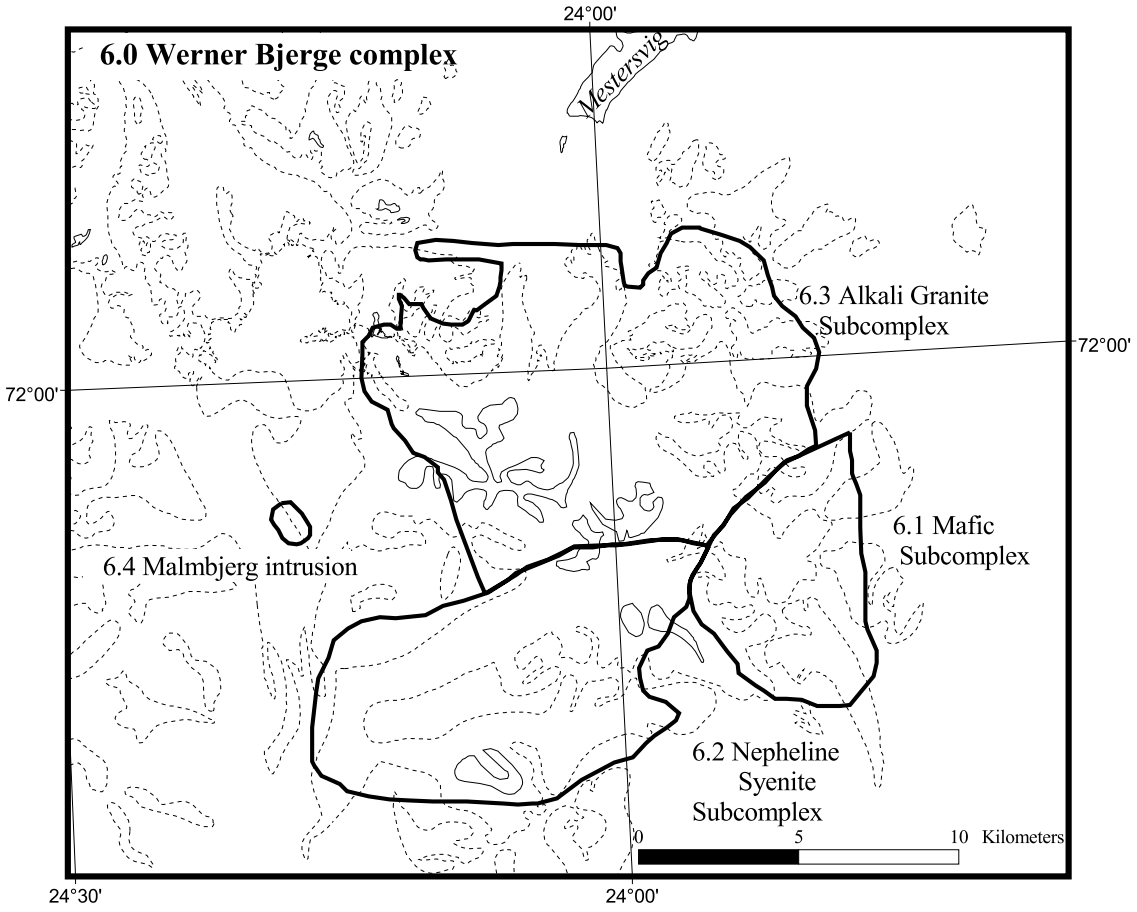
Compiler: T.F.D. Nielsen.

Date: 2002-01-17.

6. Region 6: The Werner Bjerge complex

The Werner Bjerge subvolcanic complex is located at the intersect between the fault controlled N-S oriented Schuchert Dal and the NE-SW oriented magmatic lineament defined by the intrusions on Traill Ø and in the Antarctic Havn area. The complex is exposed in alpine glacier terrain of difficult access. The complex is a marked magnetic anomaly – more than 25 km across. Reviews are published by Noe-Nygaard (1976) and Brooks et al. (1982).

The complex is semi-circular with a diameter of *c.* 17 km. It is divided into 4 intrusive subcomplexes. The magnetic anomaly suggests that all of these subcomplexes and the related volcanics are originate from a large mafic complex at depth. The oldest subcomplex is the mafic subcomplex (>5km across) in the eastern part of Werner Bjerge. The Mafic Subcomplex (data sheet 6.1) has a partially preserved roof of feldspar porphyries, breccias and pyroclastics. The basic subcomplex is followed by syenites. Nepheline syenites form a subcomplex (>8 km across) in the southern and south-western part (data sheet 6.2) and alkali syenites and form a subcomplex (>10 km across) in the central to northern part of Werner Bjerge (data sheet 6.3). The syenites in the north-western part of the complex are in turn



intruded by a later alkali granite *(c.* 5 km across). The small Malmbjerg granite stock (1.2 km across, data sheet 6.4) is exposed at the eastern side of Schuchert Gletscher in the western part of Werner Bjerge complex. To this small stock is related the Malmbjerg molybdenum deposit. A classic description is provided by Bearth (1959). Summaries of the geology and petrography with detailed mineral chemistry are given in Harpøth *et* al. (1986) and Brooks *et* al. (1982).

A large part of the Werner Bjerge complex is characterised by intense hydrothermal alteration and has been subjected to significant exploration, notably for molybdenum. The Malmbjerg molybdenum deposit in the roof zone of the Malmbjerg granite stock has the potential for being a "world class" molybdenum deposit. Other parts of the Werner Bjerge complex also show all the characteristics of porphyry molybdenum mineralisation and other large deposits may be present. Scattered lead-zinc mineralisations are known from parts of the complex. Parts of the complex have also been investigated for REE and niobium mineralisations.

References

Bearth, P. 1959: On the alkali massif of the Werner Bjerge in East Greenland. Meddelelser om Grønland **153(4)**, 63 pp.

Brooks, C.K., Pedersen, A.K., Larsen, M.L. & Engell, J. 1982: The mineralogy of the Werner Bjerge complex, East Greenland. Meddelelser om Grønland Geoscience **7**, 35 pp.

Harpøth, O., Pedersen, J.L., Schønwandt, H.K. & Thomassen, B. 1986: The mineral occurrences of central east Greenland. Meddelelser om Grønland, Geoscience **17**, 139 pp.

Noe-Nygaard, A. 1976: Tertiary igneous rocks between Shannon and Scoresby Sund, East Greenland. In: Escher A. &Watt, W.S. (eds): Geology of Greenland, 386-402. Copenhagen: Grønlands Geologiske Undersøgelse.

6.1 Werner Bjerge Mafic Subcomplex

Multiphase alkaline gabbro to syenite and granite complex.
Extensive hydrothermal alteration

Location:	71°56'N, 23°50'W.
Main references:	Bearth (1959), Brooks *et* al. (1982) and Harpøth *et* al. (1986).
Topographic maps:	1:250 000 KMS: 71Ø1 Carlsberg Fjord. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat image:	TM path row: 227-009 and 229-009.
Aerial photographs:	***All Werner Bjerge complex*** 1:150 000 KMS flight line 888M, nos 1238–1242. KMS flight line 888N, nos 371–375. 1:50 000 KMS flight line 278A, nos 251–259. KMS flight line 278B, nos 325–330. KMS flight line 278C, nos 331–335. KMS flight line 278D, nos 326-332.
Geological maps:	Regional map: 1:500 000, sheet 12 Scoresby Sund (Geological Survey of Denmark and Greenland, 1982). Publication map: Koch & Haller (1971), Bearth (1959), Brooks *et* al. (1982), Harpøth *et* al. (1986).
Geophysical maps:	GEUS: Aeromagnetic Map of Greenland, sheet 4 (69° - 74°N, 19° - 27°W); 1:1 000 000 (Danmarks og Grønlands Geologiske Undersøgelse, 1988).
Hyperspectral data:	Total coverage (contact GEUS).
Geochemical maps:	Geochemistry of heavy mineral samples is reported in Harpøth et al. (1986).
Short description:	Subvolcanic mafic to felsic multiphase complex, app. semicircular and *c.* 8 km N-S and 5 km E-W equivalent to *c.* 40

km^2. The mafic subcomplex is composed of agglomerates, breccias, porphyritic marginal facies and coarse-grained varieties with magmatic layering and late brecciation. The intrusive lithologies include pyroxenites, gabbros, syenograbbros, syenites and granites. The syenograbbros, syenites and granites are invariably hydrothermaly altered.

Rex *et* al. (1979) give an isochron age for the Werner Bjerge complex of *c.* 30 Ma, but see also "*Further information*".

Petrography: Detailed investigation in Bearth (1959) followed up with modern methods by Brooks *et* al. (1982).

Geochemistry: Geochemical investigations by Bearth (1959).

Exploration activity: No significant exploration has been conducted in the Werne Bjerge Mafic Subcomplex.

Exploration results: No significant mineralisations have been observed in the Werne Bjerge Mafic Subcomplex.

Comments and company recommendations: No recommendations are given.

Further information: GEUS: B. Thomassen and T. Tukiainen.
Københavns Universitet: C.K. Brooks.
Århus Universitet: C. Tegner (unpublished Ar-Ar age determinations).

References:

Research papers and descriptions:

Bearth, P. 1959: On the alkali massif of the Werner Bjerge in East Greenland. Meddelelser om Grønland **153**(4), 63 pp.

Brooks, C.K., Pedersen, A.K., Larsen, M.L. & Engell, J. 1982: The mineralogy of the Werner Bjerge complex, East Greenland. Meddelelser om Grønland Geoscience **7**, 35 pp.

Harpøth, O., Pedersen, J.L., Schønwandt, H.K. & Thomassen, B. 1986: The mineral occurrences of central east Greenland. Meddelelser om Grønland, Geoscience **17**, 139 pp.

Kock, L. & Haller, J. 1971: Geological map of East Greenland 72^o – 76^oN. Lat. (1:250 000). Meddelelser om Grønland, **183**, 26 pp.

Noe-Nygaard, A. 1976: Tertiary igneous rocks between Shannon and Scoresby Sund, East Greenland. In: Escher A. & Watt, W.S. (eds): Geology of Greenland,

386-402. Copenhagen: Grønlands Geologiske Undersøgelse.

Rex, D.C., Gledhill, A.R., Brooks, C.K. & Steenfelt, A. 1979: Radiometric ages of Teriary salic intrusions near Kong Oscars Fjord, East Greenland. Papport Grønlands Geologiske Undersøgelse **95,** 106-109.

Company reports:

See Harpøth *et* al. (1986) for further information.

Compiled by: T.F.D. Nielsen.

Date: 2002-01-16.

6.2 Werner Bjerge Nepheline Syenite subcomplex

Multiphase, subcomplex composed of alkali syenites and foyaites.
Minor hydrothermal alteration and carbonate veining.

Location:	71°55'N, 24°08'W.
Main references:	Bearth (1959), Brooks *et* al. (1982) and Harpøth *et* al. (1986).
Topographic maps:	1:250 000 KMS: 71Ø1 Carlsberg Fjord and 71Ø2 Stauning Alper. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat image:	TM path row: 227-009 and 229-009.
Aerial photographs:	***All Werner Bjerge complex*** 1:150 000 KMS flight line 888M, nos 1238–1242. KMS flight line 888N, nos 371–375. 1:50 000 KMS flight line 278B, nos 325–330. KMS flight line 278C, nos 331–335. KMS flight line 278D, nos 326-332.
Geological maps:	Regional map:1:500 000, sheet 12 Scoresby Sund (Geological Survey of Denmark and Greenland, 1982). Publication map: Koch & Haller (1971), Bearth (1959), Brooks *et* al. (182), Harpøth *et* al. (1986). Unpublished field maps: All available data are included in map sheets and publication maps.
Geophysical maps:	GEUS: Aeromagnetic Map of Greenland, sheet 4 (69° - 74°N, 19° - 27°W); 1:1 000 000 (Geological Survey of Greenland, 1988).
Hyperspectral data:	Total coverage (contact GEUS).
Geochemical maps:	See Harpøth et al. (1986) and references therein.

Short description:

The Nepheline Syenite subcomplex is exposed in heavily glaciated alpine terrain. The shape of the subcomplex is not easily defined, but believed to be circular with a diameter in the order of 9 km, excluding some minor outliers to the north-east.

The volcanic roof over the complex is partly preserved in the south. From a distance the nepheline syenite subcomplex seems to be a large homogeneous intrusive body. Bearth (1959) notes, however, that the subcomplex is composed of several phases and quite heterogeneous. The dominant lithologies include analcime-alkali syenite and nepheline-sodalite- foyaites. Late tinguaite dikes are related to the syenites.

Rex *et* al. (1979) give an isochron age for the Werner Bjerge complex of *c.* 30 Ma, but see also "*Further information*".

Petrography:

Detailed investigation in Bearth (1959) followed up with modern methods by Brooks *et* al. (1982).

Geochemistry:

Geochemical investigations by Bearth (1959).

Exploration activity:

No exploration has been conducted in the Nepheline Syenite subcomplex.

Exploration results:

Bearth (1959) mentions rare mineralised veinlets with siderite, strontianite and baryte (?) and areas of Fe-oxide and Mn staining.

Comments and company recommendations:

None.

Further information:

GEUS: B. Thomassen and T. Tukiainen.
Københavns Universitet: C.K. Brooks.

References:

Research papers and descriptions:

Bearth, P. 1959: On the alkali massif of the Werner Bjerge in East Greenland. Meddelelser om Grønland **153**(4), 63 pp.

Brooks, C.K., Pedersen, A.K., Larsen, M.L. & Engell, J. 1982: The mineralogy of the Werner Bjerge complex, East Greenland. Meddelelser om Grønland Geoscience **7**, 35 pp.

Harpøth, O., Pedersen, J.L., Schønwandt, H.K. & Thomassen, B. 1986: The mineral occurrences of central East Greenland. Meddelelser om Grønland, Geoscience **17**, 139 pp.

Koch, L. & Haller, J. 1971: Geological map of East Greenland 72^{o} – 76^{o}N. Lat. (1:250 000). Meddelelser om Grønland, **183**, 26 pp.

Noe-Nygaard, A. 1976: Tertiary igneous rocks between Shannon and Scoresby Sund, East Greenland. In: Escher A. &Watt, W.S. (eds): Geology of Greenland, 386-402. Copenhagen: Grønlands Geologiske Undersøgelse.

Rex, D.C., Gledhill, A.R., Brooks, C.K. & Steenfelt, A. 1979: Radiometric ages of Teriary salic intrusions near Kong Oscars Fjord, East Greenland. Papport Grønlands Geologiske Undersøgelse **95,** 106-109.

Company reports:

See Harpøth *et* al. (1986) for further information.

Compiled by: T.F.D. Nielsen.

Date: 2002-01-16.

6.3 Werner Bjerge Alkali Granite subcomplex

Alkali syenite and alkali granite intrusion(s) with extensive hydrothermal alteration. Molybdenum, tungsten, fluorite and base-metal mineralisation.

Location: 72°00'N, 24°10'W.

Main references: Bearth (1959), Brooks *et* al. (1982) and Harpøth *et* al. (1986).

Topographic maps:
1:250 000
KMS: 71Ø1 Carlsberg Fjord, 71Ø2 Stauning Alper and 72Ø2 Kong Oscars Fjord.
1:100 000
GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.

Landsat image: TM path rows: 227-009 and 229-009.

Aerial photographs:
All Werner Bjerge complex
1:150 000
KMS flight line 888M, nos 1238–1242.
KMS flight line 888N, nos 371–375.
1:50 000
KMS flight line 278A, nos 251–259.
KMS flight line 278B, nos 325–330.
KMS flight line 278C, nos 331–335.
KMS flight line 278D, nos 326-332.

Geological maps:
Regional map:1:500 000, sheet 12 Scoresby Sund (Geological Survey of Denmark and Greenland, 1982).
Publication map: Koch & Haller (1971), Bearth (1959), Brooks *et* al. (1982), Harpøth *et* al. (1986).

Geophysical maps: GEUS: Aeromagnetic Map of Greenland, sheet 4 (69° - 74°N, 19° - 27°W); 1:1 000 000 (Geological Survey of Greenland, 1988).

Geochemical maps: Geochemistry of heavy mineral samples is reported in Harpøth et al. (1986). See also Geyti (1981).

Hyperspectral data: Total coverage (contact GEUS).

Short description:

The Werner Bjerge Alkali Granite subcomplex is the largest in the Werner Bjerge complex. It is - as all other parts of Werner Bjerge complex – exposed in a heavily glaciated and alpine terrain. The exposures suggest a semi-circular multiphase body, *c.* 10 km N-S and 12 km E-W equivalent to *c.* 100 km^2.
The subcomplex should probably be divided into an Alkaline Syenite subcomplex with partially preserved roof and roof pendants and a later alkali granite stock – the Mellempas Granite Stock (*c.* 5 km N-S and 6 km E-W) – forming the western part of the Werner Bjerge Alkali Granite subcomplex. The Mellempas Granite stock may be genetically related to the Malmbjerg Granite stock, whose roof zone hosts the Malmbjerg molybdenum deposit.

Rex *et* al. (1979) give an isochron age for the Werner Bjerge complex of *c.* 30 Ma, but see also "*Further information*".
The Alkali Syenite subcomplex is quite heterogeneous in textures and composition and apparently a multiphase intrusion. The described samples range from feldspathoidal syenite into quartz-bearing varieties and into felsitic rocks. The undersaturated varieties are described from the eastern parts of the subcomplex and include sodalite-bearing syenite. Nepheline syenite (s.s.) in small exposures in the southern part of the Northern Subcomplex may be outliers from the Werner Bjerge Nepheline Syenite subcomplex.

In the Mellempas Granite Stock quartz-bearing varieties the mafic phases are dominated by biotite, that is often deuterically altered. Fluorite and calcite are common deuteric phases. Druses contain fluorite, wolframite and molydenite. Molybdenite and wolframite form phenocrysts in late schlieren. Deuteric alteration is massive and widespread.

Petrography:

Detailed investigation in Bearth (1959) followed up with modern methods by Brooks *et* al. (1982).

Geochemistry:

Geochemical investigations by Bearth (1959).

Exploration activity:

Exploration activity is summarised in Harpøth et al. (1986). First finds in 1949 followed up by Nordisk Mineselskab A/S until 1958. Renewed investigations in 1980 by Geyti (1981).

Exploration results:

Exploration results are reviewed in detail in Harpøth *et* al. (1986) and the reader is referred to these authors for detailed information. Harpøth *et* al. (1986) include evaluation of the lead-zinc and the molybdenum potential of the Mellempas Granite Stock. The average molybdenum content of the entire

stock is estimated to 14 ppm (Geyti, 1981). Although massive lenses of lead-zinc mineralisation are observed in veins in biotite granite of Mellempas Granite Stock no significant lead-zinc or related mineralisation has been found.

Comments and company recommendations:

The pervasive nature of the molybdenum, tungsten, and fluorite mineralisation and the showings of base metals mineralisation in the Mellempas Granite Stock have prompted investigations by Geyti (1981). The severe alpine and heavily glaciated terrain has not allowed investigations of the entire stock.

Further information:

GEUS: B. Thomassen and T. Tukiainen.
Københavns Universitet: C.K. Brooks.
Århus Universitet: C. Tegner (unpublished Ar-Ar age determinations).

References:

Research papers and descriptions:

Bearth, P. 1959: On the alkali massif of the Werner Bjerge in East Greenland. Meddelelser om Grønland **153**(4), 63 pp.

Brooks, C.K., Pedersen, A.K., Larsen, M.L. & Engell, J. 1982: The mineralogy of the Werner Bjerge complex, East Greenland. Meddelelser om Grønland Geoscience **7**, 35 pp.

Harpøth, O., Pedersen, J.L., Schønwandt, H.K. & Thomassen, B. 1986: The mineral occurrences of central East Greenland. Meddelelser om Grønland, Geoscience **17**, 139 pp.

Koch, L. & Haller, J. 1971: Geological map of East Greenland 72^{o} – 76^{o}N. Lat. (1:250 000). Meddelelser om Grønland, **183**, 26 pp.

Noe-Nygaard, A. 1976: Tertiary igneous rocks between Shannon and Scoresby Sund, East Greenland. In: Escher A. &Watt, W.S. (eds): Geology of Greenland, 386-402. Copenhagen: Grønlands Geologiske Undersøgelse.

Rex, D.C., Gledhill, A.R., Brooks, C.K. & Steenfelt, A. 1979: Radiometric ages of Teriary salic intrusions near Kong Oscars Fjord, East Greenland. Papport Grønlands Geologiske Undersøgelse **95,** 106-109.

Company reports:

Geyti, A. 1981: Pophyry molybdenum in the malmbjerg-Mellempas area. Geological mapping and sampling, 1980. Internal NM-Report **11/80**, 98 pp. (in archive of

Danmark og Grønlands Geologiske Undersøgelse, GRF no. 20721).

See Harpøth *et* al. (1986) for further information.

Compiled by: T.F.D. Nielsen.

Date: 2002-01-17.

6.4 Malmbjerg intrusion

Multiphase granitic intrusion.
Large tonnage medium grade molybdenum deposit.

Location:	71°57'30''N, 24°17'W.
Main references:	Bearth (1959), Brooks *et* al. (1982) and Harpøth *et* al. (1986).
Topographic maps:	1:250 000 KMS/Geodætisk Institut: 71Ø1 Carlsberg Fjord, 71Ø2 Staunings Alper and 72Ø2 Kong Oscars Fjord. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request. 1:5000 GEUS archives: Aerokort (1969).
Landsat image:	TM path rows: 227-009 and 229-009.
Aerial photographs:	1:150 000 KMS line 888M, nos. 1239-1241. 1:50 000 KMS line 278A, nos. 255–256 and special search.
Geological maps:	Regional map: 1:500 000, sheet 12 Scoresby Sund. GEUS map: 1:100 000: 71Ø2 Nord Sydlige Staunings Alper. Publication map: Koch & Haller (1971), Bearth (1959), Brooks *et* al. (1982), Harpøth *et* al. (1986) Unpublished field maps: All available data are included in map sheets and publication maps.
Geophysical maps:	GEUS: Aeromagnetic Map of Greenland, sheet 4 (69° - 74°N, 19° - 27°W); 1:1 000 000 (Danmarks og Grønlands Geologiske Undersøgelse, 1988).
Hyperspectral data:	Total coverage (contact GEUS).
Geochemical maps:	Heavy mineral geochemistry is reported in Harpøth et al. (1986). See also Geyti (1981).
Short description:	The Malmbjerget granite stock is semi-circular and *c.* 1km across. It is composed of quartz and feldspar porphyritic per

thite granite intruded by quatz porphyritic aplite. Deeper parts of the stock are composed of texturally different porphyritic granites. Silicification and alteration is extensive both above and below the stockwork mineralisation (see Harpøth *et* al. (1986) and references therein).

Rex *et* al. (1979) give an isochron age for the Werner Bjerge complex of *c.* 30 Ma. Harpøth et al. (1986) give k-Ar ages for the Malmbjerg intrusion between 21 and 26 Ma (see also "*Further information"*).

Petrography: Detailed investigation in Bearth (1959) and Brooks *et* al. (1982). More detailed descriptions in Harpøth *et* al. (1986).

Geochemistry: Geochemical investigations by Bearth (1959).

Exploration activity: ***1954***: The Malmbjerg mineralisation was located (Bearth, 1959).
1955-1956: Nordisk Mineselskab A/S. Surface sampling.
1958-1962: Nordisk Mineselskab A/S. Surface sampling, diamond drilling, and adit escarvated.
1962-1979: Arktisk Minekompani A/S (Nordisk Mineselskab A/S and AMAX). Surface sampling, diamond drilling, including deep hole (973 m) and several adits through the deposit.

Exploration results: The extensive exploration has defined the Malmbjerg molybdenum deposit as a world class molybdenum deposit. Harpøth *et* al. (1986) quotes T. Schassberger (pers. comm., 1977) for a total proven reserve of 150 million tons with 0.23% MoS_2 and 0.02% WO_3 at a cut off of 0.16% MoS_2. The reader is referred to the extensive review in Harpøth *et* al. (1986) for further information and to the large number of company reports in GEUS archive (special search).

Three main types of mineralisation are recorded: 1) Stockwork molybdenum mineralisation, 2) greisen mineralisation as veins in the uppermost part of the stock, in the contact zone and in host rocks. The greisen veins and sheets carry topas, wolframite, fluorite, and minor beryl, cassiterite, siderite, pyrite, chalcopyrite, bismuth and bismuthinite and 3) base-metal veins in argillised steep veins, mainly outside the stockwork mineralisation. The base metal minerals include: sphalerite, chalcopyrite, galena and siderite,

Comments and company

recommendations: No further exploration is suggested at present. Significant changes in molybdenum market could re-open the investigation of the deposit.

Further information: GEUS: B. Thomassen and T. Tukiainen.
Københavns Universitet: C.K. Brooks.
Århus Universitet: C. Tegner (unpublished Ar-Ar age determinations).
Bureau of Mines and Petroleum, Nuuk, Greenland: H.K. Schønwandt.

References:

Research papers and descriptions:

Bearth, P. 1959: On the alkali massif of the Werner Bjerge in East Greenland. Meddelelser om Grønland **153**(4), 63 pp.

Brooks, C.K., Pedersen, A.K., Larsen, M.L. & Engell, J. 1982: The mineralogy of the Werner Bjerge complex, East Greenland. Meddelelser om Grønland Geoscience **7**, 35 pp.

Harpøth, O., Pedersen, J.L., Schønwandt, H.K. & Thomassen, B. 1986: The mineral occurrences of central east Greenland. Meddelelser om Grønland, Geoscience **17**, 139 pp.

Koch, L. & Haller, J. 1971: Geological map of East Greenland 72^{o} – 76^{o}N. Lat. (1:250 000). Meddelelser om Grønland **183**, 26 pp.

Noe-Nygaard, A. 1976: Tertiary igneous rocks between Shannon and Scoresby Sund, East Greenland. In: Escher A. & Watt, W.S. (eds): Geology of Greenland, 386-402. Copenhagen: Grønlands Geologiske Undersøgelse.

Rex, D.C., Gledhill, A.R., Brooks, C.K. & Steenfelt, A. 1979: Radiometric ages of Teriary salic intrusions near Kong Oscars Fjord, East Greenland. Papport Grønlands Geologiske Undersøgelse **95,** 106-109.

Company reports:

Geyti, A. 1981: Pophyry molybdenum in the malmbjerg-Mellempas area. Geological mapping and sampling, 1980. Internal NM-Report **11/80**, 98 pp. (in archive of Danmark og Grønlands Geologiske Undersøgelse, GRF no. 20721).

See references to the many company reports in Harpøth et al. (1986). Further search in GEUS archive.

Compiler: T.F.D. Nielsen.

Date: 2002-07-24.

7.0 Regional sills in Jameson Land and Scoreby Land

Mainly tholeiitic sills, some with significant volumes
Contact magnetite skarn mineralisation.

Location: East Coast of Greenland between 70°15' and 72°N.

Main references: Larsen & Marcussen (1992) and Hald & Tegner (2000).

Topographic maps:
1:250 000
KMS: 70Ø1 Scorebysund and 71Ø1 Carlsberg Fjord.
1:100 000
GEUS archive: All of Jameson Land is covered by maps produced by GEUS around 1980.

Landsat image: TM path-row 226-010.

Aerial photographs:
1:150 000
KMS flight line 888M, nos 1215–1239.
KMS flight line 888N, nos 345–376.
KMS flight line 888P, nos 1340–1364.
KMS flight line 888Q, nos 534–553.
1:50 000 and other scales
Special search in GEUS archive.

Geological maps:
Regional map: GEUS 1:500 000, sheet 12 Scoresby Sund (Geological Survey of Denmark and Greenland, 1982).
GEUS 1:100 000: 70Ø1 Syd Kap Brewster; 70Ø1 Nord Hurry Inlet; 70Ø2 Syd Vikinge Bugt; 70Ø2 Nord Kap Leslie; 71Ø1 Syd Carlsberg Fjord; 71Ø1 Nord Fleming Fjord; 71Ø2 Syd Gurreholm and 71Ø2 Nord Sydlige Stauning Alper.
Publication map: Larsen & Marcussen (1992).
Unpublished field maps: Special search for exploration related maps in GEUS archive.

Geophysical maps:
GEUS: Aeromagnetic Map of Greenland, sheet 4 (69° - 74°N, 19° - 27°W); 1:1 000 000 (Geological Survey of Greenland, 1988).

GEUS: Magnetic and AEM maps and data. Standard dataset area G (Stemp, 1998).

Special search in GEUS archives for geophysical investigations related to exploration for hydrocarbons.

Geochemical maps: Geochemistry of heavy mineral samples in Harpøth et al. (1986).

Short description: Three regionally exposed sills have been mapped through large areas in the Jameson Land sedimentary basin. The three sills belong to a suite of very voluminous sills emplaced into the deep sedimentary basin (Larsen & Marcussen, 1992). The sills have the shape of lopoliths and reach across the entire basin. They may be up to 300 m thick in the centre of the basin. They thin and step up through the stratigraphy toward the margins of the basin. The age of dated sill samples is 52-53 Ma. The sill complex post-dates the main tholeiitic plateau basalt magmatism in East Greenland (Hald & Tegner, 2000).

Petrography: The sills are tholeiitic in composition and vary from aphyric to strongly plagioclase-phyric with phenocrysts up to 7 cm in length.

Geochemistry: Hald & Tegner (2000) gives major and trace element analyses, age information and petrogenetic models.
PGE concentrations are given by Momme (2000). They indicate that the sill magmas are not depleted in PGE.

Exploration activity: Based on AEM investigations (Stemp, 1998) a number of magnetic anomalies related to exposed sills have been investigated by GEUS (Pedersen & Stendal, 1999).

Exploration results: The results of the investigations of AEM anomalies related to the Palaeogene sills of the Jameson Land basin are described in Pedersen & Stendal (1999). The anomalies are caused by magnetite-rich skarns in the sediments at the contacts to one out of three regionally occurring sills in the sedimentary basin. The sulphide content is low. Further details in Pedersen & Stendal (1999).

Comments and company recommendations: No further exploration is suggested.

Further information: GEUS: H. Stendal and B. M. Nielsen.
Geological Museum, Copenhagen: N. Hald.
Århus Universitet: C. Tegner.

References:

Research papers and descriptions:

Hald, N. & Tegner, C. 2000: Composition and age of tertiary sills and dykes, Jameson Land Basin, East Greenland: relation to regional flood volcanism. Lithos **54**, 207-233.

Larsen, H.C. & Marcussen, C. 1992: Sill-intrusion, flood basalt emplacement and the deep structure of the Scoresby Sund region, East Greenland. In: Storey, B.C., Alabaster, T & Pankhurst, R.J. (eds): Magmatism and the causes of continental break-up. Geological Society of London, Special Publication **68**, 365-386.

Momme, P. 2000: Flood basalt generation and differentiation: PGE-geochemistry of East Greenland flood basalts, comagmatic intrusions and comparison with Siberian flood basalts. Ph.D. thesis, Geological Institute, Aarhus Universitet, Århus, Danmark, 154 pp.

Pedersen, M. & Stendal, H. (1999) Ground check of airborne geophysical anomalies in northern Jameson Land, central East Greenland. Danmarks ogGrønlands Geologiske Undersøgelse Rapport **1999/38**, 74 pp.

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Compiler: T.F.D. Nielsen.

Date: 2002-07-25.

8. Region 8: Blosseville Kyst

Brooks (1973) and Burke & Dewey (1973) identified the Kangerlussuaq area as the centre of a triple junction formed above the head of the ancestral Icelandic mantle plume around 55 Ma ago. The triple junction is identified by dyke swarms and flexure of the continental margin south of Kangerlussuaq fjord and along the E-W oriented, southern part of the Blosseville Kyst. The failed arm of the triple junction is identified by a suite of intrusions and dyke swarms parallel to the NW oriented Kangerlussuaq fjord.

The crustal block to the east of the present-day coast line was removed by seafloor spreading. The southwestern bock exposes Precambrian gneiss with Palaogene intrusive centres and dyke swarms, but was in Palaogene times - at least partially – covered by plateau basalts. The northern block limited by the Kangerlussuaq fjord and the Blosseville Kyst exposes a stratigraphically higher section in the Paleogene crust. More than 6 km of Paleaogene plateau basalts and early continental rift "Lower Basalts" overly Precambrian basement and Mesozoic to Palaeogene sediments. The sediment are described, e. g., in Larsen *et* al. (2001). The sediments and the Lower Basalts host basaltic sill complexes of significant volume (Brooks & Nielsen, 1982 and Gisselø, 2000; data sheet 8.4).

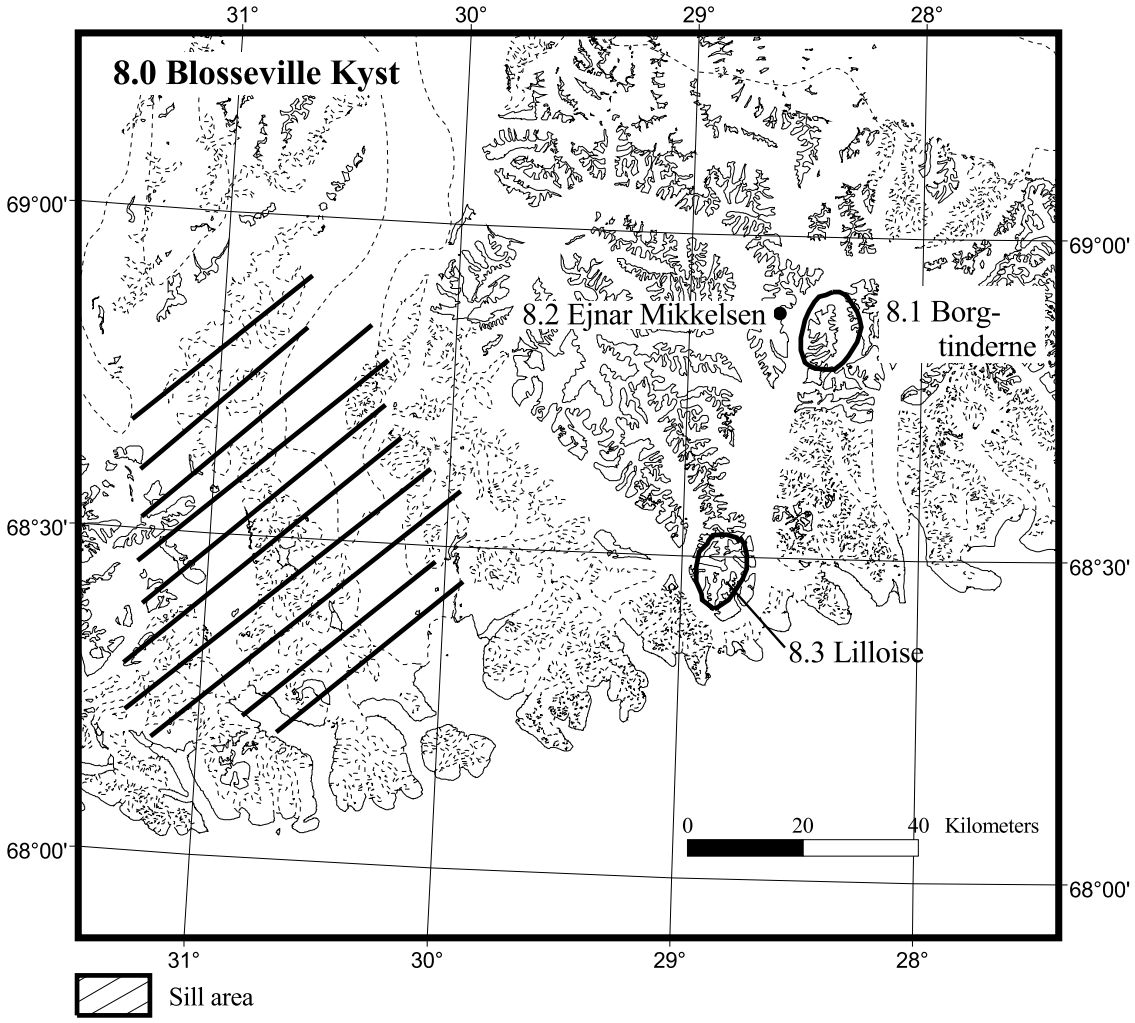
The "Lower Basalts" (Wager, 1947) is the oldest sequence of lavas on the Blosseville Kyst. They are exposed in areas just east of Kangerlussuaq Fjord. They are up to *c.* 2 km in thickness and formed between 61 and 57 Ma ago in a continental rift environment. The Lower Basalts range from picritic to evolved basaltic compositions (Nielsen *et* al., 1981, Fram & Lesher 1997 and Hansen & Nielsen, 1999).

The overlying plateau basalts are at least 6 km in thickness and formed between c. 57 and 54 Ma ago. Systematic sampling of profiles and photogrametric investigation (Larsen *et* al., 1989 and Pedersen *et* al., 1997) document lateral continuity of basalt formations throughout the region and to the Faeroe Islands. The stratigraphy and characteristics of the plateau basalts are described by Larsen *et* al., 1989, Fram & Lesher 1997, Tegner *et* al, 1998 and Hansen & Nielsen, 1999).

The plateau basalts are affected by syn- and post-depositional tectonic activity. The coast Parallel Flexure of East Greenland (Wager & Deer, 1938: Nielsen and Brooks, 1981; Karson & Brooks 1999 and Klausen & Larsen, in press) developed as a sort of collapse structure in response to doming over the plume head and the break-up of the continental crust along the present-day coast lines. The flexure is best developed in the areas around Kangerlugssuaq fjord.

The eastern part of the northern Blosseville Kyst block was in addition affected by post-plateau basalt faulting and seaward subsidence. East of a major N-S oriented structural zone (c. 28°30'W) the plateau basalts are broken up into large, E-dipping, fault blocks (Pedersen *et* al., 1997).

The Borgtinderne complex (data sheet 8.1), the Ejnar Mikkelsen intrusion (data sheet 8.2), the Lilloise intrusion (data sheet 8.3) and swarms of nodule-bearing dyke are related to the N-S structural zone in the Blosseville Kyst block of the triple junction.



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Pedersen, A.K., Watt, M., Watt, W.S. & Larsen, M.L. 1997: Structure and stratigraphy of the Early Tertiary basalts of the Blosseville Kyst, East Greenland. Journal of the Geological Society of London **154**, 565-570.

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Wager L.R. & Deer, W.A. 1938: A dyke swarm and crustal flexure in East Greenland. Geological magazine 75, 39-46.

8.1 Borgtinderne complex

Major, alpine syenite complex
No mineralisations observed.

Location:	68°52'N, 28°20'W.
Main references:	Brown *et* al. (1978) and Nielsen *et* al. (2001).
Topographic maps:	1:250 000 KMS: 68Ø2 Kap Garde. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat image:	TM path row: 228-011.
Aerial photographs:	1:150 000 KMS flight line 878D, nos 664-669.
Geological maps:	Regional map: 1:500 000, Geological map of Greenland, sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Brown *et* al. (1978).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	The Borgtinderne complex is a roughly circular complex, *c.* 10 km in diameter, and 40 km inland, in a highly alpine gletscher terrain. Until year 2000 the Borgtinderne complex was believed composed of older, dark and younger, light coloured syenite (Brown *et* al., 1978). The darker varieties were believed to represent syenite that had assimilated basaltic inclusions. Investigations year 2000 (Nielsen *et* al., 2001) have shown the Borgtinderne to be very complex and composed of an older pluton of pyroxenite, gabbro and diorite intruded by younger syenite. Pillowed dykes composed of mafic and felsic magma intrude most lithologies and show the co-existence of

mafic and felsic magma during the formation of the Borgtinderne complex.

Gleadow & Brooks (1979) give a weighted mean age of 47.4 +/- 0.9 Ma.

Petrography: Brown *et* al. (1978).

Geochemistry: Brown *et* al. (1978).

Exploration activity: None.

Exploration results: None.

Comments and company recommendations: None.

Further information: GEUS: T.F.D. Nielsen; S. Bernstein.
Copenhagen University: C.K. Brooks.
Århus Universitet: C. Tegner (unpublished Ar-Ar age determinations).

References:

Research papers and descriptions:

Brown, P.E., Brown, R.D., Chambers, A.D. & Soper, N.J. 1978: Fractionation and assimilation in the Borgtinderne syenite. Contributions to Mineralogy and Petrology **67**, 25-34.

Gleadow, A.J.W. & Brooks, C.K. 1979: Fission track dating, thermal histories and tectonics of igneous intrusions in east Greenland. Contributions to Mineralogy and Petrology **71**, 45-60.

Nielsen, T.F.D.; Hansen, H.; Brooks, C.K., Lesher C.E. & field parties 2001: The East Greenland continental margin, the Prinsen af Wales Bjerge and new Skaergaard intrusion initiatives. Geology of Greenland Survey Bulletin **189**, 83-98.

Compiler: T.F.D. Nielsen.

Date: 2002-07-29.

8.2 Ejnar Mikkelsen intrusion

Dunite and peridotite intrusion.
Minor chromite seams.

Location:	68°54'13''N; 28°33'W.
Main references:	Nielsen *et* al. (2001).
Topographic maps:	1:250 000 KMS: 68Ø2 Kap Garde. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat image:	TM path row: 228-011.
Aerial photographs:	1:150 000 KMS flight line 878D, nos 965-968. KMS flight line 878E, nos 901-904.
Geological maps:	Not shown on any map. Found year 2000 (see "*Further information"*).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	Small exposure of dunite and peridotite on the east side of Ejnar Mikkelsen Fjeld. Dunites with veins of chromite and peridotite are exposed up to 1900 m a.s.l. Above 1900 m a.s.l. the intrusion is composed of peridotites. The intrusion was first located year 2000 and is only known from reconnaissance investigations. No age information is published (see *"Further information"*).
Petrography:	Unpublished (see *"Further information"*).
Geochemistry:	Unpublished (see *"Further information"*).
Exploration activity:	None.
Exploration results:	None.

Comments and company recommendations: None.

Further information: GEUS: S. Bernstein.
Århus Universitet: C. Tegner (unpublished Ar-Ar age determinations).

References: Research papers and descriptions:

Nielsen, T.F.D.; Hansen, H.; Brooks, C.K., Lesher C.E. & field parties 2001: The East Greenland continental margin, the Prinsen of Wales Bjerge and new Skaergaard intrusion initiatives. Geology of Greenland Survey Bulletin **189**, 83-98.

Compiler: T.F.D. Nielsen.

Date: 2002-07-29.

8.3 Lilloise intrusion

Layered, mafic to ultramafic complex intruded by syn-genetic hawaiite to quartz-trachyte. Syn-genetic deformation due to faulting. No significant mineralisations are observed.

Location: 68°31'N; 28°45'W.

Main references: Brown (1973), Chambers & Brown (1995).

Topographic maps:
1:250 000
KMS: 68Ø2 Kap Garde.
1:100 000
GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.

Landsat TM image: Not available from GEUS.

Aerial photographs:
1:150 000
KMS flight line 878C, nos 1205-1209.
KMS flight line 878D, nos 970-974.

Geological maps:
Regional map: 1:500 000 Geological map of Greenland, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988).
Publication maps: Brown (1973), Chambers & Brown (1995).
Unpublished maps: 1:25 000 of the southwestern part of the intrusion in Kelemen (1990).

Geophysical maps: None.

Hyperspectral data: None.

Geochemical maps: None available, but analyses from stream sediment samples are reported in quoted company reports.

Short description: Plutonics in Lilloise Bjerge were first reported by Wager (1934). The plutonics were first described and investigated much later (Brown, 1973) and (Chambers & Brown, 1995) on which the description is based. See also Nielsen (1987).

The *c.* 8 x 4 km large layered, mafic to ultramafic, Lilloise Intrusion is emplaced into the East Greenland plateau basalts. Three petrographic zones are identified. A Lower Zone of oli

vine and clinopyroxene peridotites with equilibrium textures, a Middle Zone of olivine gabbros which in their upper parts carry liquidus Fe-Ti-oxides and an Upper Zone of laminated brown amphibole and plagioclase cumulates with cumulus Fe-Ti-oxides and apatite and minor biotite. Syn-solidification deformation is common. Upper Zone rocks, especially, are intruded by hawaiite to trachy-andesite sheets and sheets of quarts trachyte. The late sheets are suggested co-genetic with the amphibole-bearing cumulates of Upper Zone. The youngest sheets are quartz-microsyenite sheets that are believed derived from a sub-Lilliose intrusive complex.

Brooks & Gleadow (1979) give fission-track ages for zircon and apatite of 52.5+/- 1.2 Ma and 51.0 +/1 1.2 Ma, Noble *et* al. (1988) give an amphibole K-Ar age of 49.4 +/-2 Ma.

Petrography: Brown (1973) and Chambers & Brown (1995).

Geochemistry: Brown (1973), Chambers & Brown (1995) and Sheppard *et* al. (1977).

Exploration activity: ***1986***: Reconnaissance by Platinova Resources Ltd. (Waters, 1987).
1989: Exploration and geological mapping by Platinova Resources Ltd. (Kelemen, 1990).

Exploration results: Stream sediment samples (Waters, 1986) suggested that PGE and Au the Lilloise intrusion should be tested for PGE and Au mineralisation. The investigations in 1989 were not encouraging. Only low concentrations of PGE and Au, especially related to contact zones, were obtained.

Comments and company recommendations: None.

Further information: GEUS: S. Bernstein.
Copenhagen University: C.K. Brooks.

References:

Research papers and descriptions:

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Noble, R.H., Macintyre, R.M. & Brown, P.E 1988: Age constraints on Atlantic evolution: timing of magmatic activity along the E Greenland continental margin. In: Morton, A.C. & Parson, L.M. (eds): Early Tertiary volcanism and the opening of the NE Atlantic. Special Publication, Geological Society of London **39**, 201-214.

Sheppard, S.M.F., Brown, P.E. & Chambers, A.D. 1977. The Lilloise intrusion, East Greenland: hydrogen isotope evidence for the efflux of magmatic water into the contact metamorphic aureole. Contributions to Mineralogy and Petrology **63**, 129-147.

Wager, L.R. 1934: Geological investigations in East Greenland. Part I. General geology from Angmagsalik to Kap Dalton. Meddelelser om Grønland **105**(2), 46 pp.

Company reports:

Kelemen, P. 1990: report on the 1989 field season, Lilloise concession, East Greenland. 12 pp. Internal report. Toronto: Platinova Resources Ltd. & Corona Corporation (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20812).

Waters, B.C. 1987: Geological report, Platinova Resources Ltd. Kangerdlugssuaq concession, East Greenland, 43 pp.Company report. Toronto: Platinova Resources Ltd. (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20838).

Compiler: T.F.D. Nielsen.

Date: 2002-10-04.

8.4 Sills in Kangerlussuaq basin

Picritic, basaltic and syenitic sills in sediments and lavas.
No mineralisations are reported.

Location:	68°30N: 30°45'N (centre of circle with 30 km radius).
Main references:	Wager (1947), Brooks & Nielsen (1982) and Gisselø (2002).
Topographic maps:	1:250 000 KMS: 68Ø2 Kap Garde and 68Ø3 Kangerdlugssuaq. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat TM image:	Not available from GEUS.
Aerial photographs:	1:150 000 KMS flight line 878E, nos 911-925. KMS flight line 878F, nos 1843-1857. KMS flight line 878G, nos 397-409. KMS flight line 878H, nos 767-773.
Geological maps:	Regional map: 1:500 000, Geological map of Greenland, Sheet 13 Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: In Gisselø (2001, for the Sorgenfri Gletscher area) and Nielsen *et* al. (1981, for the Miki Fjord and I.C.Jacobsen Fjord area
Geophysical maps:	None.
Geochemical maps:	None, except for minor investigations in the fjord region east of the Skaergaard intrusion (Kap Irminger concession) by Della Valle (1992).
Short description:	Major province of picritic, basaltic and syenitic sills. The sills are in part concordant with bedding in Kangerdlugssuaq series sediments and the lower formations in the regional lavas. The sills are often irregular and step up or down through the host rocks. The sills vary from <1m to >200m in thickness. Gisselø (2000) evaluates that up to 20% of the volume of ba

salt in the Paleaogene magmatic province in East Greenland can be hosted in sill complexes.

Thick sills show internal differentiation whereas most sills show chemical variations due internal redistribution of intercumulus melt.

The tholeiitic sills are assumed and known to becontemporaneous with the flood basalt magmatism along the Blosseville Kyst. No age information has yet been published (see *"Further information"*).

Petrography: Tholeiitic picrite, tholeiitic basalt and syenite sills occur. Basalt sills predominate. The picrite sills are mostly accumulative. Thick basaltic sills are doleritic or gabbroic, often with pegmatitic schlieren. For details: see Gisselø (2000).

Geochemistry: Gisselø (2000) and for PGE Momme (2000) and Momme *et* al. (2002).

Exploration activity: Search for sulphide anomalies in the I.C. Jacobsen Fjord region by Platinova Resources Ltd. 1990 (see report by Della Valle, 1992 and GEUS GRF no. 21087).

Exploration results: Minor geochemical anomalies in the I.C. Jacobsen Fjord region. Elevated Ni values in sediments probably due to the common occurrence of picritic lavas with elevated Ni concentrations. No traces of massive sulphide mineralisations have been observed.

Comments and company recommendations: GEUS (T.F.D. Nielsen): A potential for PGE-rich massive sulphide mineralisation can not be excluded. The generally high PGE content of the mafic sills and the possibility for reaction with sediments (bithumen-rich and sulphide bearing shales and silisic sediments) could favour formation of PGE-rich massive sulphide deposits. Airborne geophysical investigations, geochemical mapping and systematic boulder search in moraines are suggested

Further information: GEUS: T.F.D. Nielsen.
Århus Universitet: C. Tegner (unpublished Ar-Ar age determinations).

References: Research papers and descriptions:

Brooks, C.K. & Nielsen, T.F.D. 1982: The Phanerozoic development of the Kangerdlugssuaq area, East Greenland. Meddelelser om Grønland, Geoscience **9**, 30 pp.

Deer, W.A. 1976: Tertiary igneous rocks between Scoresby Sund and Kap Gustav Holm, East Greenland. In: Escher, A. & Watt, W.S. (eds): Geology of Greenland, 404-429. Copenhagen: Grønlands Geologiske Undersøgelse.

Gisselø, P. 2000: Sorgenfri Gletscher Sill Complex, East Greenland. Solidification mechanisms of sheet-like bodies and the role of sill complexes in large igneous provinces. Aarhus Geoscience – Ph.D. Thesis **10**, 100 pp.

Momme, P. 2000: Flood basalt generation and differentiation: PGE-geochemistry of East Greenland flood basalts, comagmatic intrusions and comparison with Siberian flood basalts. Unpublished PhD Thesis, Geological Institute, Aarhus University, Denmark. 154 pp.

Momme, P., Tegner, C., Brooks, C.K. & Keays, R.R. 2002: The behaviour of platinum group elements in basalts from the East Greenland rifted margin. Contributions to Mineralogy and Petrology **143**, 133-153.

Nielsen, T.F.D. 1987: Tertiary alkaline magmatism in East Greenland: a review. In: Fitton, J.G. & Upton, B.G.J. (eds): Alkaline igneous rocks. Special Publication Geological Society of London **30**, 489-515.

Nielsen, T.F.D., Soper, N.J., Brooks, C.K., Faller, A.M., Higgins, A.C. & Matthews, D.W. 1981: The pre-basaltic sediments and the Lower Basalts at Kangerdlugssuaq, East Greenland: their stratigraphy, lithology, palaeomagnetism and petrology. Meddelelser om Grønland, Geoscience **6**, 25 pp.

Wager, L.R. 1947: Geological investigations in East Greenland. Part IV. The stratigraphy and tectonics of Knud Rasmussens Land and the Kangerdlugssuaq region. Meddelelser om Grønland **134** (5), 64 pp.

Company reports:

Della Valle, G. 1992: Geological report on the 1991 Kap Irminger exploration project central east Greenland. Internal report, Platinova Resources Ltd. & RTZ ltd., 35 pp. (in achives of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 21087).

Compiler: T.F.D. Nielsen.

Date: 2002-11-20.

9. Region 9: Kangerlussuaq

Brooks (1973) and Burke & Dewey (1973) identified the Kangerlussuaq area as the centre of a triple junction formed above the head of the ancestral Icelandic mantle plume around 55 Ma ago. The triple junction is identified by dyke swarms and flexure of the continental margin south of Kangerlussuaq fjord and along the E-W oriented, southern part of the Blosseville Kyst. The failed arm of the triple junction is identified by a suite of intrusions and dyke swarms parallel to the NW oriented Kangerlussuaq fjord. Reviews of the area are given by Deer (1976), Brooks and Nielsen (1982) and Nielsen (1987).

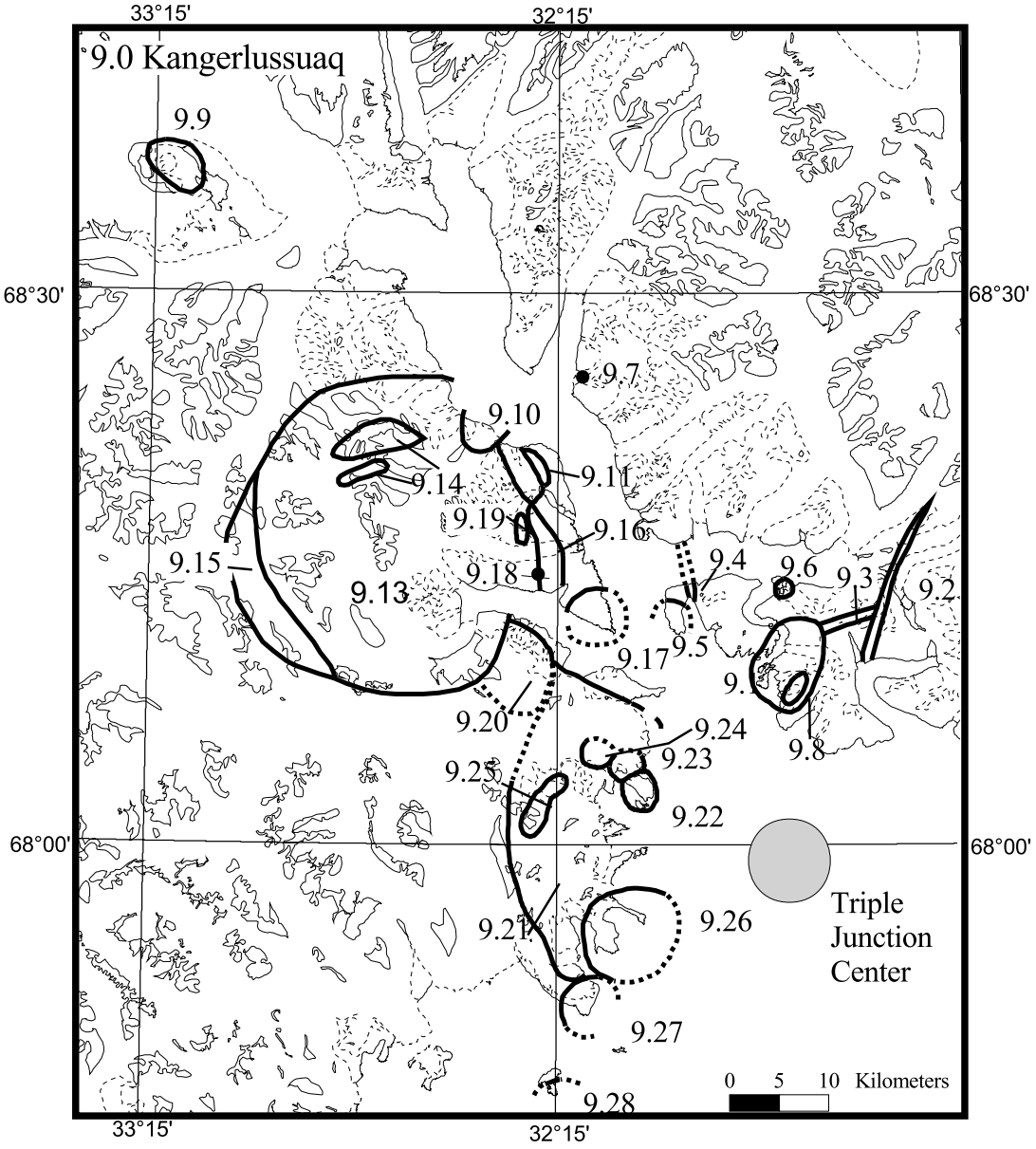
The crustal block to the east of the present-day coast line was removed by seafloor spreading. The southwestern bock expose Precambrian gneiss with Palaogene intrusive centres and dyke swarms, but was in Palaogene times - at least partially – covered by Mesozoic to Palaogene sediments and Palaeogene plateau basalts. The northern block limited by the Kangerlussuaq fjord and the Blosseville Kyst (data sheet 8.0) exposes a stratigraphically higher section in the Paleogene crust. More than 6 km of Paleaogene plateau basalts and early continental rift ”Lower Basalts” overly Precambrian basement and Mesozoic to Palaeogene sediments (e. g., Pedersen et al., 1997).

Twenty-eight intrusions and complexes have been recorded in the Kangerlussuaq fjord area. Some are large and composed of several related intrusive bodies. The intrusions and complexes of the Kangerlussuaq fjord region cover the entire range from ultramafic and mafic subalkaline and ultramafic alkaline to granitic, syenitic, and carbonatite-related complex (see references given above). They are located along both the eastern and western shores of the fjord and in the southern part of the mouth of the fjord. The syenitic Kangerdlugssuaq Alkaline Intrusion (data sheet 9.13), the gabbroic Kap Edvard Holm Complex (data sheet 9.21) and the gabbroic Skaergaard intrusion (data sheet 9.1) are the largest plutonic masses in the region.

The Skaergaard intrusion is the best-known gabbro intrusion. Exploration has located a major low-grade PGE mineralisation in the intrusion. Several other mafic intrusions and complexes have attracted scientific and exploration activity. Significant exploration has be conducted in the Kap Edvard Holm Complex and the Mikis Fjord macrodyke. Some exploration and geological investigation has also been directed to the porphyry molybdenum occurrence in the Flammefjeld diatreme (data sheet 9.18). Geological modelling suggests the Mo-mineralised blocks in the diatreme to originate from a classic porphyry molybdenum mineralisation below the peak of Flammefjeld. Regional base metal and precious metal vein-type mineralisations are believed to relate to the molybdenum mineralisation.

It should be noted that Kap Edvard Holm has given name to both the Kap Edvard Holm Complex (data sheet 9.21) and the Kap Edvard Holm Intrusion (data sheet 9.27). ”Intrusion” and ”Complex” are in this case spelled with capital letters. Note should also be taken that the ”Kangerdlugssuaq” has been used for both the "Kangerdlugssuaq Complex" and the Kangerdlugssuaq Alkaline Intrusion (data sheet 9.13). The ”Kangerdlugssuaq Complex” is a convenient and traditional term used for the Kangerdlugssuaq Alkaline Intrusion (data sheet 9.13) and the related satellite intrusions including: Kærven Syenite intrusion (data sheets 9.12), Peak 2005 syenite intrusion (data sheet 9.14), (Kangerdlugssuaq) Augite Syenite intrusion (data sheet 9.15), Snout Series complex (data sheet 9.16), Bagnæsset

syenite intrusion (data sheet 9,17), Flammefjeld diatreme (data sheet 9.18), Cirque 1320 complex (data sheet 9.19) and (Amdrup Fjord) Biotite granite intrusion (9.20).



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Brooks, C.K. and Nielsen, T.F.D. 1982: The Phanerozoic development of the Kangerdlugssuaq area, East Greenland. Meddelelser om Grønland, Geoscience **9**, 30 pp.

Burke, K. & Dewey, J.F. 1973: Plume-generated triple junctions: key indicators in applying plate tectonics to old rocks. Journal of Geology **81**, 406-433.

Deer, W.A. 1976: Tertiary igneous rocks between Scoresby Sund and Kap Gustav Holm, East Greenland. In: Escher, A. & Watt, W.S. (eds): Geology of Greenland, 404-429. Copenhagen: Grønlands Geologiske Undersøgelse.

Nielsen, T.F.D. 1987: Tertiary alkaline magmatism in East Greenland: a review. In: Fitton, J.G. & Upton, B.G.J. (eds): Alkaline igneous rocks. Special Publication, Geological Society of London **30**, 489-515.

Pedersen, A.K., Watt, M., Watt, W.S. & Larsen, M.L. 1997: Structure and stratigraphy of the Early Tertiary basalts of the Blosseville Kyst, East Greenland. Journal of the Geological Society of London **154**, 565-570.

9.1 Skaergaard intrusion

Layered tholeiitic gabbro intrusion
with major palladium and gold mineralisation

Location:	68°10'30''N; 31°40'W
Main references:	Wager & Deer (1939, re-issued 1962), Wager & Brown (1968), Norton *et* al. (1984), McBirney (1989a and b; 1996a and b), Irvine *et* al. (1998), Andersen *et* al. (1998) and Nielsen (2001).
Topographic maps:	1:250 000 KMS: 68Ø3 Kangerdlugssuaq. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request. 1:20 000 KMS: Skærgården.
Landsat TM image:	Not available from GEUS.
Aerial photographs:	1:150 000 KMS flight line 878F, nos 1841-1844. KMS flight line 878P, nos 1415-1418. 1:27 000 Colour GEUS: McBirney series, nos 3254-3260, 3274-3280, 3285-3290, 3311-3314, 3402-3407.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: 1:40 000 (Wager & Deer, 1939 and re-issued 1962), 1:20 000 by McBirney (1989b and 1996b).
Geophysical maps:	Geophysical investigations by Blank & Gettins (1973, see also Norton *et* al., 1984). Unpublished information by M. Christensen & C.K. Brooks (in Nielsen *et* al. 2001).
Hyperspectral data:	None.
Geochemical maps:	McBirney (1996a) and unpublished information by Platinova Resources Ltd. (Waters, 1987).

Short description:

The Skaergaard intrusion is described in the main references given above. The following description is based on Nielsen (2001). The Skaergaard intrusion is *c.* 55 Ma old (Brooks & Gleadow, 1977 and Hirschmann *et* al., 1997).

The Skaergaard intrusion is *c.* 70 km^2 in surface area, i.e. *c.* 11 km N-S and up to *c.* 8 km E-W. Several models for the shape of the intrusion have been proposed. Inverted cone (Wager & Deer, 1939 and re-issue 1962; Wager & Brown, 1968), laccolith type intrusion (Norton *et* al., 1984), stubby sill like body (Irvine, 1991) and an - at least partially fault-controlled - more angular body (Irvine *et* al., 1998).

Nielsen (2001) modelled the Skaergaard intrusion as an irregular box, up to 11 km N-S, up to *c.* 7 km E-W and with a total height of *c.* 4 km. The total volume was estimated to *c.* 300 km^3. The box shape of the intrusion is supported by unpublished modelling (T. Rasmussen, GEUS; pers. comm., 2002) based on the data collected by M. Christensen & C.K. Brooks (shown in Nielsen *et* al., 2001). The intrusion is tilted southwards and parts of all units in the intrusion are exposed.

The intrusion is by Nielsen (2001) assumed filled with one pulse of evolved Ti-tholeiite similar to regional plateau basalt magma. The magma cooled and fractionated under closed conditions in an onion type internal structure. Spectacular layering was developed during the solidification of the intrusion. Phase layering and other characteristics are used for the subdivision of the intrusion into zones and subzones (see figure). For further information see the main references.

The gabbros of the upper Middle Zone (for details see Nielsen, 2001) hosts a large-tonnage, low-grade, palladium-gold-platinum mineralisation (see below).

Petrography:

Wager & Deer (1939, re-issued 1962), Wager & Brown (1968). For further information see references in more publications, e.g. Irvine *et* al. (1998) and McBirney (1996a).

Geochemistry:

Wager & Deer (1939, re-issued 1962), Wager & Brown (1968), McBirney (1989a and 2002) and Nielsen (2001 and in press). See also references in more recent publications by Irvine *et* al. (1998) and McBirney (1996a).

Exploration activity:

1970: Nordisk Mineselskab A/S (Vohryzka & Vohryzka, 1971 and Brooks, 1971). Reconnaissance investigations.
1986: Stream sediment and grab sample investigation by Platinova Resources Ltd. (Waters, 1987).

1987: Based on anomalous gold in stream sediment Platinova Resources. Ltd. conducted chip line investigation and minor packsackdrilling. Identification of the mineralised section in the upper part of Middle Zone (Goodwin & Turner, 1988).
1988: Systematic chip sampling and pack sack drilling of target horizon. Confirmation of extensively mineralised horizon. (Turner & Mosher, 1989).
1989: Drilling campaign by Platinova Resources Ltd. 11 BQ holes (89-01 to 89-09B) drilled. Major mineralisation indicated (Turner, 1990). Geophysical investigation of depth to bedrock below Forbindelsesgletscher (Williams, 1990).
1990: Major drilling campaign by Platinova Resources Ltd. 23 BQ holes (90-10 to 90-27) drilled. Some holes up to 1100 m deep. Indicates the occurrence of stratabound mineralisation across the entire intrusion.

Exploration results: Identification of world class PGE (Pd) and Au stratabound mineralisation. The reader is referred to Watts, Griffis & McOuat (1991) and Nielsen (2001) for detailed information. See also Teck Corporation (1991) for evaluation of the resource.

Comments and company recommendations: Continued exploration is recommended by Watts, Griffis & McOuat (1991). The reader is referred to this report for detailed recommendations. Nielsen (2001) focuses on the palladium-rich parts of the mineralisation in the Pd5 horizon (Pd2 reef, Watts Griffis & McOuaut 1991 terminology). The mineralisation in Pd5 is suggested to contain >280 million tons grading *c.* 2 g combined PGE and Au over a width of *c.* 5m. The precious metals are totally dominated by palladium. The palladium to platinum ratio is *c.* 10.

Further information: GEUS: T.F.D. Nielsen.

References: Comment: A large number of research papers and company reports describe the Skaergaard intrusion and its mineralisation. Only a selection of papers and reports can be mentioned. The reader is advised to search for further readings in the listed publications.

<u>Research papers and descriptions</u>:

Andersen, J. C. Ø., Rasmussen, H., Nielsen, T. F. D. & Rønsbo, J. G. 1998: The Triple Group and the Platinova gold and palladium reefs in the Skaergaard intrusion:

Stratigraphic and petrographic relations. Economic Geology **93**, 488-509.

Bird, D.K., Brooks, C.K., Gannicott, R.A. & Turner, P.A. 1991: A gold-bearing horizon in the Skaergaard intrusion, East Greenland. Economic Geology **86**, 1083-1092.

Blank, H. R. & Gettins, M. E. (1973). Subsurface form and extend of the Skaergaard intrusion, East Greenland. (abs.). Transactions of the American Geophysical Union **54**, 507 only.

Brooks, C.K. & Gleadow, A.J.W. 1977: A fission-track age for the Skaergaard intrusion and the age of the East Greenland basalts. Geology **5**, 539-540.

Deer, W.A. 1976: Tertiary igneous rocks between Scoresby Sund and Kap Gustav Holm, East Greenland. In: Escher, A. & Watt, W.S. (eds): Geology of Greenland, 404-429. Copenhagen: Grønlands Geologiske Undersøgelse.

Hirschmann, M.M., Renne, P.R. & McBirney, A.R. 1997: $^{40}Ar/^{39}Ar$ dating of the Skaergaard intrusion. Earth and Planetary Science Letters **146**, 645-658.

Irvine, T. N., Andersen, J. C. Ø. & Brooks, C. K. (1998): Included blocks (and blocks within blocks) in the Skaergaard intrusion , East Greenland. Bulletin of the Geological Society of America **110** (11), 1398-1447.

McBirney, A. R. 1989a: The Skaergaard Layered Series: I. Structure and average compositions. Journal of Petrology **30**, 363-397.

McBirney, A.R. 1989b: Geological map of the Skaergaard intrusion, East Greenland. Eugene: University of Oregon.

McBirney, A. R. 1996a: The Skaergaard intrusion. In: Cawthorn, R. G. (ed.): Layered Intrusions**.** 147-180. Amsterdam: Elsevier.

McBirney, A. R. 1996b: Geological map of the Skaergaard intrusion, East Greenland. In: Cawthorn, R. G. (ed.): Layered Intrusions. Amsterdam: Elsevier.

Nielsen, T. F. D. 2001: The palladium potential of the Skaergaard intrusion, South-East Greenland. Report GEUS **2001/23**, 38 pp.

Norton, D., Taylor, H. P. Jr. & Bird, D. K. (1984). The geometry and high-temperature brittle deformation of the Skaergaard intrusion. Journal of Geophysical Research **89B, 10**.178-10192.

Wager, L. R. & Brown, G. M. (1968). Edinburgh and London: Oliver & Boyd.

Wager, L. R. & Deer, W. A. (1939, re-issued 1962). Geological investigations in east Greenland. Part III. The petrology of the Skaergaard intrusion, Kangerdlugssuaq, East Greenland. Meddelelser om Grønland **105**(4), (1962 issue).

Company reports:

Brooks, C.K. 1971: Report covering the sprospecting activities of Group 5 during the summer of 1970 in the area of Kangerdlugssuaq, East Greenland, ca. 68° north latitude, 29 pp. Unpublished NM-Report. Copenhagen: Nordisk Mineselskab A/S (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20903).

Goodwin, J.A. & Turner, P.A. 1988: East Greenland Kangerdlugssuaq Concession, Summary report of 1987 program, 43 pp. Toronto: Platinova Resources Ltd. (in archive of Danmarks and Grønlands Geologiske Undersøgelse, GRF no. 20844).

Lakefield Research 1988a: An investigation of the recovery of gold from Skaergaard – Greenland project samples submitted by Platinova Resources INC. Progress report 1 (project report No. L.R. 3633), 41 pp.

Toronto: Lakefield Research (in achive of Danmarks og Grønlands Geologiske Underseøgelse, GRF. no. 20920).

Lakefield Research Ltd. 1988b: An investigation of the recovery of gold from Skaergaard – Greenland project samples submitted by Platinova Resources Ltd. Progress report no. 2 (per Lavana/Royex) 29 pp. Internal report. Toronto: Platinova Resources Ltd. (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF. no. 20918).

Lakefield Research Ltd. 1996: An investigation of the recovery of ilmenite from a copper/gold flotation tailings submitted by Platinova A/S, Progress report No. 1, Technical report 1995 Skærgaard project licence 08/92. 26 pp. Internal report. Toronto: Platinova Resources Ltd. (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF. no. 21439).

Teck Corporation, 1991: Tonnage beregning for Skaergaarden. 6 pp. Internal report. Toronto: Platinova A/S & Corona (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF. no. 21026).

Turner, P.A. 1990: Report of the 1989 field season, Skaergaard concession. 47 pp. (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF. no. 20843).

Turner, P.A. & Mosher, G.W. 1989: Report of the 1988 field season, Skærgaard concession and East Greenland prospecting license, 71 pp. Company report. Toronto: Platinova Resources Ltd. (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF. no. 20845).

Vohryzka, K. & Vohryzka, E. 1971: Bericht über die Prospektion im Jahr 1970 im Gebiet des Kangerdlugsaukfjorders, Ostgrönland, 68° nl. Breite, 47 pp. Internal report: Nor

disk Mineselskab A/S (in archive of Danmark og Grønlands Geologiske Undersøgelse, GRF no. 20906).

Waters, B.C. 1987: Geological report, Platinova Resources Ltd. Kangerdlugssuaq concession, East Greenland, 43 pp. Toronto: Platinova Resources Ltd. (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20838).

Watts, Griffis & McOuat 1991: 1990 Skaergaard project, Platinova/Corona concession, East Greenland, 55 pp. with appendixes in volumes 2A, 2B, 3A and 3B (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20848).

Williams B.S. 1990: Report on the seismic surveys on the Forbindeles Glacier, Skaergaard, East Greenland, for Corona Corporation, 4 pp. Dublin: Williams Geophysics.

Compiler: T.F.D. Nielsen.

Date: 2002-08-01.

9.2 Mikis Fjord Macrodyke

Layered gabbro dyke.
PGE-bearing sulphide mineralisation along contacts.

Location:	68°10'30''N; 31°30'W.
Main references:	Deer (1976) and Blickert-Toft *et* al. (1992).
Topographic maps:	1:250 000 KMS: 68Ø3 Kangerdlugssuaq. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request. 1:25 000 GEUS: Orthophoto map produced by Geodætisk Institut (KMS) in 1982. The map covers the northern part of the Macrodyke. 1:21 350 Transparency of the area between Skaergaard intusion and I.C. Jacobsen Fjord and Miki Fjord and Watkins Fjord. Base for geological map in 1:40 000 in Nielsen et al. (1981).
Landsat TM image:	Not available from GEUS.
Aerial photographs:	1:150 000 KMS flight line 878F, nos 1842-1846. 1:27 000 Colour GEUS: McBirney series, nos 3227-3231 and 3241-3246
Geological maps:	Regional map: 1:500 000, sheet 13 Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Nielsen *et* al. (1981) and Blickert-Toft *et* al. (1992).
Geophysical maps:	Exploration geophysics, see Williams (1988) and Andersen (1997).
Hyperspectral data:	None.
Geochemical maps:	None.

Short description:

NE-trending up to 500m wide tholeiitic gabbro dyke. The dyke can be followed >50km inland (Deer, 1976). Part of the roof is preserved in the high country between Miki Fjord and the Issøerne area. The dike thins to a few tenths of meters or less NE of the head of Watkins Fjord.

The lower parts as exposed at the mouth of Vandfaldsdalen are composed of non-layered fairly homogeneous gabbro. In the high country to the NE the dyke becomes strongly layered and very rich in large rafts of hornfelsed lava. Spectacular layering, also due to anorthosite melt layers formed during anatectic melting of altered basalt inclusions (Blichert-Toft *et* al., 1992).

Based on the field relations and the similarities to the Skaergaard intrusion the Mikis Fjord Macrodyke is believed to be *c.* 55 Ma old.

Petrography:

Deer (1976) and Blichert-Toft *et* al. (1992).

Geochemistry:

Deer (1976) and Blichert-Toft *et* al. (1992).

Exploration activity:

1986: Reconnaissance investigations by Platinova Resources Ltd. (Waters, 1987).
1987: Systematic sampling by Platinova Resources Ltd. (Goodwin and Turner, 1988) and geophysical investigations reported by Williams (1988).
1996: Geophysical investigations (Andersen, 1997).

Exploration results:

PGE-bearing sulphide mineralisations in contact zones. Assays have given up to 40 ppb Pt, 615 ppb Pd and 76 ppb Au (Goodwin & Turner, 1988). Geophysical investigations suggests drilling target for massive sulphide mineralisation in the Issøerne area (Andersen, 1997).

Comments and company recommendations:

Platinova A/S suggest drilling of geophysical anomaly and further exploration.

Further information:

GEUS: T.F.D. Nielsen.
University of Copenhagen: C.K. Brooks.
University of California Davis: C.E. Lesher.

References:

Research papers and descriptions:

Blichert-Toft, J., Lesher, C.E. & Rosing, M.T. 1992: Selectively contaminated magmas of the Tertiary East Green

land macrodike complex. Contributions to Mineralogy and Petrology **110**, 154-172.

Deer, W.A. 1976: Tertiary igneous rocks between Scoresby Sund and Kap Gustav Holm, East Greenland. In: Escher, A. & Watt, W.S. (eds): Geology of Greenland, 404-429. Copenhagen: Grønlands Geologiske Undersøgelse.

Company reports:

Andersen, E.O 1997: Report on geophysical surveying. Time domain electromagnetics and magnetics. Macrodyke project. East Greenland. Mineral licence 08/92, 5 pp. Internal report. Toronto: Platinova A/S (in archive of Danmarks og Grønland Geologiske Undersøgelse, GRF. no. 21509).

Goodwin, J.A. & Turner, P.A. 1988: East Greenland Kangerdlugssuaq Concession, Summary report of 1987 program, 43 pp. Toronto: Platinova Resources Ltd. (in archives of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20844).

Waters, B.C. 1987: Geological report, Platinova Resources Ltd. Kangerdlugssuaq concession, East Greenland, 43 pp. Company report. Toronto: Platinova Resources Ltd. (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20838).

Williams, B.S. 1988: Report on geophysical surveys in the Skaergaard area, eastern Greenland - for Platinova Resources – July 1987, 5 pp. Dublin: Williams Geophysics (in archive of Danmarks and Grønlands Geologiske Undersøgelse, GRF. no. 20839).

Compiler: T.F.D. Nielsen.

Date: 2002-08-01.

9.3 Vandfaldsdalen Macrodyke

Gabbro macrodyke at the eastern contact of Skaergaard.
No mineralisation is reported.

Location:	68°12'N; 31°36'W.
Main references:	Deer (1976), White *et* al. (1989) and Rosing *et* al. (1989).
Topographic maps:	1:250 000 KMS: 68Ø3 Kangerdlugssuaq. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request. 1:20 000 KMS: Skærgården.
Landsat TM image:	Not available from GEUS.
Aerial photographs:	1:150 000 KMS flight line 878F, nos 1842-1846. 1:27 000 Colour GEUS: McBirney series, nos 3242-3244 and 3258-3260.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: 1:20 000 (Wager and Deer, 1939 and reissued 1962), Nielsen *et* al. (1981), McBirney (1989b) and McBirney (1996b).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	"The Vandfaldsdalen macrodike is a layered and differentiated gabbro dike 3.5 km long and 200 to 500 m wide" (White *et* al., 1989). It is almost perpendicular to the eastern Skaergaard contact and exposed halfway along the eastern margin of the Skaergaard intrusion in a fault block together with the Paleaogene volcanics. It is divided into: (1) a marginal series of differentiated gabbros, (2) a central series of layered gabbros

and ferrodiorites and (3) an upper body of felsic material. The gabbros are tholeiitic. The origin of the felsic material is discussed by Rosing *et* al. (1989). The felsic material is suggested – at least in part – to represent fused basement material. Detailed description of the field relations etc., are given by White *et* al. (1989).

Petrography: White *et* al. (1989) and Rosing *et* al. (1989).

Geochemistry: Deer (1976), White *et* al. (1989) and Rosing *et* al. (1989).

Exploration activity: ***1986***: Platinova Resources Ltd. (Waters, 1987). Reconnaissance sampling (in report named Skaergaard Macro-dyke)

Exploration results: No interesting values were returned.

Comments and company recommendations: None.

Further information: GEUS: T.F.D. Nielsen.

References:

Research papers and descriptions:

Deer, W.A. 1976: Tertiary igneous rocks between Scoresby Sund and Kap Gustav Holm, East Greenland. In*:* Escher, A. & Watt, W.S. (eds): Geology of Greenland, 404-429. Copenhagen: Grønlands Geologiske Undersøgelse.

McBirney, A.R. 1989b: Geological map of the Skaergaard intrusion, East Greenland. Eugene: University of Oregon.

McBirney, A. R. 1996b: Geological map of the Skaergaard intrusion, East Greenland. In: Cawthorn, R. G. (ed.): Layered Intrusions. Amsterdam: Elsevier.

Nielsen, T.F.D., Soper, N.J., Brooks, C.K., Faller, A.M., Higgins, A.C. & Matthews, D.W. 1981: The pre-basaltic sediments and the Lower Basalts at Kangerdlugssuaq, East Greenland: their stratigraphy, lithology, palaeomagnetism and petrology. Meddelelser om Grønland, Geoscience **6**, 25 pp.

Rosing, M.T., Lesher, C.E. & Bird, D.K 1989: Chemical modification of east Greenland Tertiary magmas by two-liquid interdiffusion. Geology **17**, 626-629.

Wager, L. R. & Deer, W. A. 1939: Geological investigations in east Greenland. Part III. The petrology of the Skaergaard intrusion, Kangerdlugssuaq, East Greenland. Meddelelser om Grønland **105**(4), (1962 issue).

White, C.M., Geist, D.J., Frost, C.D. & Verwoerd, W.J. 1989: Petrology of the Vandfaldsdalen macrodike, Skaergaard region. Journal of Petrology **30**, 271-298.

Company reports:

Waters, B.C. 1987: Geological report, Platinova Resources Ltd. Kangerdlugssuaq concession, East Greenland.43 pp. Company report. Toronto: Platinova Resources Ltd. (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20838).

Compiler: T.F.D Nielsen.

Date: 2002-08-29.

9.4 Kraemer Ø Macrodyke

Partly roofed, layered, dyke-like, gabbro intrusion.
Minor stratabound Fe-Ti-oxide mineralisation.

Location:	68°12'00''N; 31°54'W.
Main references:	Momme (2000) and Momme & Wilson (in press, 2002).
Topographic maps:	1:250 000 KMS: 68Ø3 Kangerdlugssuaq. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat TM image:	Not available from GEUS.
Aerial photographs:	1:150 000 KMS flight line 878F, nos 1841-1843. KMS flight line 878G, nos 391-393. 1:27 000 Colour GEUS: McBirney series, nos 3315-3319.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Deer (1976), Nielsen (1978) and Momme (2000).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	N-S oriented, up to 1 km wide olivine gabbro macrodyke with strong similarities to the Skaergaard intrusion (Momme 2000) and genetic relations to Skaergaard-like dykes (Brooks *&* Nielsen, 1978). Assimilation of country rocks is common. A central gabbro pegmatite is developed along the entire 5km length of the exposed macrodyke. The gabbros are modally layered and contain leucogabbro inclusions up to 1m across.

Mineral, whole rock and trace element compositions including PGE suggests the Kraemer Ø Macrodyke to be geochemically related to the Skaergaard intrusion.

Petrography: Deer (1976) and Momme (2000).

Geochemistry: Deer (1976) and Momme (2000).

Exploration activity: Reconnaissance sampling by Platinova Resources Ltd. (Waters, 1987).

Exploration results: Minor Fe-Ti-oxide-rich stratiform layers were observed in the southern part of the macrodyke (own, observations, 1972). No other mineralisation is reported.

Comments and company recommendations: No detailed investigations have been carried out and a potential for PGE and Au mineralisation may be present. The similarities to the Skaergaard intrusion and the abundant evidence for assimilation in contact zones suggests a potential for sulphide mineralisation prompted by assimilation.

Further information: GEUS: T.F.D. Nielsen.

References:

Research papers and descriptions:

Brooks, C.K. & Nielsen, T.F.D. 1978: Early stages in the differentiation of the Skaergaard magma as revealed by a closely related suite of dyke rocks. Lithos **11**, 1-14.

Deer, W.A. 1976: Tertiary igneous rocks between Scoresby Sund and Kap Gustav Holm, East Greenland. In: Escher, A. & Watt, W.S. (eds): Geology of Greenland, 404-429. Copenhagen: Geological Survey of Greenland.

Momme, P. 2000: Flood basalt generation and differentiation: PGE-geochemistry of East Greenland flood basalts, comagmatic intrusions and comparison with Siberian flood basalts, 154 pp. Unpublished PhD Thesis, Geological Institute, Aarhus University, Denmark.

Momme, P. & Wilson, J.R. in press: The Kraemer Island macrodyke, East Greenland: solidification of a flood basalt conduit. Geological Magazine.

Company reports:

Waters, B.C. 1987: Geological report, Platinova Resources Ltd. Kangerdlugssuaq concession, East Greenland.43 pp. Company report. Toronto: Platinova Resources Ltd.

(in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20838).

Compiler: T.F.D. Nielsen.

Date: 2002-08-29.

9.5 Kraemer Ø Syenite intrusion

Layered quartz-syenite intrusion with astrophylite-bearing pegmatites.

Location: 68°12''N; 31°58'W.

Main references: Brooks & Nielsen (1982) and Brooks (1991).

Topographic maps:
1:250 000
KMS: 68Ø3 Kangerdlugssuaq.
1:100 000
GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.

Landsat image: TM path row 231-012.

Aerial photographs:
1:150 000
KMS flight line 878F, nos 1841-1843.
KMS flight line 878G, nos 391-393.
1:27 000 Colour
GEUS: McBirney series, nos 3337-3339.

Geological maps:
Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988).
Publication maps: Nielsen (1978).

Geophysical maps: None.

Hyperspectral data: None.

Geochemical maps: None.

Short description: Minor part of layered quartz syenite intrusion on the south west peninsula of Kaermers Ø. An up to 200m wide brecciated zone constitutes the contact to Precambrian host gneiss. Trains of tholeiitic basalt inclusions and cross cutting alkaline dykes (Brooks & Nielsen, 1982). The field relations suggest an age of *c.* 50 Ma (see also *"Further information"*)

Parts of the intrusion are characterised by large rafts of basaltic inclusions, probably originating from alkaline lavas or dykes. In places the quartz syenites are well layered. Late felsic dykes and pegmatites are zircon and astrophyllite-bearing.

Petrography: Minor information in Brooks & Nielsen (1982).

Geochemistry: Minor information in Brooks & Nielsen (1982).

Exploration activity: None.

Exploration results: None.

Comments and company recommendations: None.

Further information: GEUS: T.F.D. Nielsen.
Københavns Universitet: C.K. Brooks.
Århus Universitet: C. Tegner (unpublished Ar-Ar age determinations).

References:

Research papers and descriptions

Brooks, C.K.1991: The Kraemer Ø syenite, Kangerdlugssuaq: preliminary description of one of the voluminous oversaturated syenites of the East Greenland Tertiary. Bulletin of the Geological Society of Denmark **38**, 145-151.

Brooks, C.K. & Nielsen, T.F.D. 1982: The Phanerozoic development of the Kangerdlugssuaq area, East Greenland. Meddelelser om Grønland, Geoscience **9**, 30 pp.

Compiler: T.F.D. Nielsen.

Date: 2002-08-29.

9.6 Watkins Fjord Peridotite plug.

Ultramafic intrusion on the shore of Watkins Fjord.
No mineralisation is reported.

Location:	68° 14''N; 31°42'W.
Main references:	Kays & McBirney, (1982).
Topographic maps:	1:250 000 KMS: 68Ø3 Kangerdlugssuaq. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request. 1:20 000 KMS: Skærgården.
Landsat TM image:	Path row: 231-012
Aerial photographs:	1:150 000 KMS flight line 878F, nos 1843-1844. 1:27 000 Colour GEUS: McBirney series, nos 3273-3275 and 3289-3291.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: 1:20 000 (McBirney, 1989b and 1996b).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	Exposures in heavily moraine-covered low area on the south shore of Watkins Fjord. Very few details are available (Kays & McBirney, 1982) and Brooks & Nielsen (1982). In some references this intrusion has been named the Watkins Fjord picrite. In this report it is re-named to Watkins Fjord Peridotite. The known exposures only show a rather homogenous body of peridotite. The contacts have not been found.

Petrography:	Some information in Kays & McBirney (1982).
Geochemistry:	Some information in Kays & McBirney (1982). Unpublished chemical analyses by C.K. Brooks.
Exploration activity:	None.
Exploration results:	None.
Comments and company recommendations:	None.
Further information:	GEUS: T.F.D. Nielsen. University of Copenhagen: C.K. Brooks.
References:	Research papers and descriptions:

Brooks, C.K. & Nielsen, T.F.D. 1982: The Phanerozoic development of the Kangerdlugssuaq area, East Greenland. Meddelelser om Grønland, Geoscience **9**, 30 pp.

Kays, M.A. & McBirney, A.R. 1982: Origin of picritic blocks in the Marginal Border Group of the Skaergaard intrusion, East Greenland. Geochimica et Cosmochimica Acta 46, 23-30. (Watkins Fjord plug).

McBirney 1989b: Geological map of the Skaergaard intrusion, East Greenland. Eugene: University of Oregon.

McBirney, A. R. 1996b: Geological map of the Skaergaard intrusion, East Greenland. In: Cawthorn, R. G. (ed.): Layered Intrusions. Amsterdam: Elsevier.

Compiler:	T.F.D. Nielsen.
Date:	2002-08-29.

9.7 Courtauld Fjord Gabbro plug

Small gabbro plug.
No mineralisations are reported.

Location:	68°25'28''N; 32°13'15''W.
Main references:	Brooks & Nielsen (1982).
Topographic maps:	1:250 000 KMS: 68Ø3 Kangerdlugssuaq. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat image:	TM path row 231-012.
Aerial photographs:	1:150 000 KMS flight line 878G, nos 393-395. KMS line 878H, nos 780-781.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: *c.* 1:120 000 Kempe *et* al. (1970)
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	Little known, 1 km^2, gabbro exposure on the south shore of Courtauld Fjord. Another small exposure *c.* 2 km to the south.
Petrography:	None.
Geochemistry:	None.
Exploration activity:	None.
Exploration results:	None.
Comments and company	

recommendations: None.

Further information: GEUS: S. Bernstein.

References: Research papers and descriptions:

Brooks, C.K. & Nielsen, T.F.D. 1982: The Phanerozoic development of the Kangerdlugssuaq area, East Greenland. Meddelelser om Grønland, Geoscience **9**, 30 pp.

Kempe, D.R.C., Deer, W.A. & Wager, L.R. 1970: Geological investigations in East Greenland. Part VIII. The petrology of the Kangerdlugssuaq alkaline intrusion, East Greenland. Meddelelser om Grønland **190**(2), 49 pp.

Compiler: T.F.D. Nielsen.

Date: 2002-08-29.

9.8 Basistoppen Sill

Differentiated gabbro sill in the upper part of the Skaergaard intrusion. No mineralisation is recorded.

Location: 68°09'00''N; 31°39'W.

Main references: Hughes (1956), Douglas (1964) and Naslund (1989).

Topographic maps:
1:250 000
KMS: 68Ø3 Kangerdlugssuaq.
1:100 000
GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
1:20 000
KMS: Skærgården.

Landsat TM image: Not available from GEUS.

Aerial photographs: ***All Skaergaard intrusion***
1:150 000
KMS flight line 878F, nos. 1841-1844.
KMS flight line 878P, nos. 1415-1418.
1:27 000 Colour
GEUS (McBirney series), nos. 3254-3260, 3274-3280, 3285-3290, 3311-3314 and 3402-3407.

Geological maps: Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988).
Publication maps: 1:40 000: Wager & Deer (1939 and reissued 1962), 1:20 000: McBirney (1989b) and McBirney (1996b).

Geophysical maps: None.

Hyperspectral data: None.

Geochemical maps: None.

Short description: Extensively differentiated, up to 660 m thick tholeiitic gabbro sheet emplaced into the Upper Border Group of the Skaergaard intrusion. The field relations suggests the Basistoppen Sheet to be emplaced during the cooling of the Skaergaard

intrusion (Naslund, 1986) The age is suggested to be *c.* 55 Ma.

In terms of petrography and geochemistry the Basistoppen sill differs from the Skaergaard intrusion. Chills along contacts and mass balance considerations suggest the Basistoppen sheet to be less TiO_2-rich than the Skaergaard intrusion. The composition relates to low-Ti type tholeiite lavas in East Greenland, as defined by Larsen *et* al. (1989).

Petrography: Naslund (1986 and 1989).

Geochemistry: Naslund (1986 and 1989).

Exploration activity: 1986: Reconnaissance sampling and analyses by Platinova Resources Ltd. (Waters, 1987).

Exploration results: No anomalous values are recorded.

Comments and company recommendations: None.

Further information: GEUS: T.F.D. Nielsen.

References:

Research papers and descriptions:

Deer, W.A. 1976: Tertiary igneous rocks between Scoresby Sund and Kap Gustav Holm, East Greenland. In: Escher, A. & Watt, W.S. (eds): Geology of Greenland, 404-429.

Douglas, J.A.V. 1964: Geological investigations in East Greenland. Part VII. The Basistoppen sheet. A differentiated basic intrusion into the upper part of the Skaergaard complex, East Greenland. Meddeleser om Grønland **164**(5), 66 pp.

Hughes, C.J. 1956: Geological investigations in East Greenland. Part VI. A differentiated basic sill enclosed in the Skærgaard intrusion, East Greenland and related sills injecting the lavas. Meddelelser om Grønland, **137**(2), 28 pp.

McBirney, A.R. 1989b: Geological map of the Skaergaard intrusion, East Greenland. Eugene: University of Oregon.

McBirney, A. R. 1996b: Geological map of the Skaergaard intrusion, East Greenland. In: Cawthorn, R. G. (ed.): Layered Intrusions. Amsterdam: Elsevier.

Naslund, H.R. 1986: Disequilibrium partial melting and rheomorphic layer formation in the contact aureole of the Basistoppen sill, East Greenland. Contributions to Mineralogy and Petrology **93**, 359-367.

Naslund, H.R. 1989: Petrology of the Basistoppen sill, east Greenland: a calculated magma differentiation trend. Journal of Petrology **30**, 299-319.

Wager, L. R. & Deer, W. A. 1939: Geological investigations in east Greenland. Part III. The petrology of the Skaergaard intrusion, Kangerdlugssuaq, East Greenland. Meddelelser om Grønland **105**(4), (1962 issue).

Company reports:

Waters, B.C. 1987: Geological report, Platinova Resources Ltd. Kangerdlugssuaq concession, East Greenland.43 pp. Company report. Toronto: Platinova Resources Ltd. (in archives of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20838).

Compiler: T.F.D. Nielsen.

Date: 2002-08-29.

9.9 Gardiner complex

Subvolcanic melanephelintic complex with melilitolite and carbonatite. Major apatite mineralisation, immiscible REE-enriched Fe-Ti oxide breccias and veins and minor perovskite concentrations in seams.

Location:	68°37'N; 33°13'W.
Main references:	Frisch & Keusen (1978), Nielsen (1980) and Nielsen (1981).
Topographic maps:	1:250 000 KMS: 68Ø4 Kangerdlugssuaq Gletscher. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat image:	TM path row 231-012.
Aerial photographs:	1:150 000 KMS flight line 878J, nos 675-677. KMS flight line 878K, nos 1013-1015. 1:27 000 Colour GEUS: McBirney series, nos 3373-3380.
Geological maps:	Regional map: 1:500 000, sheet 13 Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Frisch & Keusen (1978) and Nielsen (1981).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	Zoned and replenished, 5 km wide, circular, melanephelinitic to melilititic subvolcanic (0.5-1 kbar) complex of very difficult access (Frisch & Keusen, 1978 and Nielsen 1980). The complex intrudes into Precambrian gneiss and the regional tholeiitic lavas. Several age determinations are given in the literature. They give an age of *c.* 50 Ma. The contact to the basement is chilled, e.g. Gleadow & Brooks, 1979. More recent age de

terminations (unpublished) suggests slightly older ages, i.e, 54 Ma (see *"Further information").*

The oldest and dominating sequence of rings of ultramafic cumulates were formed by repeated influxes of melanephelinitic melt (Nielsen, 1981) in the open subvolcanic magma chamber. The ultramafics are during the waning stages of the magmatism intruded by: 1) a suite of nephelinitic to phonolitic dykes (Frisch & Keusen, 1978, Nielsen, 1979 and Nielsen 1994) and 2) late melilititic melt forming an up 400 m wide ring dike and a sparsely exposed central unit of melilitolite (plutonic melilite-rich rock (Nielsen, 1980 and Nielsen, 1994).

To the melilitolites are related peralkaline nephelinitic to phonolitic and carbonatitic dykes (Nielsen, 1980 and Nielsen *et* al, 1999). The melitolites includes a zone of marked magmatic layering, composed of alternating layers of melilitite–rich and perovskite-rich litholigies. Metasomatic alteration is extensive along contacts to melilitolites resulting in the formation of wide zones of glimmerite.

Late irregular veins and dike-like bodies in the form of a major ring dike structure are composed of apatite-rich rocks (up to 90%, vol.) and believed formed by immiscible separation of apatite liquid and related Fe-oxide liquid.

Petrography: Frisch & Keusen (1978), Nielsen (1979, 1980, 1981).

Geochemistry: Frisch & Keusen (1978), Nielsen (1979, 1980, 1981, 1993), Nielsen *et* al. (1999).

Exploration activity ***1971***: Exploration by Nordisk Mineselskab A/S (Frisch & Keusen, 1973).
1986: Reconnaissance by Platinova Resources Ltd. (Waters, 1987).

Exploration results: No detailed estimate of possible resources of apatite and other commodities have been attempted due to the extremely difficult logistics and weather conditions. The apatite resource is undoubtedly large. All other mineralisations are limited. No Cu-mineralisation (i.e., Palabora type) has been observed. Sulphide mineralisation is limited to late felsic dykes.

Comments and company recommendations: No exploration is proposed due to the very difficult access between major crevassed glaciers, the distance to tide water,

the extreme ice conditions in inner Kangerdlugssuaq Fjord and the extreme weather conditions on the Gardiner Plateau.

Further information: GEUS: T.F.D. Nielsen.
Århus Universitet: C. Tegner (unpublished Ar-Ar age determinations).

References:

Research papers and descriptions:

Frisch, W. & Keusen, H. 1975: Eine neue ultramafitische-alkalische Intrusion in Ost-Grönland. Schweizerische Mineralogische und petrographische Mitteilungen **55**, 132-136.

Frisch, W. & Keusen, H. 1978: Gardiner intrusion, an ultramafic complex at Kangerdlugssuaq, East Greenland. Grønlands Geologiske Undersøgelse Bulletin **122**, 62 pp.

Nielsen, T.F.D. 1980: The petrology of a melilitolite, melteigite, carbonatite and syenite ring dike system, in the Gardiner complex, East Greenland. Lithos **13**, 181-197.

Nielsen, T.F.D. 1981: The ultramafic cumulate series, Gardiner complex, East Greenland. Cumulates in a shallow level magma chamber of a nephelinitic volcano. Contributions to Mineralogy and Petrology **76**, 60-72.

Nielsen, T.F.D. 1994: Alkaline dike swarms of the Gardiner complex and the origin of ultramafic alkaline complexes. Geochemistry International **31**(3), 37-56.

Company reports:

Frisch, W. & Keusen, H. 1973: Gardiner intrusion, a new ultramafic/alkaline complex at Kangerdlugssuaq, East Greenland, 57 pp. Internal report: Nordisk Mineselskab A/S (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20655).

Waters, B.C. 1987: Geological report, Platinova Resources Ltd. Kangerdlugssuaq concession, East Greenland.43 pp. Company report. Toronto: Platinova Resources Ltd. (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20838).

Compiler: T.F.D. Nielsen.

Date: 2002-08-29.

9.10 Kælvegletscher ultramafic intrusion

Little-known ultramafic intrusion.
Minor supergene nickel mineralisation.

Location: 68°23'20''N; 32°28'W.

Main references: Prægel & Holm (2001).

Topographic maps:
1:250 000
KMS: 68Ø3 Kangerdlugssuaq.
1:100 000
GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
1:20 000
GEUS archives: covers the area between 68°18'N to 68°24'N and 32°12'W to 32°30'W (by P.M. Holm, 1987).

Landsat image: TM path row 231-012.

Aerial photographs:
1:150 000
KMS flight line 878G, nos 391-393.
KMS flight line 878H, nos 421-423 (alternative: 781-783).
1:50 000
KMS flight line 861L, nos 7061-7064.
KMS flight line 861M, nos 7057-7059.
1:27.000 Colour
GEUS: McBirney series, nos. 3363-3364.

Geological maps:
Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988).
Publication maps: *c.* 1:120 000 (Kempe *et* al. 1970).

Geophysical maps: None.

Hyperspectral data: None.

Geochemical maps: None.

Short description: The Kælvegletscher ultramafic intrusion is a little-known ultramafic body exposed along the heavily glaciated western shore of inner Kangerlusuaq Fjord, just north of the Kærven Syenite Intrusion. Prægel & Holm (1991, 1992 & 2001) de

scribe the intrusion as mainly composed of dunite wehrlite. Prægel & Holm describe a possible feeder to the complex. A K-Ar age of 55 +/- 2 Ma is quoted in Brooks & Nielsen (1982).

Two small mafic to ultramafic plugs are located just north of the Kælvegletscher (Kempe et al., 1970).

Petrography: Prægel & Holm (2001).

Geochemistry: Prægel & Holm (2001).

Exploration activity: ***1970:*** Minor reconnaissance by Nordisk Mineselskab A/S (Vohryzka & Vohryzka, 1971).
1987: Reconnaissance investigations by Platinova Resources Ltd. (Goodwin & Turner, 1988).

Exploration results: Minor surface exposures with secondary Ni mineralisation (Vohryzka & Vohryzka, 1971).

Comments and company recommendations: No recommendations are given.

Further information: GEUS: B. Thomassen and T.F.D. Nielsen.
University of Copenhagen: P.M. Holm and C.K. Brooks.

References:

Research papers and descriptions:

Kempe, D.R.C., Deer, W.A. & Wager, L.R. 1970: Geological investigations in East Greenland. Part VIII. The petrology of the Kangerdlugssuaq alkaline intrusion, East Greenland. Meddelelser om Grønland **190**(2), 49 pp.

Prægel, N.-O. & Holm, P.M. 1991: Ultramafic intrusions in the Kærven / Kælvegletscher area. In: Brooks, C.K. & Stærmose, T. (eds): Kangerdlugssuaq studies. Processes at a rifted continental margin [II], 21-23. Internal report. Copenhagen: Geologisk Centralinstitut.

Prægel, N.-O. & Holm, P.M. 1992: Preliminary data on the mineral chemistry of the Kælvegletscher ultramafic complex, East Greenland. In: Brooks, C.K., Hoch, E. & Brantsen, A.K. (eds): Kangerdlugssuaq studies. Processes at a rifted continental margin III, 94-96. Internal report. Copenhagen: Geological Museum.

Prægel, N.-O. & Holm, P.M. 2001: Replenishment episodes and crustal contamination in the development of an early Tertiary magma chamber, East Greenland: evidence from layered cumulates of the Kælvegletscher ultramafic complex. Mineralogy and Petrology **73**, 279-304.

Company reports:

Goodwin, J.A. & Turner, P.A. 1988: East Greenland Kangerdlugssuaq Concession, Summary report of 1987 program, 43 pp. Toronto: Platinova Resources Ltd. (in archives of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20844).

Vohryzka, K. & Vohryzka, E. 1971: Bericht über die Prospektion im Jahr 1970 im Gebiet des Kangerdlugsaukfjordes, Ostgrönland, 68^{o} nl. Breite, 47 pp. Internal report: Nordisk Mineselskab A/S (in archive of Danmark og Grønlands Geologiske Undersøgelse, GRF no. 20906).

Compiler: T.F.D. Nielsen.

Date: 2002-08-29.

9.11 Kærven Gabbro intrusion

Layered gabbro intrusion. Only partially preserved due to later syenite intrusions. No significant mineralisation is reported.

Location:	68°21'00''N; 32°20'W.
Main references:	Ohja (1966), Deer (1976) and Breddam (1995).
Topographic maps:	1:250 000 KMS: 68Ø3 Kangerdlugssuaq. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request. 1:25 000 GEUS archives: Orthophoto map produced by Geodætisk Institut (KMS) 1982. 1:20 000 GEUS archives: covers the area between 68°18'N to 68°24'N and 32°12'W to 32°30'W (by P.M. Holm, 1987).
Landsat image:	TM path row 231-012.
Aerial photographs:	1:150 000 KMS flight line 878G, nos 391-393. KMS flight line 878H, nos 421-423 (alternative, 781-783). 1:50 000 KMS flight line 861M, nos 7057-7059. KMS flight line 861N, nos 6926-6928. 1:27 000 Colour GEUS: McBirney series, nos 3360-3363.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Ohja (1966), Holm *et* al. (1991) and Breddam (1995).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.

Short description:

The Kærven gabbro forms a crescent shaped exposure of layered gabbro. The present exposure is *c.* 1 km wide and can be followed *c.* 8 km along the eastern contact of the Kærven Syenite complex. The gabbro is older than the Kærven Syenite intrusion. An age of *c.* 58 Ma is suggested by Holm (1991), but more recent Ar-Ar dating suggests a yonger maximum age (see *"Further information"*).

The gabbros are well-layered and originally described as part of a large intrusion. Breddam (1995) re-investigated the gabbros and found that they represent a sheet like structure formed by repeated injection of magma and not part of a classic layered intrusion.

More detailed descriptions are given in Ohja (1966) and Breddam (1995). A summary by Deer (1976) predates the new observations in Breddam (1995).

Petrography:

Ohja (1966) and Breddam (1995).

Geochemistry:

Ohja (1966) and Breddam (1995).

Exploration activity:

1986: Reconnaissance by Platinova Resources Ltd. (Waters, 1987).

Exploration results:

No significant mineralisation or anomalous have been observed.

Comments and company recommendations:

Waters (1987) suggest No further investigations.

Further information:

Dansk Lithosfærecenter (DLC): K. Breddam
Københavns Universitet: P.M. Holm.
Århus Universitet: C. Tegner (unpublished Ar-Ar age determinations).

References:

Research papers and descriptions:

Breddam, K. 1995: Kærven Gabbro Kompleks: "Et Tertiært intrusivt bjergartskompleks Kangerlussuaqområdet, Østgrønland". Unpublished M.Sc. dissertation. Københavns Universitet.

Deer, W.A. 1976: Tertiary igneous rocks between Scoresby Sund and Kap Gustav Holm, East Greenland. In: Escher, A. & Watt, W.S. (eds): Geology of Greenland, 404-429. Copenhagen: Grønlands Geologiske Undersøgelse.

Holm, P.M. 1991: Radiometric age determinations in the Kærven area, Kangerdlugssuaq, East Greenland Tertiary ig

neous Province: 40Ar/38Ar, K/Ar and Rb/Sr isotopic results. Bulletin of the Geological Society of Denmark 38, 183-201.

Holm, P.M., Prægel, N.-O. & Egebjerg, E.D. 1991: Multiple syenite intrusions at Kærven, Kangerdlugssuaq, East Greenland: Evidence from the 1986 fieldwork. Bulletin of the Geological Society of Denmark **38**, 173-181.

Ohja, D.N. 1966: Petrology of the Kærven layered intrusion, east Greenland. Journal of the Geochemical Society of India **1**, 86-112.

Exploration and company reports:

Waters, B.C. 1987: Geological report, Platinova Resources Ltd. Kangerdlugssuaq concession, East Greenland.43 pp. Company report. Toronto: Platinova Resources Ltd. (in archives of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20838).

Compiler: T.F.D. Nielsen.

Date: 2002-10-04.

9.12 Kærven Syenite complex

Syenite and quartz syenite satellite complex of the Kangerdlugssuaq Alkaline Intrusion.
No mineralisation is reported.

Location:	68°20N; 32°23'W.
Main references:	Deer & Kempe (1976), Holm & Prægel (1988) and Holm *et* al. (1991).
Topographic maps:	1:250 000 KMS: 68Ø3 Kangerdlugssuaq. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request. 1:25 000 GEUS archive: Orthophoto map by Geodætisk Institut (KMS) 1982. 1:20 000 GEUS archive: covers the area between 68°18'N to 68°24'N and 32°12'W to 32°30'W (by P.M. Holm, 1987).
Landsat image:	TM path row 231-012.
Aerial photographs:	1:150 000 KMS flight line 878G, nos 391-393. KMS flight line 878H, nos 421-423 (alternative: 781-783). 1:50 000 KMS flight line 861M, nos 7057-7059. KMS flight line 861N, nos 6926-6928. 1:27 000 Colour GEUS (McBirney series), nos 3360-3362.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Kempe *et* al. (1970) and Holm *et* al. (1991).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.

Short description: The Kærven syenite complex (previously also named the Kærven syenite intrusion) is composed of a series of partially concentric units of syenites and granites (Holm & Prægel, 1988 and Holm *et* al. 1991). The exposure of the complex is *c.* 3 km N-S and 2 km E-W. Dykes originating from the Kærven syenite complex intrudes the Kærven gabbro intrusion exposed along the eastern contact of the Kærven syenites. The Kærven syenites and granites are in turn intruded by the nordmarkites of the Kangerdlugssuaq Alkaline intrusion.

Holm (1991) gives ages between 58 and 50 Ma.

Petrography: Deer & Kempe (1976) and Holm & Prægel (1988).

Geochemistry: Holm & Prægel (1988) and Nielsen (1989).

Exploration activity: None.

Exploration results: None.

Comments and company recommendations: None.

Further information: Københavns Universitet: P.M. Holm.

References:

Research papers and descriptions:

Deer, W.A. & Kempe, D.R.C. 1976: Geological investigations in East Greenland. Part XI. The minor peripheral intrusions, Kangerdlugssuaq, East Greenland. Meddelelser om Grønland **197**(4), 25 pp.

Holm, P.M. 1991: Radiometric age determinations in the Kærven area, Kangerdlugssuaq, East Greenland Tertiary igneous Province: 40Ar/38Ar, K/Ar and Rb/Sr isotopic results. Bulletin of the Geological Society of Denmark 38, 183-201.

Holm, P.M. & Prægel, N.-O. 1988: The Tertiary Kærven syenite complex, Kangerdlugssuaq, East Greenland: mineral chemistry and geochemistry. Mineralogical Magazine **52**, 435-450.

Holm, P.M. & Prægel, N.-O. 1989: Reply to comments by T.F.D.Nielsen on 'The Tertiary Kærven syenite complex, Kangerdlugssuaq, East Greenland: mineral chemistry and geochemistry'. Mineralogical Magazine **53**, 647-651.

Nielsen, T.F.D. 1989: Comments on 'The Tertiary Kærven syenite complex, Kangerdlugssuaq, East Greenland: mineral chemistry and geochemistry' by P.M.Holm and N.-O.Prægel. Mineralogical Magazine **53**, 642-646.

Wager, L.R. 1965: The form and internal structure of the alkaline Kangerdlugssuaq intrusion, East Greenland. Mineralogical Magagazine **34**, 487-497.

Company reports:

Goodwin, J.A. & Turner, P.A. 1988: East Greenland Kangerdlugssuaq Concession, Summary report of 1987 program, 43 pp. Toronto: Platinova Resources Ltd. (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20844).

Compiler: T.F.D. Nielsen.

Date: 2002-10-30.

9.13 Kangerdlugssuaq Alkaline Intrusion

Large, zoned, syenite complex. The complex is c. 33 km across and zoned from oversaturated, quartz-nordmakites to central, undersaturated foyaites.
Extensive areas of epithermal gold, silver and base metal vein mineralisation.

Location: 68°16'N; 32°43'W.

Main references: Wager (1965), Kempe & Deer (1970 and 1976), Kempe *et* al. (1970) Pankhurst *et* al. (1976) and Brooks & Gill (1982).

Topographic maps:

1:250 000
KMS: 68Ø3 Kangerdlugssuaq.
KMS: 68Ø4 Kangerdlugssuaq Gletscher.

1:100 000
GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.

1:20 000
GEUS archives: covers the area between 68°18'N to 68°24'N and 32°12'W to 32°30'W (by P.M. Holm, 1987).

1:10 000
GEUS archives: Southeast part of Kangerdlugssuaq Alkaline Intrusion, including Bagnæsset (9.17) and Flammefjeld (9.18). The map is also compiled in 1:25 000.

Landsat image: TM path row 231-012.

Aerial photographs:

1:150 000
KMS flight line 878G, nos 388-392.
KMS flight line 878H, nos 421-428 (alternatively nos. 781-787).
KMS flight line 878J, nos 671-677.

1:50 000
KMS flight line 861J, nos 7205-7214.
KMS flight line 861K, nos 7188-7201.
KMS flight line 861L, nos 7061-7073.
KMS flight line 861M, nos 7048-7059.
KMS flight line 861N, nos 6926-6934.
KMS flight line 861O, nos 6916-6922.

1:27 000 Colour
GEUS: McBirney series, nos 3356-3360 and 3387-2294 (only partial coverage).

Geological maps: Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988).
Publication maps*:* Wager (1965), Kempe *et* al. (1970) and Kempe & Deer (1970).

Geophysical maps: None.

Hyperspectral data: None.

Geochemical maps: No map compilation is available, but reconnaissance chemistry on sediments samples and heavy mineral concentrates is reported in reports from GEUS, Nordisk Mineselskab A/S and Platinova Resources Ltd.

Short description: Roughly circular, zoned syenite intrusion emplaced into Precambrian basement and earlier, and possibly, related satellite intrusions (see introduction to Kangerlussuaq area, 9.0). The Kangerdlugssuaq Alkaline Intrusion is *c.* 33 km in diameter and covers an area of *c.* 800 km^2. Contacts are steep or outward dipping (Wager, 1965). The age of the intrusion is ca. 50 Ma. (Pankhurst *et* al., 1976).

The outer and dominating zone (90%) of the intrusion is composed of quartz-bearing syenites (nordmarkites). They are followed by zones of quartz-free syenites (pulaskites). The core (<1%by volume) is composed of undersaturated nepheline- and sodalite-bearing foyaites. Late veins carry a variety of REE-bearing, accessory phases, e.g., at the head of Amdrup Fjord.

The main structure of the intrusion is described by Wager (1965), the mineralogy and petrology in Kempe *et* al. (1970) and Deer & Kempe (1976). Pankhurst *et* al. (1976) suggest fluid transport to be responsible for the formation of undersaturated paragenesis, whereas Brooks & Gill (1982) ascribe the zonation in the intrusion to contamination of undersaturated magma by Precambrian gneiss. In some areas (Atrophyllite Bay) syenites compositions seems formed by partial melting of basement and diffusion re-equilibration to alkaline basaltic melts (Nielsen & Brooks, 1991).

Petrography: Kempe *et* al. (1970), Kempe & Deer (1970) and Brooks & Gill (1982).

Geochemistry: Kempe *et* al. (1970) and Kempe & Deer (1976).

Exploration activity:

1970-1971: Nordisk Mineselskab A/S investigated the Kangerdlugssuaq Complex (see introduction to the Kangerlussuaq area, data sheet 9.0) for the occurrence of porphyry-molydenum mineralisation and Nb-REE mineralisations (Brooks, 1971, 1972; see also Thomassen & Krebs, 2001b for further references).

1981*:* Reconnaissance and find of stockwork molybdenum mineralisation by C.K. Brooks, University of Copenhagen.

1982: Based on finds in 1981 Nordisk Mineselskab A/S investigated the Flammefjeld diatreme (Geyti & Thomassen, 1983 and 1984) (See Flammefjeld, data sheet 9.18).

1986: Geological Survey of Greenland investigations of Flammefjeld and its surroundings (Brooks *et* al., 1987; Stenstrop, 1987).

1986-1988: Investigations of selected areas in the Kangerdlugssuaq complex by Platinova Resources Ltd. (Waters, 1987; Goodwin & Turner, 1988 and Turner & Mosher, 1989).

2000: Investigations by GEUS (Thomassen & Krebs, 2001a and 2001b)

Exploration results:

Nb-REE mineralisation:

Nb-REE-bearing late veins were located in the inner Amdrup Fjord (Vohryzka & Vohryzka, 1971). No mineralisation of any significance has been observed.

Gold, silver and base metal veins:

The occurrence of epithermal gold, silver and base metal veins are review by Thomassen & Krebs (2001b) and include (quote):

1) Pyrite-bearing, often aurifeous veins with widths in the cm-dm range,

2) Galena-sphalerite-pyrite-bearing veins enriched in silver that may reach thicknesses of 30 m and strike lengths of several hundred metres,

3) Chalcopyrite-tethahedrite-tennatite-pyrite +/- galena +/- sphalerite-bearing veins.

Type (2) veins are most common.

Individual grab samples have up to 38 g/t Au and the 2 chip lines run *c.* 1 g/t Au over 2 and 5 m, respectively. Most samples have elevated silver contents with 8% of the samples showing >200 ppm Ag. Concentrations of >1000 ppm Ag have been observed. Examples of chip line data are: 157 ppm Ag over 10 m and 531 ppm Ag over 2 m.

Galena-rich veins of considerable lateral extend have shown up to: 10.2% Pb over 10m, 4.6% Zn over 4m and 1.5% Cu over 5m.

Porphyry type molybdenum mineralisation:
See Flammefjeld, data sheet 9.18.

Several mineralised samples from the area have been presented to the Ujarassiorit program (Dunnells, 1995).

Comments and company recommendations:

Thomassen & Krebs (2001) give the following recommendation (quote):

The vein-type mineralisation, which was encountered, is unlikely to yield economic base metal deposits, but it does have a potential for gold and silver.

Based on this and the data in the mentioned reports further investigations of the larger vein-type mineralisation are recommended.

Recommendations regarding the Flammefjeld (data sheet 9.18) porphyry-molybdenum potential and the Cirque 1320 (data sheet 9.19) subvolcanic complex see relevant sections in this report.

Further information:

GEUS: B. Thomassen and T.F.D. Nielsen.
University of Copenhagen: C.K. Brooks.

References:

Research papers:

Brooks, C.K. & Gill, R.C.O. 1982: Compositional variation in the pyroxenes and amphiboles of the Kangerdlugssuaq intrusion, East Greenland: further evidence for crustal contamination of syenite magma. Mineralogical Magazine 45, 1–9.

Geyti, A. & Thomassen, B.1984: Molybdenum and precious metal mineralization at Flammefjeld, Southeast Greenland. Economic Geology **79**, 1921-1929.

Kempe, D.R.C. & Deer, W.A. 1970: Geological investigations in East Greenland. Part IX. The mineralogy of the Kangerdlugssuaq alkaline intrusion. Meddelelser om Grønland **190**(3), 95 pp.

Kempe, D.R.C. & Deer, W.A. 1976: The petrogenesis of the Kangerdlugssuaq alkaline Kangerdlugssuaq intrusion, east Greenland. Lithos **9**, 111-123.

Kempe, D.R.C., Deer, W.A. & Wager, L.R. 1970: Geological investigations in East Greenland. Part VIII. The petrology of the Kangerdlugssuaq alkaline intrusion, East Greenland. Meddelelser om Grønland **190**(2), 49 pp.

Nielsen, T.F.D. & Brooks, C.K. 1991: Generation of nordmarkitic melts by melting of basement gneisses: the Astrophyllite Bay complex, Kangerdlugssuaq. Bulletin of the Geological Society of Denmark 38, 161-164.

Pankhurst, R.J., Beckinsale, R.D. & Brooks, C.K. 1976: Strontium and oxygen isotope evidence relating to the petrogenesis of the Kangerdlugssuaq alkaline intrusion, east Greenland. Contributions to Mineralogy and Petrology **54**, 17-42.

Thomassen, B. & Krebs, J.D 2001a: Reconnaissance for noble metals in Precambrian and Palaeogene rocks, Amdrup Fjord, southern East Greenland. Geology of Greenland Survey Bulletin **189**, 76-82.

Thomassen, B. & Krebs, J.D. 2001b: Palaeogene gold- and silver-bearing epithermal veins at Amdrup Fjord, southern East Greenland. Danmarks og Grønlands Geologiske Undersøgelse rapport **2001/133,** 26 pp.

Wager, L.R. 1965: The form and internal structure of the alkaline Kangerdlugssuaq intrusion, East Greenland. Mineralogical Magagazine **34**, 487-497.

Company reports:

Brooks, C.K. 1971: Report covering the prospecting activities of Group 5 during the summer of 1970 in the area of Kangerdlugssuaq, East Greenland, ca. 68^{o} north latitude, 29 pp. Unpublished NM-Report. Copenhagen: Nordisk Mineselskab A/S (archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20903).

Brooks, C.K. 1972: Report on the prospecting of Group 5 in the Southern Concession Area (Kangerdlugssuaq), 35 pp. Unpublished NM-Report. Copenhagen: Nordisk Mineselskab A/S (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20907).

Dunnells, D. 1995: Ujarassiorit: 1989 to 1994. A summary report of years 1-6, 41 pp. Unpublished company report. Nuuk: Nuna Oil A/S (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 201421).

Geyti, A. & Thomassen, B. 1983: Exploration for molybdenum and precious metals at Flammefjeld, South-East Greenland. 51 pp.

Unpublished NM-Report. Copenhagen: Nordisk Mineselskab A/S (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20774).

Goodwin, J.A. & Turner, P.A. 1988: East Greenland Kangerdlugssuaq Concession, Summary report of 1987 program, 43 pp. Toronto: Platinova Resources Ltd. (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20844).

Polegeg, S. & Köck, H. 1972: Montangeologischer Bericht Nordmine 1971. Prospektion am Nordufer der Amdrup Fjords und NW von Batbjerg (Inner Kangerdlugssuaq), 23 pp. Internal report. København: Nordisk Mineselskab A/S (in archives of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20760).

Stenstrop, G. 1987: New field investigations of the porphyry and vein-type mineralizations at Flammefjeld, southern East Greenland, 37 pp. Unpublished Report. Copenhagen: Danmarks og Grønlands Geologiske Undersøgelse.

Turner, P.A. & Mosher, G.W. 1989: Report of the 1988 field season, Skærgaard concession and East Greenland prospecting license, 71 pp. Company report. Toronto: Platinova Resources Ltd. (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF. no. 20845).

Vohryzka, K. & Vohryzka, E. 1971: Bericht über die Prospektion im Jahr 1970 im Gebiet des Kangerdlugsuakfjordes, Ostgrönland, 68° nl. Breite, 47 pp. Internal report. København: Nordisk Mineselskab A/S (in archive of Danmark og Grønlands Geologiske Undersøgelse, GRF no. 20906).

Waters, B.C. 1987: Geological report, Platinova Resources Ltd. Kangerdlugssuaq concession, East Greenland.43 pp. Company report. Toronto: Platinova Resources Ltd. (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20838).

Compiler: T.F.D. Nielsen.

Date: 2001-10-04.

9.14 Peak 2005 Syenite intrusion

Little known, dark, syenite engulfed by the Kangerdlugssuaq Alkaline intrusion.

Location:	68°21'00''N; 32°45'W.
Main references:	Wager (1965), Kempe *et* al. (1970) and Deer & Kempe (1976).
Topographic maps:	1:250 000 KMS: 68Ø4 Kangerdlugssuaq Gletscher. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request. 1:20 000 GEUS archives: covers the area between 68°18'N to 68°24'N and 32°12'W to 32°30'W (by P.M. Holm, 1987).
Landsat image:	TM path row 231-012.
Aerial photographs:	1:150 000 KMS flight line 878H, nos 424-427 (alternatively, nos. 783-786). 1:50 000 KMS flight line 861K, nos 7193-7200. KMS flight line 861L, nos 7063-7069.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Wager (1965), Kempe *et* al. (1970) and Deer & Kempe (1976).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	The Peak 2005 Syenite consists of two areas of dark coloured syenite in the north-central parts of the Kangerdlugssuaq Alkaline intrusion (Wager, 1965). These syenites are believed to pre-date the Kangerdlugssuaq Akaline Intrusion nordmarkites, but field information is very restricted. The larger exposure is

up to 10 km E-W and 2 km N-S and a smaller exposure *c.* 5km by 1km. No further information is available.

A restricted number of grab samples from these syenites are described by Deer & Kempe (1976). They compare the syenite to the pulaskites of the Kangerdlugssuaq Alkaline Intrusion.

Petrography: Deer & Kempe (1976).

Geochemistry: Deer & Kempe (1976).

Exploration activity: None.

Exploration results: None.

Comments and company recommendations: None.

Further information: GEUS

References: Research papers and descriptions:

Deer, W.A. & Kempe, D.R.C. 1976: Geological investigations in East Greenland. Part XI. The minor peripheral intrusions, Kangerdlugssuaq, East Greenland. Meddelelser om Grønland **197**(4), 25 pp.

Kempe, D.R.C., Deer, W.A. & Wager, L.R. 1970: Geological investigations in East Greenland. Part VIII. The petrology of the Kangerdlugssuaq alkaline intrusion, East Greenland. Meddelelser om Grønland **190**(2), 49 pp.

Wager, L.R. 1965: The form and internal structure of the alkaline Kangerdlugssuaq intrusion, East Greenland. Mineralogical Magagazine **34**, 487-497.

Compiler: T.F.D. Nielsen

Date: 2002-10-04

9.15 (Kangerdlugssuaq) Augite Syenite intrusion

Heterogeneous, little known, syenite intrusion at the western contact of Kangerdlugssuaq Alkaline Intrusion.

Location:	68°16'N; 33°03'W
Main references:	Wager (1965) and Deer & Kempe (1976).
Topographic maps:	1:250 000 KMS: 68Ø4 Kangerdlugssuaq Gletscher. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat image:	TM path row 231-012.
Aerial photographs:	1:150 000 KMS flight line 878H, nos 425-428 (alternatively, nos. 785-788). 1:50 000 KMS flight line 861J, nos 7209-7215. KMS flight line 861K, nos 7187-7190. KMS flight line 861L, nos 7071-7072. KMS flight line 861M, nos 7049-7051.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Wager (1965), Kempe *et* al. (1970) and Deer & Kempe (1976).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	The Kangerdlugssuaq Augite Syenite intrusion is a heterogeneous syenite body at the western contact of the Kangerdlugssuaq Alkaline Intrusion. The restricted exposures in this area dominated by glaciers suggest the syenite body to be arc-shaped and *c.* 17 km long and up to 4 km wide (Wager, 1965).

Investigations are limited to the study of a number of grab samples (Deer & Kempe, 1976). These authors ascribe the heterogeneity of the syenites to extensive reaction between large proportions of basaltic inclusions and syenitic magma. The suite of samples includes olivine gabbro, monzonite and a variety of syenites. The ferromagnesian paragenesis is dominated by amphiboles, of which many are formed by re-crystalisation of pyroxene.

No mineralisations have been observed.

Petrography: Deer & Kempe (1976).

Geochemistry: Deer & Kempe (1976).

Exploration activity: None.

Exploration results: None.

Comments and company recommendations: None.

Further information: Københavns Universitet: C.K. Brooks.

References:

Research papers and descriptions:

Deer, W.A. & Kempe, D.R.C. 1976: Geological investigations in East Greenland. Part XI. The minor peripheral intrusions, Kangerdlugssuaq, East Greenland. Meddelelser om Grønland **197**(4), 25 pp.

Kempe, D.R.C., Deer, W.A. & Wager, L.R. 1970: Geological investigations in East Greenland. Part VIII. The petrology of the Kangerdlugssuaq alkaline intrusion, East Greenland. Meddelelser om Grønland **190**(2), 49 pp.

Wager, L.R. 1965: The form and internal structure of the alkaline Kangerdlugssuaq intrusion, East Greenland. Mineralogical Magagazine **34**, 487-497.

Compiler: T.F.D. Nielsen.

Date: 2002-10-04.

9.16 Snout Series complex

Complex quartz syenite and granite intrusion area at the eastern margin of the Kangerdlugssuaq Alkaline Intrusion.
Areas of hydrothermal and veins of precious and base metals.

Location:	68°17'N; 32°17'W.
Main references:	Wager (1965), Deer & Kempe (1976).
Topographic maps:	1:250 000 KMS: 68Ø3 Kangerdlugssuaq. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000,1:500 000 and 1:1 000 000 and other scales on request. 1:20 000 GEUS archive: covers the area between 68°18'N to 68°24'N and 32°12'W to 32°30'W (by P.M. Holm, 1987).
Landsat image:	TM path row 231-012.
Aerial photographs:	1:150 000 KMS flight line 878G, nos 390-392. 1:50 000 KMS flight line 861M, nos 7056-7058. KMS flight line 861N, nos 6927-6929. 1:27 000 colour GEUS: McBirney series, nos 3356-3360.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Wager (1965), Kempe & Deer (1970), Kempe *et* al. (1970) and Deer and Kempe (1976).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	The Snout Series is a complex, mainly felsic, area of intrusive bodies exposed over more than 15 km from the south shore of Amdrup Fjord to Nordre Syenit Geltscher along the eastern

margin of the Kangerdlugssuaq Alkaline Intrusion (Kempe *et* al, 1970). The area mapped as the Snout Series is up to 4km wide.

There is some uncertainty about the age of Snout Series. In the descriptions by L.R. Wager and colleagues (e.g., Wager, 1965 and Kempe *et* al., 1970) the Snout Series are described at younger than the Kangerdlugssuaq Alkaline Intrusion. This seems supported by fission-track ages of 50-47 Ma. (Gleadow & Brooks, 1979). This is, however, in conflict with the field observation of chilled contacts of Kangerdlugssuaq Alkaline Intrusion nordmarkite to lithologies of the Snout Series along the eastern contact of the Kangerdlugssuaq Alkaline intrusion (Dahlstrøm, 1989 and Pedersen, 1989 and own observations). These conflicting observations may be due to a long and complicated evolution of the area assigned to the Snout Series.

The investigated areas of Snout Series are very complex and composed of many small intrusive bodies of tackybasaltic, dioritic, granodioritic, monzonitic, syenitic and granitic composition. Many of the lithologies are phenocryst-rich. In many respects the Snout Series appear composed of the same components that build the Astrophyllite Bay Complex (Nielsen & Brooks, 1991), which could suggest that the entire eastern margin of Kangerdlugssuaq Alkaline intrusion is emplace into this melange of basic to felsic lithologies, some older and some younger than the Kangerdlugssuaq Alkaline Intrusion.

Field relations, petrography and geochemistry of parts of Snout Series is described in M.Sc. thesis by Pedersen (1989).

Petrography: Deer & Kempe (1976). Additional description in M.Sc. theses by Dahlstrøm (1989) and Petersen (1989).

Geochemistry: Deer & Kempe (1976). Additional analyses in M.Sc. thesis by Dahlstrøm (1989) and Petersen (1989).

Exploration activity: ***1970-1971***: Nordisk Mineselskab A/S (Brooks, 1971**;** Vohryzka & Vohryzka, 1971 and Polegeg & Köck, 1972). Reconnaissance.
1982: Nordisk Mineselskab A/S (Geyti & Thomassen, 1983).
1986: Platinova Resources Ltd. (Waters, 1987). Reconnaissance.
1987: Platinova Resources Ltd. (Goodwin & Turner, 1988). Reconnaissance.

Exploration results: Precious- and base metal veins occur throughout the region. They are described in more detail in the data sheet on the Kangerdlugssuaq Alkaline Intrusion, 9.13.

Comments and company recommendations: See data sheet on the Kangerdlugssuaq Alkaline Intrusion, 9.13.

Further information: GEUS: T.F.D. Nielsen.
Københavns Universitet: C.K. Brooks.

References:

Research papers and descriptions:

Brooks, C.K., Schønwandt, H.K. & Stenstrop, G. 1987: Reconnaissance for economic minerals in the Kangerdlugssuaq area, East Greenland. Rapport Grønlands Geologiske Undersøgelse **135**, 66-68.

Dalstrøm, K. 1989: Feltgeologisk og Petrologisk detaljestudie af Søndre Syenit Gletscher Granit Kompleks (SSGG) i Snout Series, Kangerdlugssuaq, Østgrønland. MSc. Thesis. Københavns Universitet, **163** pp.

Deer, W.A. & Kempe, D.R.C. 1976: Geological investigations in East Greenland. Part XI. The minor peripheral intrusions, Kangerdlugssuaq, East Greenland. Meddelelser om Grønland **197**(4), 25 pp.

Geyti, A. & Thomassen, B.1984: Molybdenum and precious metal mineralization at Flammefjeld, Southeast Greenland. Economic Geology **79**, 1921-1929.

Nielsen, T.F.D. & Brooks, C.K. 1991: Generation of nordmarkitic melts by melting of basement gneisses: the Astrophyllite Bay complex, Kangerdlugssuaq. Bulletin of the Geological Society of Denmark **38**, 161-164.

Pedersen, M. 1989. Dannelse af Snout Series og nærliggende magmatiske bjergarter, Kangerdlugssuaq, Østgrønland. MSc. Thesis, Københavns Universitet, 66 pp plus appendices.

Thomassen, B. & Krebs, J.D. 2001a: Reconnaissance for noble metals in Precambrian and Palaeogene rocks, Amdrup Fjord, southern East Greenland. Geology of Greenland Survey Bulletin **189**, 76-82.

Wager, L.R. 1965: The form and internal structure of the alkaline Kangerdlugssuaq intrusion, East Greenland. Mineralogical Magagazine **34**, 487-497.

Exploration and company reports:

Brooks, C.K. 1971: Report covering the prospecting activities of Group 5 during the summer of 1970 in the area of Kangerdlugssuaq, East Greenland, ca. 68^{o} north latitude,

29 pp. Unpublished NM-Report. Copenhagen: Nordisk Mineselskab A/S (in achive of Danmark og Grønlands Geologiske Undersøgelse, GRF no. 20903).

Geyti, A. & Thomassen, B. 1983: Exploration for molybdenum and precious metals at Flammefjeld, South-East Greenland. 51 pp. Unpublished NM-Report. Copenhagen: Nordisk Mineselskab A/S (in archive of Danmark og Grønlands Geologiske Undersøgelse, GRF no. 20774).

Goodwin, J.A. & Turner, P.A. 1988: East Greenland Kangerdlugssuaq Concession, Summary report of 1987 program, 43 pp. Toronto: Platinova Resources Ltd. (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20844).

Polegeg, S. & Köck, H. 1972: Montangeologischer Bericht Nordmine 1971. Prospektion am Nordufer des Amdrups-Fjords und NW von Bat-Bjerg (inneren Kangerdlugssuaq) Internal report, 23 pp. København: Nordisk Mineselskab A/S (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF. no. 20760).

Vohryzka, K. & Vohryzka, E. 1971: Bericht über die Prospektion im Jahr 1970 im Gebiet des Kangerdlugsaukfjordes, Ostgrönland, 68^{o} nl. Breite, 47 pp. Internal report. København: Nordisk Mineselskab A/S (in archive of Danmark og Grønlands Geologiske Undersøgelse, GRF no. 20906).

Waters, B.C. 1987: Geological report, Platinova Resources Ltd. Kangerdlugssuaq concession, East Greenland, 43 pp. Company report. Toronto: Platinova Resources Ltd. (in achive of Danmark og Grønalnds Geologiske Undersøgelse, GRF no. 20838).

Compiler: T.F.D. Nielsen.

Date: 2002-10-04.

9.17 Bagnæsset syenite intrusion

Heterogeneous, multiphase, syenite intrusion. The roof is partially preserved. Hosts regional base metal veins.

Location:	68°13'00''N; 32°08'W.
Main references:	Deer & Kempe (1976), Larsen (1982).
Topographic maps:	1:250 000 KMS: 68Ø3 Kangerdlugssuaq. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request. 1:20 000 GEUS: hard copy of topographic map in GEUS archive. The map has been produced by L.C. Larsen.
Landsat image:	TM path row 231-012.
Aerial photographs:	1:150 000 KMS flight line 878G, nos. 391-392. 1:50 000 KMS flight line 861O, nos. 6918-6921. KMS flight line 861P. nos 7337-7339. 1:27 000 colour GEUS: McBirney series, nos. 3355-3359.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Wager (1965) and Kempe *et* al. (1970). Unpublished: 1:20 000: Larsen (1982).
Geophysical maps:	Some unpublished data by Blank & Gettins (1973).
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	The Bagnæsset Syenite is a very heterogeneous syenitic multifase body of syenites and granite with common inclusions of basement host rocks. The roof of the intrusive bodies

is partially preserved (Deer & Kempe, 1976 and Larsen, 1982).

To the Bagnæsset Syenite intrusion are related: (1) a syenite dome emplaced by stoping halfway between Bagnæsset point and Søndre Syenit Gletscher along the western shore of Kangerdlugssusq Fjord and (2) a pillow complex called the Astrophyllite Bay Complex (Nielsen & Brooks, 1991) in the Astrophyllite Bugt area, about 7.5km northwest of Bagnæsset point. The syenites and granites form domes and sheets in the often strongly metasomatised basement gneisses. There is no clear picture of the emplacement history or genesis of the complex.

In the related Astrophyllite Bay Complex irregular bodies and domes of mildly alkaline diorite are emplaced into the basement. These bodies are often surrounded by rheomorphic melts. Contacts are crenulated and suggest formation of syenitic melts by reaction with the dioritic masses (Nielsen & Brooks, 1991).

Petrography: Deer & Kempe (1976) and Larsen (1982).

Geochemistry: Deer & Kempe (1976) and Larsen (1982).

Exploration activity: ***1970-1971***: Nordisk Mineselskab A/S (Brooks, 1971; Polegeg & Köck 1972 and Vohryzka & Vohryzka, 1971). Reconnaissance.
1982: Nordisk Mineselskab A/S (Geyti & Thomassen, 1983). Reconnaissance.

Exploration results: Identification of base-metal veins in the roof zone. The type of veins are described in data sheet 9.13.

Comments and company recommendations: Thomassen & Krebs (2001) suggest that the large scale regional base metal veins are further investigated due to their gold and silver potential (see data sheet 9.13).

Further information: GEUS: T.F.D. Nielsen and B. Thomassen.
Københavns Universitet: C.K. Brooks.

References: Research papers and descriptions:

Blank, H. R. & Gettins, M. E. 1973: Subsurface form and extend of the Skaergaard intrusion, East Greenland. (abs.).

Transactions of the American Geophysical Union **54**, 507 only.

Deer, W.A. & Kempe, D.R.C. 1976: Geological investigations in East Greenland. Part XI. The minor peripheral intrusions, Kangerdlugssuaq, East Greenland. Meddelelser om Grønland **197**(4), 25 pp.

Larsen, L.C. 1982: Bagnæsset Syenitkompleks, Kangerdlugssuaq Distriktet, Østgrønland, 106 pp. Unpublished M. Sc. thesis, Institute for Petrologi, Københavns Universitet.

Nielsen, T.F.D. & Brooks, C.K. 1991: Generation of nordmarkitic melts by melting of basement gneisses: the Astrophyllite Bay complex, Kangerdlugssuaq. Bulletin of the Geological Society of Denmark **38**, 161-164.

Thomassen, B. & Krebs, J.D. 2001a: Reconnaissance for noble metals in Precambrian and Palaeogene rocks, Amdrup Fjord, southern East Greenland. Geology of Greenland Survey Bulletin **189**, 76-82.

Company reports:

Brooks, C.K. 1971: Report covering the prospecting activities of Group 5 during the summer of 1970 in the area of Kangerdlugssuaq, East Greenland, ca. 68° north latitude, 29 pp. Unpublished NM-Report. København: Nordisk Mineselskab A/S (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20903).

Geyti, A. & Thomassen, B. 1983: Exploration for molybdenum and precious metals at Flammefjeld, South-East Greenland. 51 pp. Unpublished NM-Report. Copenhagen: Nordisk Mineselskab A/S (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20774).

Polegeg, S. & Köck, H. 1972: Montangeologischer Bericht Nordmine 1971. Prospektion am Nordufer des Amdrups-Fjords und NW von Bat-Bjerg (inneren Kangerdlugssuaq) Internal report, 23 pp. København: Nordisk Mineselskab A/S (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF. no. 20760).

Vohryzka, K. & Vohryzka, E. 1971: Bericht über die Prospektion im Jahr 1970 im Gebiet des Kangerdlugsuakfjordes, Ostgrönland, 68° nl. Breite, 47 pp. Internal report. København: Nordisk Minerelskab A/S (in archive of Danmark og Grønlands Geologiske Undersøgelse, GRF no. 20906).

Compiler: T.F.D. Nielsen.

Date: 2002-10-04.

9.18 Flammefjeld diatreme

Felsic pipe breccia and quartz porphyries in diatreme.
Inclusions with high grade molybdenum mineralisarion.

Location: 68°17'N; 32°20'W.

Main references: Geyti & Thomassen (1984) and Thomassen & Krebs (2001).

Topographic maps:
1:250 000
KMS: 68Ø3 Kangerdlugssuaq.
1:100 000
GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
1:10:000
GEUS: in the archive of Nordisk Mineselskab A/S

Landsat image: TM path row 231-012.

Aerial photographs:
1:150 000
KMS flight line 878G, nos 390-392.
1:50.000
KMS flight line 861N, nos 6928-6930.
KMS flight line 861O, nos 6919-6920.
1:27 000 Colour
GEUS: McBirney series, nos 3254-3260, 3274-3280, 3285-3290, 3311-3314, 3402-3407.

Geological maps:
Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988).
Publication maps: Geyti & Thomassen (1984) and Stenstrup (1987).

Geophysical maps: None.

Hyperspectral data: None.

Geochemical maps: None.

Short description: Flammefjeld is a 938.m high mountain with striking colour anomalies on the north side of Amdrup Fjord. The colour anomalies are due to extensive sulphide mineralisation and argillaceous and phyllitic alteration.

The Flammefjeld diatreme covers a circular area of *c.* 600 x 800 m just east of Flammefjeld peak. The diatreme is partially

covered by ”Flammefjeldgletscher”. The diatreme cuts through the boundary between the marginal nordmarkites of the Kangerdlugssuaq Alkaline Intrusion (9.13) and the Snout Series (9.16). The Flammefjeld diatreme is one of the youngest plutonic events in the Kangerlussuaq area.

Brooks *et* al. (1987) states that the Flammefjeld diatreme ”consists of a breccia pipe containing fragments of the host syenite in its various forms and also fragments of felsite porphyry which also occurs cutting the surrounding syenites. These rocks were later intruded by a quartz porphyry and finally by a hydrothermal breccia”.

Detailed information is given by Geyti & Thomassen (1983 & 1984).

Petrography: Geyti & Thomassen (1983 and 1984).

Geochemistry: Geyti & Thomassen (1983 and 1984).

Exploration activity: ***1970-1971***: Nordisk Mineselskab A/S (Brooks, 1971; Thomassen, 1971; Vohryzka & Vohryzka, 1971 and Polegeg & Köck, 1972). Reconnaissance in the general area.
1982: Nordisk Mineselskab A/S (Geyti & Thomassen, 1983). Reconnaissance exploration of Flammefjeld diatreme for stockwork porphyry molybdenum deposit.
1986: Grønlands Geologiske Undersøgelse (Stenstrop, 1987 and Brooks *et* al., 1987).

Exploration results: The Flammefjeld diatreme contains a large number of xenolith of local felsic plutonics with high-grade stockwork molybdenum mineralisation. Molybdenum is also found in the matrix of the pipe breccia. The present model for the formation of the diatreme suggest the mineralised xenolith to originate from a classic porphyry molybdenum mineralisation at a limited depth below the present exposures. Geyti & Thomassen (1983) suggest the hidden mineralised zone to be located above sea and below the present exposures of the diatreme. The presence of the hidden mineralised zone has not been confirmed.

Assay concentrations in individual samples reach 0.45 % MoS_2. More detailed accounts are given in Geyti & Thomassen (1983 and 1984).

Regionally occurring precious and base metal veins in the Flammefjeld area are described in data sheet 9.13.

Comments and company recommendations:

The recommendations given in Geyti & Thomassen (1983) suggest further surface investigations and exploration drilling. The drill target is the mineralised zone from which the Mo-mineralised xenolith originate. Drilling is suggested due to the high molybdenum grade in the investigated samples.

Further information:

GEUS: B. Thomassen

References:

Research papers:

Brooks, C.K., Schønwandt, H.K. & Stenstrop, G. 1987: Reconnaissance for economic minerals in the Kangerdlugssuaq area, East Greenland. Rapport Grønlands Geologiske Undersøgelse **135**, 66-68.

Geyti, A. & Thomassen, B.1984: Molybdenum and precious metal mineralization at Flammefjeld, Southeast Greenland. Economic Geology **79**, 1921-1929.

Thomassen, B. 1971: Prospektering i Østgrønland. Grønland **12**, 365-374.

Thomassen, B. & Krebs, J.D. 2001a: Reconnaissance for noble metals in Precambrian and Palaeogene rocks, Amdrups Fjord, southern East Greenland. Geology of Greenland Survey Bulletin **189**, 76-82.

Exploration and company reports:

Brooks, C.K. 1971: Report covering the prospecting activities of Group 5 during the summer of 1970 in the area of Kangerdlugssuaq, East Greenland, ca. 68^{o} north latitude, 29 pp. Unpublished NM-Report. København: Nordisk Mineselskab A/S (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20903).

Geyti, A. & Thomassen, B. 1983: Exploration for molybdenum and precious metals at Flammefjeld, South-East Greenland. 51 pp. Unpublished NM-Report. København: Nordisk Mineselskab A/S (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20774).

Polegeg, S. & Köck, H. 1972: Montangeologischer Bericht Nordmine 1971. Prospektion am Nordufer des Amdrups-Fjords und NW von Bat-Bjerg (inneren Kangerdlugssuaq) Internal report, 23 pp. København: Nordisk Mineselskab A/S (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF. no. 20760).

Stenstrop, G. 1987: New field investigations of the porphyry and vein-type mineralizations at Flammefjeld, southern East Greenland, 37 pp. Unpublished Report. Copenhagen: Danmarks og Grønlands Geologiske Undersøgelse.

Waters, B.C. 1987: Geological report, Platinova Resources Ltd. Kangerdlugssuaq concession, East Greenland.43 pp. Company report. Toronto: Platinova Resources Ltd. (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20838).

Compiler: T.F.D. Nielsen.

Date: 2002-10-31.

9.19 Cirque 1320 complex

Gabbro, diorite, granodiorite and porphyry complex with sulphide mineralisation.

Location:	68°17'50''N; 32°22'W.
Main references:	Brooks *et* al. (1987), Goodwin & Turner (1988) and Dahlstrøm (1989).
Topographic maps:	1:250 000 KMS: 68Ø3 Kangerdlugssuaq. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request. 1:20 000 GEUS archives: covers the area between 68°18'N to 68°24'N and 32°12'W to 32°30'W (by P.M. Holm, 1987).
Landsat image:	TM path row 231-012.
Aerial photographs:	1:150 000 KMS flight line 878G, nos 391-392. 1:50 000 KMS flight line 861N, nos 6927-6929.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Sketch map: Goodwin & Turner (1988).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	Some stream sediment analyses of relevance in Waters (1987) and Goodwin & Turner (1988).
Short description:	Intrusive subvolcanic complex in nordmarkite at the eastern contact of the Kangerdlugssuaq Alkaline Intrusion. The complex was identified 1987 during the Platinova Resources Ltd. exploration investigation (Brooks *et* al., 1987 and Goodwin & Turner, 1988). The complex may in fact represent two individ

ual areas of intrusive rocks; a northern basic to intermediate intrusion and a southern granitic complex. The southern monzonitic to granitic part of the complex is in the M.Sc. thesis of Dahlstrøm (1989) named the Søndre Syenit Gletscher Granite (SSGG).

The complex consists of a northern 1-2 km wide gabbro to diorite plug in the ridge along the south shore of Nordre Syenit Gletscher and a southern granodiorite intruded by a variety of feldspar and quartz porphyries in the floor of Cirque 1320 (the SSGG). The granodiorite contains inclusions and gabbros and appears to be younger that the gabbros. The felsic melts are suggested to contain a large component of anatectic melts derived from the Precambrian basement.

The sulphide-bearing and rusty gabbros are from fine grained to pegmatic and exhibit locally subvertical layering. The gabbros are net-veined by diorite and grade into diorite.

The granodiorite to porphyry suite in Cirque 1320 (SSGG) is very complex. The youngest intrusive phase is a banded and finegrained quartz porphyry.

Both of these intrusions are younger that the nordmarkites of the Kangerdlugssuaq Alkaline Intrusion and thus younger than c. 50 Ma.

Petrography: A description is given in Goodwin & Turner (1988). More detailed information is available for the granitic to monzonitic part of the Cirque 1320 complex. No published information is available. Mineralogical and petrological information in Dahlstrøm (1989).

Geochemistry: No published information is available. Geochemical information in Dahlstrøm (1989).

Exploration activity: ***1986***: Platinova Resources Ltd. (Waters, 1987); reconnaissance.
1987: Platinova Resources Ltd. (Goodwin & Turner, 1988). Exploration.

Exploration results: Despite the extensive sulphide mineralisation (up to 20% sulphide) no significant concentrations of economic interest have been found. Anomalous Au concentrations are observed in a moraine boulder on Nordre Syenit Gletscher (148 ppb), in hydrothermaly altered nordmarkite (278 ppb) and in stream sediments (Goodwin & Turner, 1988).

Comments and company recommendations:

No further investigations are recommended by Goodwin & Turner (1988). It should, however, be added that the origin of with anomalous Au in the moraine on Nordre Syenit Gletscher (see Waters, 1987 and Goodwin & Turner, 1988) is not known with certainty. Exploration has been limited to specific areas and a potential for Au mineralisation within the Cirque 1320 Complex or its surroundings can not be excluded.

Further information:

Københavns Universitet: C.K. Brooks.

References:

Research papers and descriptions:

Brooks, C.K., Schønwandt, H.K. & Stenstrop, G. 1987: Reconnaissance for economic minerals in the Kangerdlugssuaq area, East Greenland. Rapport Grønlands Geologiske Undersøgelse **135**, 66-68.

Dalstrøm, K. 1989: Feltgeologisk og Petrologisk detaljestudie af Søndre Syenit Gletscher Granit Kompleks (SSGG) i Snout Series, Kangerdlugssuaq, Østgrønland. MSc. thesis. Københavns Universitet, **163** pp.

Exploration and company reports:

Goodwin, J.A. & Turner, P.A. 1988: East Greenland Kangerdlugssuaq Concession, Summary report of 1987 program, 43 pp. Toronto: Platinova Resources Ltd. (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20844).

Waters, B.C. 1987: Geological report, Platinova Resources Ltd. Kangerdlugssuaq concession, East Greenland, 43 pp. Company report. Toronto: Platinova Resources Ltd. (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20838).

Compiler:

T.F.D. Nielsen.

Date:

2002-10-10.

9.20 (Amdrup Fjord) Biotite Granite intrusion

Late biotite granit intrusion.
No mineralisations have been reported.

Location:	68°11'N; 32°20'W.
Main references:	Deer & Kempe (1976).
Topographic maps:	1:250 000 KMS: 68Ø3 Kangerdlugssuaq. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat image:	TM path row 231-012.
Aerial photographs:	1:150 000 KMS flight line 878G, nos 388-390. KMS 1:50 000. KMS flight line 861N, nos 6929-6932. KMS flight line 861O, nos 6915-6919.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Kempe *et* al. (1970).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	Little-known biotite granite intrusion on the alpine and heavily glaciated south shore of Amdrup Fjord. The intrusion is app. 7 km across and intrudes the Precambrian basement, the gabbros of the Kap Edvard Holm intrusion and the nordmarkites of the Kangerdlugssuaq intrusion. No detailed investigations have been carried out. See also Deer (1976). No age information is published, but in accordance with the field relation an age younger than 50 Ma is exspected, see also *"Further information"*.

Petrography:	Deer & Kempe (1976).
Geochemistry:	Deer & Kempe (1976).
Exploration activity:	None.
Exploration results:	None.
Comments and company recommendations:	None.
Further information:	København Universitet: C.K. Brooks. Århus Universitet: C. Tegner (unpublished Ar-Ar age determination).
References:	Research papers and descriptions:

Deer, W.A. & Kempe, D.R.C. 1976: Geological investigations in East Greenland. Part XI. The minor peripheral intrusions, Kangerdlugssuaq, East Greenland. Meddelelser om Grønland **197**(4), 25 pp.

Kempe, D.R.C., Deer, W.A. & Wager, L.R. 1970: Geological investigations in East Greenland. Part VIII. The petrology of the Kangerdlugssuaq alkaline intrusion, East Greenland. Meddelelser om Grønland **190**(2), 49 pp.

Compiler:	T.F.D. Nielsen.
Date:	2002-10-07.

9.21 Kap Edvard Holm Complex

Large, replenished tholeiitic gabbro complex.
Anomalous values of PGE and Au in zone over 30 km.

Location: 68°00'N; 32°15'W.

Main references: Abbott & Deer (1972), Elsdon (1969) and Bernstein *et* al. (1992).

Topographic maps:
1:250 000
KMS: 68Ø3 Kangerdlugssuaq.
1:100 000
GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
1:5000
GEUS: digital map (1991) of Willow Ridge area drilled by Platinova Resources Ltd. and RTZ.

Landsat image: TM path row 231-012 (northeastern part only).

Aerial photographs:
1:150 000
KMS line 878F, nos 1836-1841.
KMS flight line 878G, nos 386-391.
1:50 000
KMS flight line 861N, nos 6930-6933.
KMS flight line 861O, nos 6912-6919.
KMS flight line 861P, nos 7332-7338.
KMS flight line 861Q, nos 7347-7353.
KMS flight line 861R, nos 7447-7455.
1:27 000
GEUS: McBirney series, nos. 3341-3354 (only northeastern part along the shore of Kangerlussuaq fjord).

Geological maps:
Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988).
Publication map: Abbott & Deer (1972).

Geophysical maps: None.

Hyperspectral data: None.

Geochemical maps: None.

Short description:

The Kap Edvard Holm complex is - a maybe - 800 km^2 layered, tholeiitic gabbro complex (Abbott & Deer, 1972). It is exposed in nunataks and coast exposures between Søndre Boswell Bugt and the mountains on the south shore of Amdrup Fjord. Large parts are hidden under Hutchinson Gletscher. The gabbros in the exposures just south of Amdrup Fjord could also belong to a separate gabbro intrusion. The Kap Edvard Holm comples is *c.* 50 Ma. old (Nevle *et* al., 1994**)** and Tegner *et* al. (1998).

The complex was originally subdivided into the Lower, Middle and Upper Layered Series. More recently the consensus is that the Middle Layered series represent a separate body on the Kangerlussuaq fjord shore and that the Upper layered Series in the southern part of the complex are the lateral equivalents of the Lower Layered Series in the Kap Deichman/Hutchinson Gletscher area. The complex is intruded by the Boswell syenite complex, the Kap Deichman syenite complex, the Hutchinson I and II syenite intrusions, the Amdrup Fjord Biotite Granite and Kontaktbjerg breccia.

Investigations in the Lower Series (Bernstein *et* al., 1992 and 1996) suggest the complex to be equivalent to ocean-floor type tholeiitic gabbro complexes characterised by repeated influx of new magma. Re-setting of mineral chemistry to more primitive compositions due to new influxes of magma is abundant and well documented (Bernstein *et* al., 1996). The gabbros are very well layered with abundant evidence of instability. Internal contact zones are described by Tegner *et* al. (1993).

Major bodies of gabbro pegmatite are observed. The gabbros are intruded by late wehrlite bodies and sills that are reminiscent of similar ultramafic melts in ophiolite-hosted gabbro intrusions (Bernstein *et* al., 1996).

Petrography:

Abbott & Deer (1972), Elsdon (1969), Deer (1976), Tegner *et* al. (1993) and Bernstein *et* al. (1992 & 1996). Mineralogy of zone of anomalous enrichment in Au and PGE is given by Arnason & Bird (2000).

Geochemistry:

Deer (1976), Tegner *et* al. (1993) and Bernstein *et* al. (1992 and 1996). The geochemistry of whole rocks related to the zone of anomalous enrichment in Au and PGE is given in Arnason & Bird (2000).

Exploration activity:

Exploration has been carried out between 1986 and 1991 by Platinova Resources Ltd and partners:

1986: Platinova Resources Ltd., stream sediment investigation and grab samples.
1987: Platinova Resources Ltd., stream sediment investigation and grab samples.
1988: *Platinova Resources Ltd., stream sediment investiga*tion and grab samples.
1989: Platinova Resources Ltd., stream sediment investigation and grab samples.
1990: Platinova Resources Ltd., systematic chip line sampling and minor packsack drilling
1991: Platinova Resources Ltd. and RTZ, 12 BQ cores drilled from 6 locations.

Exploration results:

PGE and Au anomalies have been identified over a distance of ca. 30 km. The anomaly that appears to be stratabound runs <1 g/t PGE and Au over a couple of meters. Anomalous high contents (up to 3 g PGE and Au) were identified in 1990 in one packsack drill core from Willow Ridge close to the southern contact of Hutchinson II syenite. Follow-up drilling in 1991 did not confirm the elevated values in the anomalous core.

A detailed description of the mineralogy and the chemistry of precious metal phase is given by Arnason & Bird (2000).

Comments and company recommendations:

No economic PGE and Au mineralisation has been located in the Kap Edvard Holm Complex. The investigations do, however, show a potential for stratiform PGE and Au mineralisation.

Further information:

GEUS: S. Bernstein.
Københavns Universitet: C.K. Brooks.
Århus Universitet: R. Wilson and C. Tegner.

References:

Research papers:

Abbott, D. & Deer, W.A. 1972: Geological investigations in East Greenland. Part X. The gabbro cumulates of the Kap Edvard Holm Lower Layered Series. Meddelelser om Grønland **190**(6), 42 pp.

Arnason, J.G. & Bird, D.K. 2000: A gold- and platinum-mineralized layer in gabbros of the Kap Edvard Holm complex: Field, petrologic, and geochemical relations. Economic Geology **95**, 945-970.

Bernstein, S., Kelemen, P.B. & Brooks, C.K. 1996: Evolution of the Kap Edvard Holm Complex: a mafic intrusion at a rifted continental margin. Journal of Petrology **37**, 497-519.

Bernstein, S, Rosing, M.T., Brooks, C.K. & Bird, D.K. 1992: An ocean-ridge type magma chamber at a passive volcanic, continental margin: the Kap Edvard Holm layered gabbro complex, East Greenland. Geological magazine **129**, 437-456.

Bird, D.K., Arnason, J.G., Brandriss, M.E., Nevle, R.J., Radford, G., Bernstein, S., Gannicott, R.A. & Kelemen, P.B. 1995: A gold-bearing horizon in the Kap Edvard Holm complex, East Greenland. Economic Geology **90**, 1288-1300.

Brandriss, M.E., Nevle, R.J., Bird, D.K. & O'Neil, J.R. 1995: Imprint of meteoric water on the stable isotope compositions of igneous and secondary minerals, Kap Edvard Holm Complex, East Greenland. Contributions to Mineralogy and Petrology **121**, 74-86.

Deer, W.A. 1976: Tertiary igneous rocks between Scoresby Sund and Kap Gustav Holm, East Greenland. *In* Escher, A. & Watt, W.S. (eds) Geology of Greenland, 404-429. Copenhagen: Grønlands Geologiske Undersøgelse.

Elsdon, R. 1969: The structure and intrusive mechanism of the Kap Edvard Holm layered gabbro complex, East Greenland. Geological Magazine **106**, 46-56.

Tegner, C., Duncan, R.A., Bernstein, S., Brooks, C.K., Bird, D.K. & Storey, M. 1998: 40Ar-39Ar geochronology of Tertiary mafic intrusions along the East Greenland rifted margin: Relation to flood basalts and the Icelandic hotspot track. Earth and Planetary Science Letters **156**, 75-88.

Tegner, C., Wilson, J.R. & Brooks, C.K. 1993: Intraplutonic quench zones in the Kap Edvard Holm Layered Gabbro Complex, East Greenland. Journal of Petrology **34**, 681-710.

Company reports and other reports:

Radford, G. 1990: 1989 field work within the Kap Edvard Holm concession East Greenland. 12pp. Internal report. Toronto: Platinova Resources Ltd. & Corona Corporation (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20851).

Radford, G. & Bird, D.K. 1991: 1990 field work within the Kap Edvard Holm concession East Greenland, 16 pp. Internal report. Toronto: Platinova Resources Ltd. (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20835).

Turner, P.A. 1990: Report of the 1989 field season: Nordre Aputiteq Kap Edvard Holm concession, 14 pp. Toronto:

Platinova Resources Ltd. (in archive of Danmarks og Grønblands Geologiske Undersøgelse, GRF. no. 20814).

Turner, P.A. & Mosher, G.W. 1989: Report of the 1988 field season, Skærgaard concession and East Greenland prospecting license, 71 pp. Company report. Toronto: Platinova Resources Ltd. (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF. no. 20845).

Waters, B.C. 1987: Geological report, Platinova Resources Ltd. Kangerdlugssuaq concession, East Greenland, 43 pp. Company report. Toronto: Platinova Resources Ltd. (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20838).

Wolfende, M. 1991: Kap Edvard Holm project. 15 pp. Internal report, Toronto: Platinova Resources Ltd & RTZ Minning and Exploration (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20648).

Compiler: T.F.D. Nielsen.

Date: 2002-10-10.

9.22 Kap Deichman complex

Fayalite syenite complex.
No mineralisations are reported.

Location:	68°03'N; 32°04'W.
Main references:	Deer *et* al. (1984) and Nielsen (1987).
Topographic maps:	1:250 000 KMS: 68Ø3 Kangerdlugssuaq. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat TM image:	Not available from GEUS.
Aerial photographs:	1:150 000 KMS flight line 878F, nos 1839-1840. 1:50 000 KMS flight line 861Q, nos 7548-7450. KMS flight line 861R, nos 7452-7454. 1:27 000 colour GEUS: McBirney series, nos 3345-3347 and 3349-3351.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication map: app 1: 70 000 in Nielsen (1987).
Geophysical maps:	None.
Hyperspektral data:	None.
Geochemical maps:	None.
Short description:	The brown-weathering, fayalite-bearing, Kap Deichman syenite complex forms a prominent, 830m high, headland on the western shore of outer Kangerlussuaq fjord. The complex is *c.* 4 km across and emplaced into gabbros of the Kap Edvard Holm Complex. The intrusion is stock-like with steep contacts. As many other felsic intrusion and complexes in the Tertiary of East Greenland, the Kap Deichman syenites are surrounded by a zone of breccia composed of the local host and

syenite to granite veins. To the west the Kap Deichman syenites are intruded by the Hutchinson I syenite. The complex has not been dated, but an age of *c.* 50 Ma. is assumed.

The Kap Deichman complex is according to Nielsen (1987) composed of two units. An early outer ring of inclusion-bearing syenites and a clean central syenite stock. The syenite has minor quartz and is characteristically fayalite and aenigmatite-bearing (Brooks & Nielsen, 1982). The first detailed description of the petrography and geochemistry of the complex is given by Deer *et* al. (1984).

Petrography: Deer *et* al. (1984).

Geochemistry: Deer *et* al. (1984) and GEUS unpublished.

Exploration activity: None.

Exploration results: None.

Comments and company recommendations: None.

Further information: GEUS: T.F.D. Nielsen.
Københavns Universitet: C.K. Brooks.

References: Research papers:

Brooks, C.K. & Nielsen, T.F.D. 1982: The Phanerozoic development of the Kangerdlugssuaq area, East Greenland. Meddelelser om Grønland, Geoscience **9**, 30 pp.

Deer, W.A. 1976: Tertiary igneous rocks between Scoresby Sund and Kap Gustav Holm, East Greenland. In: Escher, A. & Watt, W.S. (eds): Geology of Greenland, 404-429. Copenhagen: Grønlands Geologiske Undersøgelse.

Deer, W.A., Kempe, D.R.C. & Jones, G.C. 1984: Syenitic and associated intrusions of the Kap Edvard Holm region of Kangerdlugssuaq, East Greenland. Meddelelser om Grønland, Geoscence **12**, 26 pp.

Nielsen, T.F.D. 1987: Tertiary alkaline magmatism in East Greenland: a review. In: Fitton, J.G. & Upton, B.G.J. (eds): Alkaline igneous rocks. Special Publication, Geological Society of London **30**, 489-515

Compiler: T.F.D. Nielsen.

Date: 2002-10-29.

9.23 Hutchinson I syenite intrusion

Syenite intrusion.
No mineralisations are reported.

Location:	68°03'40''N; 32°07'W.
Main references:	Deer *et* al. (1984) and Nielsen (1987).
Topographic maps:	1:250 000 KMS: 68Ø3 Kangerdlugssuaq. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat TM image:	Not available from GEUS.
Aerial photographs:	1:150 000 KMS flight line 878F, nos 1838-1840. 1:50 000 KMS flight line 861Q, nos 7249-7251. 1:27 000 colour GEUS: McBirney series, nos 3349-3351.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication map: app 1: 70 000 in Nielsen (1987).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	Syenite intrusion at the western margin of the Kap Deichman complex. The intrusion is *c.* 3 km across and emplaced into the gabbros of the Kap Edvard Holm complex and the syenites of the Kap Deichman complex. Also the Hutchinson I intrusion is surrounded by an up to several hundred metres wide brecciated zone netveined by syenite and granite. A brecciated contact zone of Hutchinson I syenite and partially digested Kap Deichman syenites separates Hutchinson I syenite from the older Kap Deichman syenites (Nielsen, 1987). The Hutchinson I syenite is younger than the Kap Deichman syenites, but has not been dated.

The syenites form a rather monotonous body of clean syenite. They are poor in plagioclase, contain minor quartz and are characterised by amphibole. Accessories are biotite, apatite and zirkon (Deer *et* al., 1984).

Petrography: None.

Geochemistry: GEUS: unpublished major element compositions.

Exploration activity: None.

Exploration results: None.

Comments and company recommendations: None.

Further information: GEUS: T.F.D. Nielsen.
Københavns Universitet: C.K. Brooks.

References:

Research papers and descriptions

Deer, W.A., Kempe, D.R.C. & Jones, G.C. 1984: Syenitic and associated intrusions of the Kap Edvard Holm region of Kangerdlugssuaq, East Greenland. Meddelelser om Grønland, Geoscence **12**, 26 pp.

Nielsen, T.F.D. 1987: Tertiary alkaline magmatism in East Greenland: a review. In: Fitton, J.G. & Upton, B.G.J. (eds): Alkaline igneous rocks. Special Publication, Geological Society of London **30**, 489-515.

Compiler: T.F.D. Nielsen.

Date: 2002-10-10.

9.24 Hutchinson II syenite intrusion

Syenite intrusion.
No mineralisations are reported.

Location:	68°04'35''N; 32°11'30''W.
Main references:	Deer *et* al. (1984) and Nielsen (1987).
Topographic maps:	1:250 000 KMS: 68Ø3 Kangerdlugssuaq. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat TM image:	Not available from GEUS.
Aerial photographs:	1:150 000 KMS flight line 878F, nos 1838-1840. 1:50 000 KMS flight line 861P, nos 7334-7336. KMS flight line 861Q, nos 7259-7251. 1:27 000 colour GEUS: McBirney series, no. 3350 (partial coverage).
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication map: app 1: 70 000 in Nielsen (1987).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	Exposure of margin of syenite intrusion at the southern margin of Hutchinson Gletscher. The grey syenites are chilled to the gabbros of the Kap Edvard Holm Complex. Only a very restricted part of the intrusion is exposed. In contrast to other syenite intrusions Hutchinson II syenite does not seem to have a broad netveined contact zone. No contact to the Hutchinson I syenite is exposed. No age information is available.

Following Deer *et* al. (1984) the intrusion is believed to have assimilated gabbroic material before the emplacement. This would explain the plagioclase content and general characteristics of the syenite. The accessory phases include biotite, zirkon, sphene and apatite.

Petrography: Deer *et* al. (1984).

Geochemistry: Deer et al. (1984).

Exploration activity: None.

Exploration results: None.

Comments and company recommendations: None.

Further information: GEUS: T.F.D. Nielsen and S. Bernstein.

References:

Research papers:

Deer, W.A., Kempe, D.R.C. & Jones, G.C. 1984: Syenitic and associated intrusions of the Kap Edvard Holm region of Kangerdlugssuaq, East Greenland. Meddelelser om Grønland, Geoscence **12**, 26 pp.

Nielsen, T.F.D. 1987: Tertiary alkaline magmatism in East Greenland: a review. In: Fitton, J.G. & Upton, B.G.J. (eds): Alkaline igneous rocks. Special Publication, Geological Society of London **30**, 489-515

Compiler: T.F.D. Nielsen.

Date: 2002-10-29.

9.25 Kontaktbjerg breccia complex

Zone of syenite brecciated gabbros and hybrid rock.
No mineralisation have been observed.

Location:	68°02'00''N; 32°22'25''W.
Main references:	Deer *et* al. (1984).
Topographic maps:	1:250 000 KMS: 68Ø3 Kangerdlugssuaq. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat image:	None available from GEUS.
Aerial photographs:	1:150 000 KMS flight line 878F, nos 1838-1840. KMS flight line 878G, nos 388-390. 1:50.000 KMS flight line 861P, nos 7332-7335.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: *c.* 1:80 000 in Abbott & Deer (1972).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	An >8 km long and up to 2 km wide, arcuate area of gabbros brecciated by granitic and syenitic veins in the western part of the Kap Edvard Holm Complex. A younger hybrid syenite is emplaced centrally into the brecciated zone. Brecciation and emplacement of the hybrid syenite post-dates the Kap Edvard Holm complex. The field information is limited. Deer *et* al. (1984) described the brecciated zone as a syenite body with inclusions of gabbro.
Petrography:	Deer *et* al. (1984).

Geochemistry: Deer *et* al. (1984).

Exploration activity: ***1989***: Chip line profile in Kap Edvard Holm gabbros continued into the breccia zone (Radford, 1990).

Exploration results: No anomalous values have been recorded.

Comments and company recommendations: None.

Further information: GEUS: S. Bernstein.

References:

Research papers and descriptions

Abbott, D. & Deer, W.A. 1972: Geological investigations in East Greenland. Part X. The gabbro cumulates of the Kap Edvard Holm Lower Layered Series. Meddelelser om Grønland **190**(6), 42 pp.

Deer, W.A., Kempe, D.R.C. & Jones, G.C. 1984: Syenitic and associated intrusions of the Kap Edvard Holm region of Kangerdlugssuaq, East Greenland. Meddelelser om Grønland, Geoscence **12**, 26 pp.

Company reports

Radford, G. 1990: 1989 field work within the Kap Edvard Holm concession East Greenland. 12pp. Internal report. Toronto: Platinova Resources Ltd. & Corona Corporation (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20851).

Compiler: T.F.D. Nielsen.

Date: 2002-10-29.

9.26 Kap Boswell syenite complex

10 km wide, semicircular, multiphase syenite and granite complex with minor extrusives.
No mineralisations reported.

Location:	67°55'N; 32°08'W.
Main references:	Deer *et* al. (1984) and Nielsen (1987).
Topographic maps:	1:250 00 KMS: 68Ø3 Kangerdlugssuaq. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat TM image:	None available from GEUS.
Aerial photographs:	1:150 000 KMS flight line 878F, nos 1236-1239. 1:50 000 KMS flight line 861R, nos 7448-7451. KMS flight line 861S, nos 7460-7464.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication map: app 1: 140 000 in Nielsen (1987).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	The Kap Boswell syenite complex, including the intrusives and extrusives of Barberkniven, is a large and complex intrusive centre, 10 km across, emplaced into the gabbros of the Kap Edvard Holm Complex. The inclusion of the magmatic rocks of Barberkniven may be questioned as no field evidence indicates a direct genetic relationship with the Kap Boswell syenite complex proper (see map in Nielsen, 1987). An amphibole from a late granite has given an age of 51.8 +/- 3.9 Ma (Beckinsale *et* al., 1970). Deer (1976) gives a geological

overview, which, however, predates the findings of Nielsen (1987).

The Kap Boswell syenite proper is surrounded by: (1) an up to 1 km wide zone of hydrothermal alteration containing bodies of microganite to which may be related large, rusty, sheets of sulphide-bearing granite in plateau basalts on the south coast of Kap Edvard Holm and (2) an up to 500m wide brecciated zone consisting of the local host rocks, pillowed dykes and granitic to syenitic veins (Deer *et* al., 1984). This zone circumscribe app. 2/3 of the complex.

The main mass of the Kap Boswell complex is formed by three, partially concentric units of syenite and nordmarkite. The nordmarkite has occasionally rapakivi-type texture and carries inclusions of earlier syenites and more mafic inclusions (Nielsen, 1987). Late pulses of alkali granite are found in several location and are abundant high in Kap Boswell.

The relationship of Kap Boswell granites, syenites and nordmarkites to the microgranites and the silicic volcanics of Barberkniven is unknown. The remnants of silicic volcanics and a concentrically build, syenite intrusion (< 2 km across) are exposed on the eastern point of Barberkniven (Nielsen, 1987). The latest phases of magmatism include oversaturated peralkaline tinguaite dikes.

Petrography: Deer *et* al. (1984).

Geochemistry: Deer *et* al. (1984) and GEUS unpublished.

Exploration activity: ***1986***: Platinova Resources Ltd. (Waters, 1987).

Exploration results: No anomalous samples were located.

Comments and company recommendations: None.

Further information: GEUS: T.F.D. Nielsen

References:

Research papers:

Brooks, C.K. & Nielsen, T.F.D. 1982: The Phanerozoic development of the Kangerdlugssuaq area, East Greenland. Meddelelser om Grønland, Geoscience **9**, 30 pp.

Deer, W.A. 1976: Tertiary igneous rocks between Scoresby Sund and Kap Gustav Holm, East Greenland. In: Escher, A. & Watt, W.S. (eds): Geology of Greenland, 404-429. Copenhagen: Grønlands Geologiske Undersøgelse.

Deer, W.A., Kempe, D.R.C. & Jones, G.C. 1984: Syenitic and associated intrusions of the Kap Edvard Holm region of Kangerdlugssuaq, East Greenland. Meddelelser om Grønland, Geoscence **12**, 26 pp.

Nielsen, T.F.D. 1987: Tertiary alkaline magmatism in East Greenland: a review. In: Fitton, J.G. & Upton, B.G.J. (eds): Alkaline igneous rocks. Special Publication, Geological Society of London **30**, 489-515

Company reports:

Waters, B.C. 1987: Geological report, Platinova Resources Ltd. Kangerdlugssuaq concession, East Greenland.43 pp. Company report. Toronto: Platinova Resources Ltd. (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20838).

Compiler: T.F.D. Nielsen.

Date: 2002-10-10.

9.27 Kap Edvard Holm intrusion

Layered gabbro intrusion at Kap Edvard Holm.
No mineralisations are reported.

Location:	67°52'N; 32°12'W.
Main references:	Abbott & Deer (1972) and Brooks & Nielsen (1982).
Topographic maps:	1:250 000 KMS: Kruuse Fjord. 1:100 000 GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.
Landsat TM image:	None available from GEUS.
Aerial photographs:	1:150 000 KMS flight line 878F, nos. 1836-1837. 1:50 000 KMS flight line 861S, nos. 7463-7465.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Abbott & Deer (1972).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	Little-know, 3 km wide and 838 m high, body of gabbro on the point of Kap Edvard Holm. Contact relations are badly exposed and mostly below sea level. The original size of the intrusion is not known. The only exposed contact is intruded by a granophyre. The northern part of the intrusion is tectonized and altered in the breccia and hydrothermal alteration zones surrounding the Kap Boswell complex. Well-layered gabbros are reported for the central parts of the intrusion (S. Bernstein, pers. comm., 2002).
Petrography:	None.

Geochemistry: None.

Exploration activity: None.

Exploration results: None.

Comments and company recommendations: None.

Further information: GEUS: S. Bernstein and T.F.D. Nielsen.

References:

Research papers and descriptions:

Abbott, D. & Deer, W.A. 1972: Geological investigations in East Greenland. Part X. The gabbro cumulates of the Kap Edvard Holm Lower Layered Series. Meddelelser om Grønland **190**(6), 42 pp.

Brooks, C.K. & Nielsen, T.F.D. 1982: The Phanerozoic development of the Kangerdlugssuaq area, East Greenland. Meddelelser om Grønland, Geoscience **9**, 30 pp.

Compiler: T.F.D. Nielsen.

Date: 2002-11-13.

9.28 Nordre Aputiteq gabbro intrusion

Layered, ocean-type gabbro complex with features suggesting replenishment. Minor PGE mineralisations

Location: 67°48'N; 32°17'W.

Main references: Brooks & Nielsen (1982).

Topographic maps:
1:250 000
KMS: 67Ø1 Kruuse Fjord.
1:100 000
GEUS: digital maps in 1:100 000 and compilations in 1:250 000, 1:500 000 and 1:1 000 000 and other scales on request.

Landsat TM image: Not available from GEUS.

Aerial photographs:
1:150 000
KMS 878F, nos 1834-1836.
1:50 000
KMS flight line 861S, nos 7466-7468.

Geological maps:
Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988).
Unpublished maps: sketch maps in Turner & Mosher (1989) and Turner (1990).

Geophysical maps: None.

Hyperspectral data: None.

Geochemical maps: None.

Short description: Only a small part of layered gabbro intrusion is exposed. Nordre Aputiteq island is app. 2 km across and assuming a semicircular gabbro complex the complex would have had a diameter of 5 km or more. A thin sliver of contact metamorphosed Palaeogene volcanics is exposed along the west coast of the island. Nevle *et* al. (1994) give an age of *c.* 48 Ma.

The *c.* 200 m wide marginal zone of the intrusion shows similarities to the Marginal Border Group of the Skaergaard intru

sion. The marginal zone is followed by a 100-200 m wide, sulphide-bearing, ”Mixed Zone”.

This zone is described as a zone of syn-magmatic deformation and sulphide mineralisation separating the marginal gabbros from the melanocratic olivine gabbros in the central part of the intrusion.

In the ”Mixed Zone” is found abundant evidence for replenishment in the form of cross bedding and slumping. Megacyclic units are developed as well as inch-scale layering (Petersen, 1973 and Turner, 1990).

Late stage pegmatites and metasomatic gabbros are believed to be sheet or pipe-like. Discontinuous PGE mineralisation is related to these structures.

Petrography: Some unpublished information (GEUS, T.F.D. Nielsen). The plagioclase of the olivine-gabbros is very basic (An 90 or so).

Geochemistry: No data is available.

Exploration activity: ***1986***: Platinova Resources Ltd. (Waters, 1987). Reconnaissance investigations.
1988: Platinova Resources Ltd. (Turner & Mosher, 1989). Reconnaissance investigations.
1989: Platinova Resources Ltd. (Turner, 1990). Panel sampling and follow-up investigations.

Exploration results: An anomalous zone with a strike length of *c.* 1 km has been identified. Mineralisation is pod-like and discontinuous. The best samples have returned 928 ppb Pd and 376 ppb Pt. No significant gold values were obtained.

Comments and company recommendations: Turner (1990) states that the mineralisation has little economic potential.

Further information: GEUS: T.F.D. Nielsen.
Københavns Universitet: C.K. Brooks.
Stanford University: D.K. Bird.

References: Research papers and descriptions:

Brooks, C.K. & Nielsen, T.F.D. 1982: The Phanerozoic development of the Kangerdlugssuaq area, East Greenland. Meddelelser om Grønland, Geoscience **9**, 30 pp.

Petersen, T.S. 1973: Layered gabbros of Nordre and Søndre Aputitêq and Pâtûterajivit. In: Brooks, C.K. (ed.): Geological investigations in the Kangerdlugssuaq district, 47-49. Internal report. Copenhagen: Institute of Petrology, University of Copenhagen.

Nevle, R.J., Brandriss, M.E., Bird, D.K., Williams, M.O. & O´Neil, J.R. 1994: Tertiary plutons monitor climate change in East Greenland. Geology **22**, 775-778.

Company reports:

Turner, P.A. 1990: Report of the 1989 field season: Nordre Aputiteq Kap Edvard Holm concession, 14 pp. Toronto: Platinova Resources Ltd. (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF. no. 20814).

Turner, P.A. & Mosher, G.W. 1989: Report of the 1988 field season, Skærgaard concession and East Greenland prospecting license, 71 pp. Company report. Toronto: Platinova Resources Ltd. (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF. no. 20845).

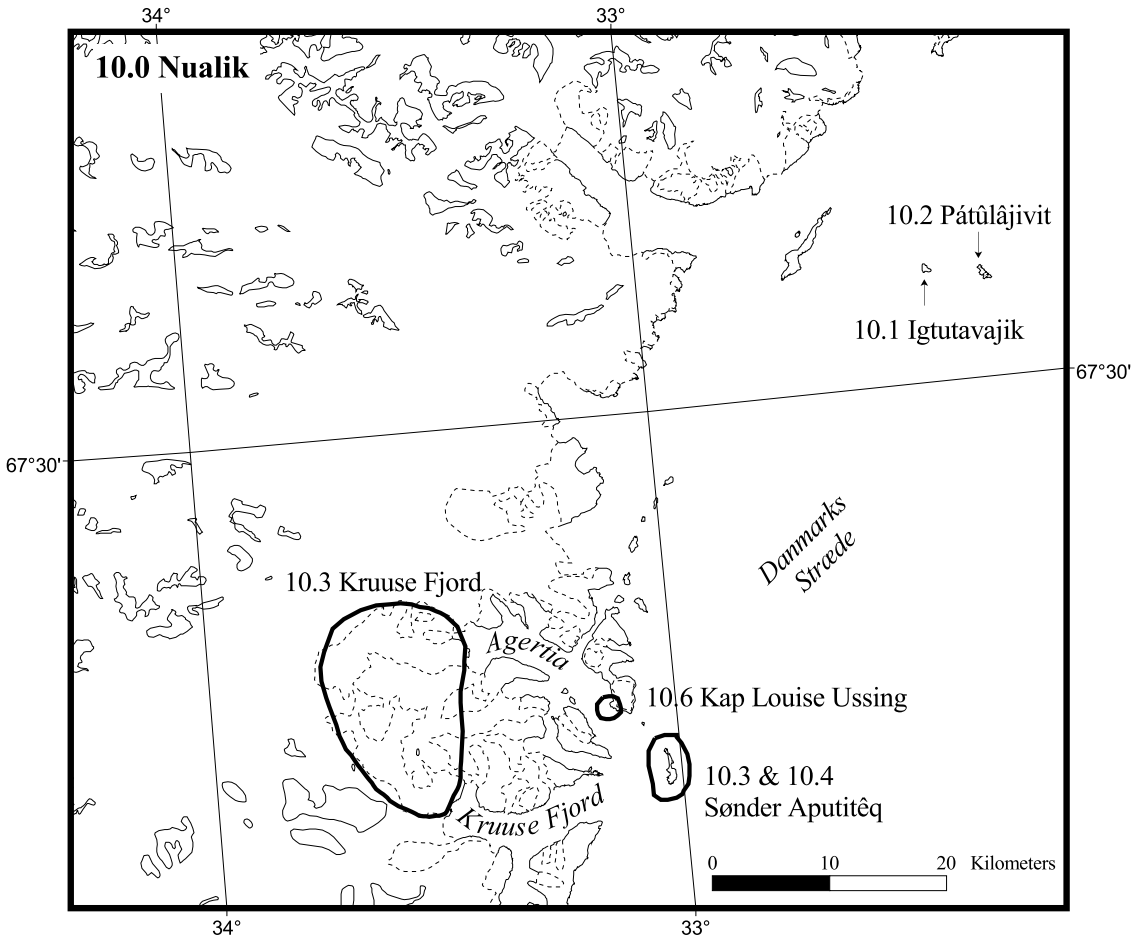
Waters, B.C. 1987: Geological report, Platinova Resources Ltd. Kangerdlugssuaq concession, East Greenland, 43 pp. Company report. Toronto: Platinova Resources Ltd. (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20838).

Compiler: T.F.D. Nielsen.

Date: 2002-10-29.

10. Nualik region

The Nualik region or district is located on the coast 100 km SSW of Kangerlussuaq triple junction (Myers, 1980). The area has not been mapped in detail due to the generally very difficult access. Headlands and islands are characterised by the well-developed coast parallel dyke swarm (e. g., Rex *et* al. 1979 and Klausen & Larsen, in press). The very large Kruuse Fjord ultramfic to mafic complex (data sheet 10.5) dominates the inland between the heads of Agertia fjord and Kruuse Fjord (Arnason *et* al., 1997).



On the coast and the islands are exposed several mafic and felsic complexes of more limited area extend. The syenites of Ersingerseq intrusion and the related breccias on the headland Nuuk (data sheet 10.9) and the Kap Louise Ussing gabbro (data sheet 10.6) are located centrally in the Nualik segment of the coast parallel dyke swarm. The Kruuse Fjord complex (data sheet 10.5) is located on the inland side of this large dyke system, where as the intrusions on Søndre Aputitêq (data sheet 10.4) and the islands of Igtutarajik (data sheet 10.1) and Pátûlâjivit (data sheet 10.2) are located on the ocean side of the coast parallel dyke swarm. Ages around 48 Ma dominate the region.

References

Arnason, J.G., Bird, D.K., Bernstein, S., Rose, N.M. & Manning, C.E. 1997: Petrology and geochemistry of the Kruuse Fjord Gabbro Complex, East Greenland. Geological Magazine 134, 67-89.

Klausen, M.B. & Larsen, H.C. (in press): The east Greenland coast parallel dyke swarm and its role in continental breakup. In: Menzies, M., Baker, J.A. & Davidson, I. (eds): Proceedings of Penrose Conference on Magmatic Rifted Margins. Geological Society of America, special publication.

Myers, J.S. 1980: Structure of the coastal dyke swarm and associated plutonic intrusions of East Greenland. Earth and Planetary Science Letters 46, 407-418.

Rex, D.C., Gledhill, A.R., Bridgwater, D. & Myers, J.S. 1979:A Rb-Sr whole rock age of 55±7 m.y. from the Nualik plutonic centre, East Greenland. Rapport Grønlands Geologiske Undersøgelse 95, 102-105.

10.1 Igtutarajik gabbro

Part of little-known part of tholeiitic, gabbro intrusion exposed on the island of Igtutarajik.
No mineralisations are reported.

Location:	67°37'N, 32°38' W.
Main references:	Wager (1934) and Goodwin & Turner (1988).
Topographic maps:	1:250 000 KMS: 67Ø1 Kruuse Fjord.
Landsat image:	None available from GEUS.
Aerial photographs:	1:150 000 KMS flight line 878E, nos 222-224. 1:50 000 KMS flight line 861R, nos 7439-7441.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	Little-know marginal part of gabbro intrusion. The gabbros may be part of a very large gabbro intrusion including the gabbros on the near-by islands of Pátùlâjivit and a group of small islands and skerries north and north-east of Pátúlâjivit, two skerries *c.* 15 km to the north and the gabbros on Nordre Aputiteq (see Goodwin & Turner, 1988). Tegner *et* al. (1998) dated mica from a gabbro pegmatite. The age is *c.* 47 Ma. The contact zone to metamorphosed basalts is exposed on the western part of the island. The gabbros recall the marginal gabbros of the Skaergaard intrusion. Magnetite-bearing gabbros occur on the eastern part of the island. Veins characterised by calcic amphibole and minor sulphides are common.
Petrography:	None published.

Geochemistry: None published.

Exploration activity: ***1987***: Reconnaissance by Platinova Resources Ltd. (Goodwin & Turner, 1988).

Exploration results: No mineralisations of significance were observed.

Comments and company recommendations: Comment*:* No further exploration is proposed on the basis on the available information.

Further information: Stanford University: D.K. Bird.

References:

Research papers and descriptions:

Tegner, C., Duncan, R.A., Bernstein, S., Brooks, C.K., Bird, D.K. & Storey, M. 1998: 40Ar-39Ar geochronology of Tertiary mafic intrusions along the East Greenland rifted margin: Relation to flood basalts and the Icelandic hot-spot track. Earth and Planetary Science Letters **156**, 75-88.

Wager, L.R. 1934: Geological investigations in East Greenland. Part I. General geology from Angmagssalik to Kap Dalton*.* Meddelelser om Grønland **105**(2), 46 pp.

Company reports:

Goodwin, J.A. & Turner, P.A. 1988: East Greenland Kangerdlugssuaq Concession, Summary report of 1987 program, 43 pp. Toronto: Platinova Resources Ltd. (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20844).

Compiler: T.F.D. Nielsen.

Date: 2002-10-23.

10.2 Pátûlâjivit gabbro

Small part of little-known, tholeiitic gabbro intrusion on the island of Pátùlâjivit. No significant mineralisations are reported.

Location: 67°36'21''N, 32°30'32''W.

Main references: Petersen (1973) and Tegner *et* al. (1998).

Topographic maps:
1:250 000
KMS: 67Ø1 Kruuse Fjord.
Unpublished:
GEUS: Sketch maps based on aerial photographs in 1:50 000 (T.F.D. Nielsen).

Landsat image: None available from GEUS.

Aerial photographs:
1:150 000
KMS flight line 878E, nos 222-223.
1:50 000
KMS flight line 861S, nos 7472-7475.

Geological maps: Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988).

Geophysical maps: Aeromagnetic Map of Greenland, sheet 3 (63°30' - 68°30'N, 23°00' - 41°00'W); 1:1 000 000 (Geological Survey of Greenland, 1988).

Hyperspectral data: None.

Geochemical maps: None.

Short description: Small part of little-known tholeiitic gabbro intrusion. The gabbros may be part of a very large intrusion including the gabbros on the near-by islands of Igtutarajik, a group of small islands and skerries north and northeast of Pátúlâjivit (Wager, 1934), two skerries *c.* 15 km to the north and the gabbros on Nordre Aputitêq (see Goodwin & Turner, 1988).

The gabbros of Pátúlâjivit show many striking structural features. In the southern part of the island the gabbros show rather poorly developed, but regular layering. North of a dislocation zone inch scale layering, very regular rythmic gravity

layering, cross-bedding, trough bands and slump structures suggest synmagmatic refilling and structural instability (Petersen, 1973).

On the assumption that the Pátúlâjivit gabbros are related to the gabbros of Nordre Aputitêq (Nevle *et* al., 1994) and of Igtutarajik (Tegner *et* al., 1998) an age of 47 - 48 Ma is suggested.

Petrography: No information is published.

Geochemistry: No information is published.

Exploration activity: ***1987***: Platinovas Resources Ltd. reconnaissance (Goodwin & Turner, 1988).

Exploration results: No mineralisations were observed.

Comments and company recommendations: Comment: No exploration is suggested due to the relatively small area of exposure and the remoteness of the island.

Further information: GEUS: T.F.D. Nielsen
University of Copenhagen: C.K. Brooks
Stanford University: D.K. Bird.

References:

Research papers and descriptions:

Nevle, R.J., Brandriss, M.E., Bird, D.K., McWilliams, M.O. & O'Niel, J.R. 1994: Tertiary plutons monitor climate change in East Greenland. Geology **22**, 775-778.

Petersen, T.S. 1973: Layered gabbros of Nordre and Søndre Aputitêq and Pâtûterajivit. In: Brooks, C.K. (ed.): Geological investigations in the Kangerdlugssuaq district, 47-49. Internal report. Copenhagen: Institute of Petrology, University of Copenhagen.

Tegner, C., Duncan, R.A., Bernstein, S., Brooks, C.K., Bird, D.K. & Storey, M. 1998: 40Ar-39Ar geochronomlogy of Tertiary mafic intrusions along the East Greenland rifted margin: Relation to flood basalts and the Icelandic hotspot track. Earth and Planetary Science Letters **156**, 7588.

Company reports:

Goodwin, J.A. & Turner, P.A. 1988: East Greenland Kangerdlugssuaq Concession, Summary report o 1987 program, 43 pp. Toronto: Platinova Resources Ltd. (in

archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20844).

Compiler: T.F.D. Nielsen

Date: 2002-10-24

10.3 Søndre Aputitêq complex

Little know intrusive complex of gabbro and granite intrusions on the island of Søndre Aputitêq.
No mineralisations have been reported.

Location:	67°15'30''N, 33°13'W.
Main references:	Petersen (1973)
Topographic maps:	1:250 000 KMS: 67Ø1 Kruuse Fjord.
Landsat image:	TM path row 231-013.
Aerial photographs:	1:150 000 KMS flight line 878E, nos 229-231. 1:50 000 KMS flight line 861R, nos 7432-7434. 1:40 000 KMS flight line A34K, nos 218-220.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	The geology of Søndre Aputitêq is complex and Petersen (1973) identified 6 lithologic units. The oldest unit is a partially layered plagioclase-pyroxene gabbro in the central part of the island (unit 1). It is heavily intruded by granitic dykes and sheets (unit 2). The second generation of gabbro (unit 3) in the north and south of the island is olivine-bearing and has macroscopic olivine. The body in the south of the island has a chilled margin to the gabbro-granite complex in the centre of the island. Units 4-6 includes gabbro (unit 4) and granite (unit 5) dykes and dolerites of the coast parallel dyke swarm (unit 6).

Petrography: Very limited information in Petersen (1973).

Geochemistry: No information available.

Exploration activity: None.

Exploration results: None.

Comments and company recommendations: None.

Further information: GEUS: T.F.D. Nielsen.
University of Copenhagen: C.K. Brooks.
Stanford University: D.K. Bird

References:

Research papers and description

Brooks, C.K. & Nielsen, T.F.D. 1982: The Phanerozoic development of the Kangerdlugssuaq area, East Greenland. Meddelelser om Grønland, Geoscience 9, 30 pp.

Petersen, T.S. 1973: Layered gabbros of Nordre and Søndre Aputitêq and Pâtûterajivit. In: Brooks, C.K. (ed.): Geological investigations in the Kangerdlugssuaq district, 47-49. Internal report. Copenhagen: Institute of Petrology, University of Copenhagen.

Compiler: T.F.D. Nielsen.

Date: 2002-10-24.

10.4 Ersingerseq intrusion.

Multiphase, dioritic intrusion on Nualik headland and Ersingerseq island. No mineralisations have been reported.

Location:	67°17'N; 33°23'W.
Main references:	Wager (1934) and Rex *et* al. (1979).
Topographic maps:	1:250 000 KMS: 67Ø1 Kruuse Fjord.
Landsat image:	TM path row: 231-013.
Aerial photographs:	1:150 000 KMS flight line 878E, nos 229-231. 1:50 000 KMS flight line 861Q, nos 7374-7376. 1:40 000 KMS flight line A33D, nos 163-166.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication map: *c.* 1: 333 000 in Rex *et* al. (1979).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	Little-known multiphase intrusion is emplaced into Precambrian basement and a sliver of Tertiary basalts and sediments. The basalts and sediments are heavily brecciated by diorite. The breccias are intruded by the main intrusion of clean diorite to quartz diorite. The diorites are in turn veined and brecciated by granitic material with both angular and rounded fragments of diorite. Descriptions are given in Wager (1934) and Rex *et* al. (1979). Rex *et* al. (1979) suggests an age of 55 +/- 7 Ma., but the whole rock "isochron" may, in part, represent a mixing line.
Petrography:	Some information in Rex *et* al. (1979).

Geochemistry: Some information in Rex *et* al. (1979).

Exploration activity: None.

Exploration results: None.

Comments and company recommendations: None.

Further information: University of Copenhagen: C.K. Brooks.

References:

Research papers and descriptions:

Rex, D.C., Gledhill, A.R., Bridgwater, D. & Myers, J.S. 1979:A Rb-Sr whole rock age of 55±7 m.y. from the Nualik plutonic centre, East Greenland. Rapport Grønlands Geologiske Undersøgelse **95**, 102-105.

Wager, L.R. 1934: Geological investigations in East Greenland. Part I. General geology from Angmagsalik to Kap Dalton. Meddelelser om Grønland **105**(2), 46 pp.

Compiler: T.F.D. Nielsen.

Date: 2002-10-25.

10.5 Kruuse Fjord Gabbro complex

Composite and layered, open, gabbro and troctolite complex with subordinate ultramafic and trondhjemitic bodies.
PGE mineralisation in internal contact zone.

Location:	67°18'N; 33°42'W.
Main references:	Arnason *et* al. (1997).
Topographic maps:	1:250 000 KMS: 67Ø1 Kruuse Fjord.
Landsat image:	TM path row: 231-013.
Aerial photographs:	1:150 000 KMS flight line 878E, nos 229-232. KMS flight line 878F, nos 313-316. 1:50 000 KMS flight line 861N, nos 6958-6962. KMS flight line 861O, nos 6885-6891. KMS flight line 861P, nos 7306-7311. 1:40 000 KMS flight line A34G, nos 177-183. KMS flight line A34H, nos 194-201.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Bernstein (1994 and 1996) and Arnason *et* al. (1997).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	Large, 180 km^2, semi-circular, mafic to ultramafic layered complex exposed between and inland from the heads of Kruuse Fjord and Agtertia fjord in heavy glacier terrain. The complex consists of an outer ring of gabbros and a large core of troctolites separated by trondhjemite. The gabbros and troctolites are affected by syn-magmatic deformation and subsidence. An ultramafic intrusion near the head of Kruuse Fjord

forms an up to 800 m wide and 5 km long body of wehrlite (Arnason *et* al., 1997).

The complex post-dates the coast parallel flexure along the North Atlantic margin. Tegner *et* al. (1998) gives an age of 48.0 +/- 1.2 Ma for the gabbro supposed to be early in the development of the complex.

The complex is suggested to be an example of bi-modal mafic-ultramatic magmatism in a rifting environment.

Petrography: Arnason *et* al. (1997).

Geochemistry: Arnason *et* al. (1997).

Exploration activity: ***1987*****:** Platinova Resources Ltd. (Goodwin & Turner, 1989). Reconnaissance, profiling and assays of grab samples.
1989**:** Platinova Resources Ltd. (Turner, 1990). Chip line sampling and reconnaissance.
1993**:** Quadrant Resources PTY Ltd. (Bernstein, 1994). Chip line sampling from western part of the complex.
1995**:** Quadrant Resources PTY Ltd. (Bernstein, 1996) Chip line sampling from discovery area.

Exploration results: A PGE mineralised zone has been identified along the contact between gabbro and wehrlite at the head of Kruuse Fjord. Grab samples give up to 806 ppb Pt, 993 ppb Pd and 293 ppb Au. (Goodwin & Turner, 1988). Follow-up chip lines (Turner, 1990) show up to 469 ppb Pt, 537 ppb Pd and 76 ppb Au over 2 metres.

Follow-up work by Quadrant Resources (Bernstein, 1994 & 1996) confirms many of the findings of Goodwin & Turner (1988) and Turner (1990). Maximum concentrations of >1 g/t PGE are recorded in samples from saw-cut chip lines. As noted by Turner (1990) the mineralisatiomn is discontinuous (Bernstein, 1996).

Comments and company recommendations: Although the mineralisation seems to be discontinuous and even though no real high grade concentrations have been located, Turner (1990) recommends further investigations due to the high Pt/Pd ratio (*c.* 1) and the very large size of the complex. Turner notes the difficult logistics in the Kruuse Fjord complex. Bernstein (1996) does not support further exploration in the Kruuse Fjord complex, as no further minerali

sation were located in follow-up investigations in 1993 and 1995 (Bernstein (1994 and 1996).

Further information: GEUS: Stefan Bernstein.

References:

Research papers and descriptions:

Arnason, J.G., Bird, D.K., Bernstein, S., Rose, N.M. & Manning, C.E. 1997: Petrology and geochemistry of the Kruuse Fjord Gabbro Complex, East Greenland. Geological Magazine 134, 67-89.

Tegner, C., Duncan, R.A., Bernstein, S., Brooks, C.K., Bird, D.K. & Storey, M. 1998: 40Ar-39Ar geochronology of Tertiary mafic intrusions along the East Greenland rifted margin: Relation to flood basalts and the Icelandic hotspot track. Earth and Planetary Science Letters 156, 75-88.

Company reports:

Bernstein, S. 1994: Report on the 1993 field season on the Kruuse Fjord intrusion, East Greenland, 5 pp. Internal report. Australia: Quadrant Resources Pty. (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 21334).

Bernstein, S. 1996: Results of the 1995 fieldwork in the Kruuse Fjord intrusion, East Greenland (licence no, 10/93. 4 pp. Internal report. Australia: Quadrant Resources Pty. (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 21431).

Goodwin, J.A. & Turner, P.A. 1988: East Greenland Kangerdlugssuaq Concession, Summary report of 1987 program, 43 pp. Toronto: Platinova Resources Ltd. (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20844).

Turner, P.A. 1990: Report on the 1989 field season, Kruuse Fjord Concession. 9 pp. Internal report. Platinova Resources Ltd. (in achive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20813).

Compiler: T.F.D. Nielsen.

Date: 2002-10-26.

10.6 Kap Louis Ussing intrusion

Small, well-layered, gabbro intrusion.
No mineralisations have been recorded.

Location:	67°18'23'' N; 33°18'40'' W.
Main references:	Rex *et* al. (1979).
Topographic maps:	1:250 000 KMS: 67Ø1 Kruuse Fjord.
Landsat image:	TM path row: 231-013.
Aerial photographs:	1:150 000 KMS flight line 878E, nos 220-221. 1:50 000 KMS flight line 861R, nos 7433-7435. 1:40 000 KMS flight line A33D, nos 165-167.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication map: *c.* 1: 333 000 in Rex *et* al. (1979).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	Part of small gabbro intrusion with mineral graded layering and slump structure. The intrusion is suggested to be semi-circular and *c.* 1 km across (Rex *et* al., 1979).
Petrography:	No details are published.
Geochemistry:	None available.
Exploration activity:	None.
Exploration results:	None.
Comments and company	

recommendations: None.

Further information:

References: Research papers and descriptions:

Rex, D.C., Gledhill, A.R., Bridgwater, D. & Myers, J.S. 1979: A Rb-Sr whole rock age of 55±7 m.y. from the Nualik plutonic centre, East Greenland. Rapport Grønlands Geologiske Undersøgelse 95, 102-105.

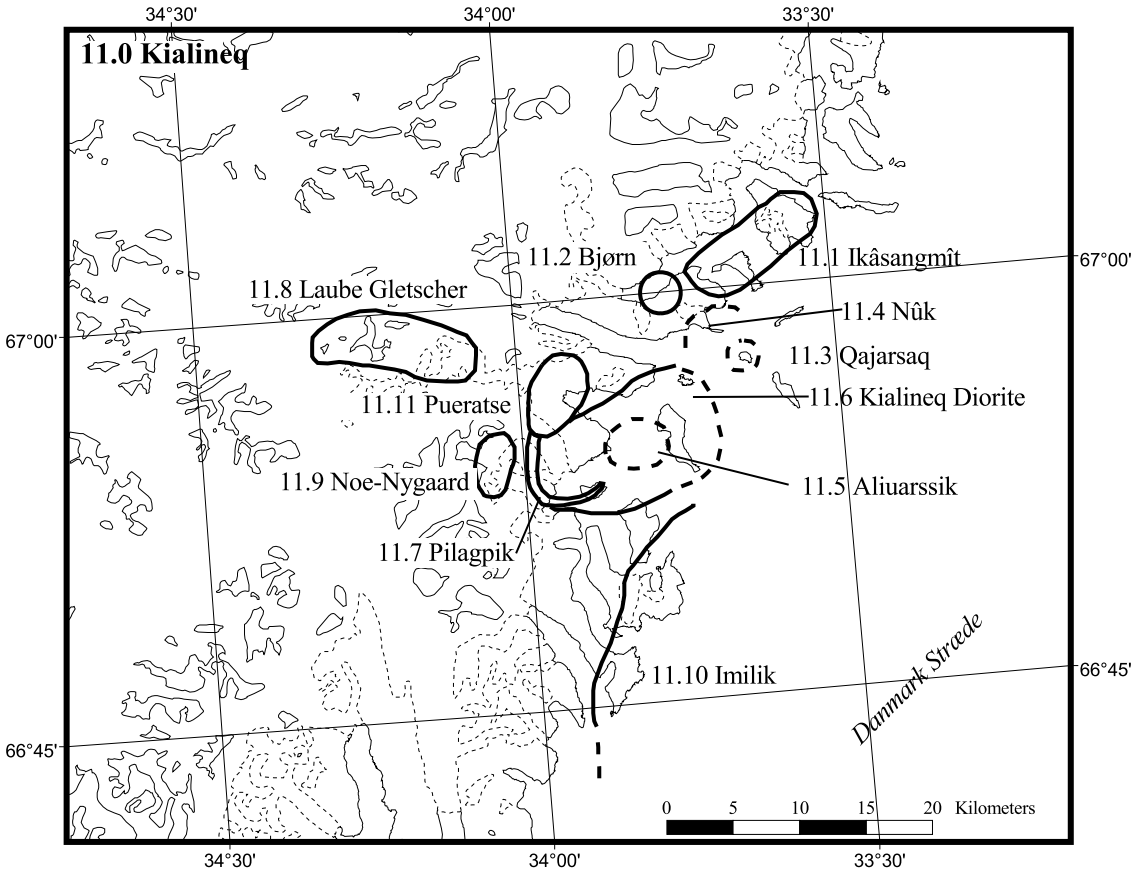
Compiler: T.F.D. Nielsen.

Date: 2002-10-25.

11.0 Kialineq Region

The Kialineq region, which has traditionally been called the Kialineq district, is located 150 km south of the centre of the Kangerlussuaq triple junction (Myers, 1980). The intrusions and complexes are exposed in the archipelago of the Skrækkensbugt (Bay of Fear), the coastal regions to the north and south, and in the inland to the west. In contrast to the intrusive centres to the north and south most of the ages of intrusions and complexes are relatively young (30-40 Ma). Only the older parts of the Imilik gabbro complex (data sheet 11.10) appear to have ages comparable to the intense period of magmatism around the time of continental break-up, i. e., 50-55 Ma ago. The reason for the often young ages in the Kialineq region is not known, but has been suggested related to changes in spreading pattern in the early North Atlantic Ocean.

Only reconnaissance mapping exists for the Kialineq area (e.g., Brown & Becker, 1986 and Bernstein & Bird, 2000). No detailed maps have been published. Some of the intrusions are well-known, others are virtually unknown. Two new intrusions and complexes have been located during expeditions in 1986 and 1995. The dominant mafic intrusion of the region is the Imilik gabbro complex (data sheet 11.10) south of Skrækkensbugt. In the central part of the region J.S. Myers (pers. comm. to S. Bernstein, 2002) defines the ”Skrækkensbugt



complex". This complex is exposed on islands and headland in Skrækkensbugt and consists of dioritic rocks (Kialineq Diorites, data sheet 11.6) as more homogenous masses of diorite, diorite breccias, sheet complexes and dykes of commingled dioritic and felsic melts. The diorite complexes are intruded by felsic intrusions (granite and syenite) emplaced by stoping and ring dykes.

Due to the lack of detailed information the identification of individual complexes is not satisfactory. The "Skrækkensbugt complex" is suggested to include the Kialineq Diorites (data sheet 11.6), the Pueratse complex of diorite lithologies and syenite ring dykes (data sheet 11.11), the Aliuarssik granite (data sheet 11.5) and the Pilagpik syenite ring dyke (data sheet 11.7). Most ages reported from the Skrækkensbugt complex are between 35 and 32 Ma. Further north syenitic rocks form the Ikâsangmit complex (data sheet 11.1) and the Bjørn intrusion (data sheet 11.2) have ages around 38 Ma. Dioritic masses and breccias on Nuuk (data sheet 11.3 and) and the granite on the island Qajarsak (data sheet 11.4) are also around 38 Ma old. Two intrusions occur inland. The mafic Noe-Nygaard intrusion (data sheet 11. 9) and the syenitic Laube Gletscher intrusion (data sheet 9.8).

References

Bernstein, S. & Bird, D.K. 2000: Formation of wehrlites through dehydration of metabasalt xenolith in layered gabbros of the Noe-Nygaard intrusion, Southeast Greenland. Geological Magazine 137(2), 109-128.

Brown, P.E. & Becker, S.M. 1986: Fractionation, hybridisation and magma-mixing in the Kialineq centre, east Greenland. Contributions to Mineralogy and Petrology 92, 57-70.

Myers, J.S. 1980: Structure of the coastal dyke swarm and associated plutonic intrusions of East Greenland. Earth and Planetary Science Letters 46, 407-418.

11.1 Ikâsangmit complex

Qquartz syenite intrusion with marginal diorite breccia and gabbro. No mineralisations are known.

Location:	67°03'23''N; 33°38'51''W.
Main references:	Bernstein & Bird (2000), Brown & Becker (1986) and Deer (1976).
Topographic maps:	1:250 000 KMS: 67Ø1 Kruuse Fjord.
Landsat image:	TM path row 231-013 and MSS250-013.
Aerial photographs:	1:150 000 KMS flight line 878E, nos 234-236. 1:50 000 KMS flight line 861Q, nos 7381-7384. KMS flight line 861R, nos 7424-7428. 1:40 000 KMS flight line A32E, nos 74-78. KMS flight line A33D, nos 155-159.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Bernstein & Bird (2000).
Geophysical maps:	Aeromagnetic Map of Greenland, sheet 3 (63°30' - 68°30'N, 23°00' - 41°00'W); 1:1 000 000 (Geological Survey of Greenland, 1988).
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	A short description is given by Deer (1976). The quartz syenites of Ikâsangmit, including minor areas of gabbro and diorite, is probably ellipsoidal and *c.* 13 km from south-west to north-east and *c.* 5 km wide Bernstein & Bird, 2000). The uncertainty is due to the large parts of the intrusion below sea level and the restricted field information (see the introduction to the Kialineq district, section 11.0). On Ikâsangmit the intrusion has steep contact to the Precambrian basement.

Gleadow & Brooks (1979) give fission track ages of 37-38 Ma. A mineral isochon gives 37 +/-2 Ma. (D.C. Rex, pers. comm., 1985).

On Ikâsangmit the marginal part of the syenite is dominated by inclusions of diorite and is back-veined by rheomorphic melts. Part of the southern contact has been mapped out as a gabbroic to dioritic intrusion on the regional geological map (see publication maps). The main mass of quartz-bearing syenite is intruded by alkali granites and intrusive breccias of mafic material in a granitic matrix.

The inclusion-rich parts of the intrusion show all the typical features of commingling of basic and felsic magmas (Brooks, 1977 and Brown & Becker, 1986).

Petrography: Brown & Becker (2000) and Brown *et* al. (1977).

Geochemistry: Brown & Becker (2000), Brown *et* al. (1977) and unpublished GEUS analyses (J.S. Myers).

Exploration activity: ***1971*****:** Nordisk Mineselskab A/S (Brooks, 1972). Reconnaissance.

Exploration results: No significant anomalies were found. One large hydrothermal alteration zone in Solo Sund.

Comments and company recommendations: Brooks (1972) states (p. 31) that ” No encouraging mineral indications have been found, but this may simply be a result of poor coverage” and (p. 34) ” This area was so poorly explored that no specific recommendations can be made”. Gold assays on samples from pyritized rhyolites are recommended.

Further information: GEUS: T.F.D. Nielsen
Københavns Universitet: C.K. Brooks.

References: Research papers and descriptions:

Bernstein, S. & Bird, D.K. 2000: Formation of wehrlites through dehydration of metabasalt xenolith in layered gabbros of the Noe-Nygaard intrusion, Southeast Greenland. Geological Magazine 137(2), 109-128.

Brooks, C.K. 1977: Example of magma mixing from the Kialineq district of East Greenland. Bulletin of the Geological Society of Denmark 26, 11-83.

Brown, P.E. & Becker, S.M. 1986: Fractionation, hybridisation and magma-mixing in the Kialineq centre, east Green

land. Contributions to Mineralogy and Petrology 92, 57-70.

Brown, P.E., van Breeman, O., Noble, R.H. & Macintyre, R.M. 1977: Mid-Tertiary igneous activity in East Greenland - the Kialineq complex. Contributions to Mineralogy and Petrology 64, 109-122.

Deer, W.A. 1976: Tertiary igneous rocks between Scoresby Sund and Kap Gustav Holm, East Greenland. In: Escher, A. & Watt, W.S. (eds): Geology of Greenland, 404-429. Copenhagen: Grønlands Geologiske Undersøgelse.

Gleadow, A.J.W. & Brooks, C.K. 1979: Fission track dating, thermal histories and tectonics of igneous intrusions in east Greenland. Contributions to Mineralogy and Petrology 71, 45-60.

Company reports (all Kialineq area):

Brooks, C.K. 1972: Report on the prospecting of Group 5 in the Southern Concession Area (Kangerdlugssuaq), 35 pp. Unpublished NM-Report. Copenhagen: Nordisk Mineselskab A/S (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20907).

Compiler: T.F.D. Nielsen.

Date: 2002-10-31.

11.2 Bjørn intrusion

Quartz syenite plug with breccias of basic material.
No mineralisations are reported.

Location:	67°01'N; 33°51'W.
Main references:	Bernstein & Bird (2000), Brown & Becker (1986) and Deer (1976).
Topographic maps:	1:250 000 KMS: 67Ø1 Kruuse Fjord.
Landsat image:	TM path row 231-013 and MSS250-013.
Aerial photographs:	1:150 000 KMS flight line 878E, nos 235-236. 1:50 000 KMS flight line 861Q, nos 7383-7385. 1:40 000 KMS flight line A33D, nos 154-156.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Bernstein & Bird (2000).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	The Bjørn quartz syenite intrusion on the south shore of Nilákâjip kangerdlua is semi-circular, *c.* 4 km across and has steep contacts. The marginal parts are crowded with dioritic inclusions. Deer (1976) states that the intrusion grades into breccias to the northeast. The information is limited. Gleadow & Brooks (1979) give a zircon fission track age of 34.9 +/- 0.9 Ma.
Petrography:	Brown & Becker (2000) and Brown *et* al. (1977).
Geochemistry:	Brown & Becker (2000), Brown *et* al. (1977) and unpublished GEUS analyses (J.S. Myers).

Exploration activity: ***1971***: Nordisk Mineselskab A/S (Brooks, 1972). Reconnaissance.

Exploration results: No significant anomalies were found.

Comments and company recommendations: Brooks (1972) states (p. 31) that " No encouraging mineral indications have been found, but this may simply be a result of poor coverage" and (p. 34) " This area was so poorly explored that no specific recommendations can be made". Gold assays on samples from pyritized rhyolites are recommended.

Further information: GEUS: T.F.D. Nielsen
Københavns Universitet: C.K. Brooks.

References:

Research papers and descriptions:

Bernstein, S. & Bird, D.K. 2000: Formation of wehrlites through dehydration of metabasalt xenolith in layered gabbros of the Noe-Nygaard intrusion, Southeast Greenland. Geological Magazine 137(2), 109-128.

Brooks, C.K. 1977: Example of magma mixing from the Kialineq district of East Greenland. Bulletin of the Geological Society of Denmark 26, 11-83.

Brown, P.E. & Becker, S.M. 1986: Fractionation, hybridisation and magma-mixing in the Kialineq centre, east Greenland. Contributions to Mineralogy and Petrology 92, 57-70.

Brown, P.E., van Breeman, O., Noble, R.H. & Macintyre, R.M. 1977: Mid-Tertiary igneous activity in East Greenland - the Kialineq complex. Contributions to Mineralogy and Petrology 64, 109-122.

Deer, W.A. 1976: Tertiary igneous rocks between Scoresby Sund and Kap Gustav Holm, East Greenland. In: Escher, A. & Watt, W.S. (eds): Geology of Greenland, 404-429. Copenhagen: Grønlands Geologiske Undersøgelse.

Gleadow, A.J.W. & Brooks, C.K. 1979: Fission track dating, thermal histories and tectonics of igneous intrusions in east Greenland. Contributions to Mineralogy and Petrology 71, 45-60.

Company reports (all Kialineq and Nualik area):

Brooks, C.K. 1972: Report on the prospecting of Group 5 in the Southern Concession Area (Kangerdlugssuaq), 35 pp. Unpublished NM-Report. Copenhagen: Nordisk

Mineselskab A/S (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20907).

Compiler: T.F.D. Nielsen.

Date: 2002-10-31.

11.3 Qajarsaq granite intrusion

Quartz-poor granite intrusion.
No mineralisations are reported.

Location:	66°58'N; 33°45'W.
Main references:	Bernstein & Bird (2000), Brown & Becker (1986) and Deer (1976).
Topographic maps:	1:250 000 KMS: 66Ø1 Steenstrups Bræer.
Landsat image:	TM path row 231-013 and MSS250-013.
Aerial photographs:	1:150 000 KMS flight line 878E, nos 235-236. 1:50 000 KMS flight line 861R, nos 7423-7425. 1:40 000 KMS flight line A32C, nos 53-55. KMS flight line A32E, nos 77-79.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Bernstein & Bird (2000).
Geophysical maps:	Aeromagnetic Map of Greenland, sheet 3 (63°30' - 68°30'N, 23°00' - 41°00'W); 1:1 000 000 (Geological Survey of Greenland, 1988).
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	Little-known part of granite intrusion on Qajarsaq island(e.g., Deer, 1976). The name "Matikalaq" has been adopted by J.S. Myers. The intrusion is on publication maps (e.g., Bernstein & Bird, 2000) shown as a circular, plug-like intrusion with a diameter of *c.* 5km. This is only an educated guess as all contacts are below sea level. Studies are restricted to investigations of grab samples. Unpublished age information (K-Ar and Rb-Sr) suggests an age of 38- 40 Ma. (D.C. Rex, pers. comm., 1985). Gleadow &

Brooks (1979) give a zircon fission track age of 34.5 +/- 0.9 Ma.

Petrography: Deer (1976), Brown et al. (1977) and Brown & Becker (2000).

Geochemistry: Deer (1976), Brown & Becker (2000), Brown *et* al. (1977) and unpublished GEUS analyses (J.S. Myers).

Exploration activity: ***1971*****:** Nordisk Mineselskab A/S (Brooks, 1972). Reconnaissance.

Exploration results: No significant anomalies were found.

Comments and company recommendations: Brooks (1972) states (p. 31) that " No encouraging mineral indications have been found, but this may simply be a result of poor coverage" and (p. 34) " This area was so poorly explored that no specific recommendations can be made". Gold assays on samples from pyritized rhyolites are recommended.

Further information: GEUS: T.F.D. Nielsen
Københavns Universitet: C.K. Brooks.

References: Research papers and descriptions:

Bernstein, S. & Bird, D.K. 2000: Formation of wehrlites through dehydration of metabasalt xenolith in layered gabbros of the Noe-Nygaard intrusion, Southeast Greenland. Geological Magazine 137(2), 109-128.

Brooks, C.K. 1977: Example of magma mixing from the Kialineq district of East Greenland. Bulletin of the Geological Society of Denmark 26, 11-83.

Brown, P.E. & Becker, S.M. 1986: Fractionation, hybridisation and magma-mixing in the Kialineq centre, east Greenland. Contributions to Mineralogy and Petrology 92, 57-70.

Brown, P.E., van Breeman, O., Noble, R.H. & Macintyre, R.M. 1977: Mid-Tertiary igneous activity in East Greenland - the Kialineq complex. Contributions to Mineralogy and Petrology 64, 109-122.

Deer, W.A. 1976: Tertiary igneous rocks between Scoresby Sund and Kap Gustav Holm, East Greenland. In: Escher, A. & Watt, W.S. (eds): Geology of Greenland, 404-429. Copenhagen: Grønlands Geologiske Undersøgelse.

Gleadow, A.J.W. & Brooks, C.K. 1979: Fission track dating, thermal histories and tectonics of igneous intrusions in east Greenland. Contributions to Mineralogy and Petrology 71, 45-60.

Company reports (all Kialineq area):

Brooks, C.K. 1972: Report on the prospecting of Group 5 in the Southern Concession Area (Kangerdlugssuaq), 35 pp. Unpublished NM-Report. Copenhagen: Nordisk Mineselskab A/S (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20907).

Compiler: T.F.D. Nielsen.

Date: 2002-10-31.

11.4 Nûk intrusion

Diorite and syenite breccia intrusion.
No mineralisations are reported.

Location:	66°59'N; 33°47'30''W.
Main references:	Brooks (1977).
Topographic maps:	1:250 000 KMS: 66Ø1 Steenstrups Bræer.
Landsat image:	TM path row 231-013 and MSS250-013.
Aerial photographs:	1:150 000 KMS flight line 878E, nos 235-236. 1:50 000 KMS flight line 861R, nos 7423-7425. 1:40 000 KMS flight line A32A, nos 55-58. KMS flight line A33D, nos 154-156.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Bernstein & Bird (2000).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	Complex of diorite breccias on the headland northwest of Qajarsaq. Breccias and dykes and sheets of commingled felsic and mafic magmas appear to overly a biotite-bearing microdiorite. Brooks (1977) described samples from Nuuk. The inland areas of the intrusion towards the Bjørn syenite intrusion have not been mapped. No age has been published, but the intrusion is believed to be around 35 Ma old.
Petrography:	Brooks (1977).
Geochemistry:	Brooks (1977).

Exploration activity: ***1971***: Nordisk Mineselskab A/S (Brooks, 1972). Reconnaissance.

Exploration results: No significant anomalies were found.

Comments and company recommendations: Brooks (1972) states (p. 31) that ” No encouraging mineral indications have been found, but this may simply be a result of poor coverage” and (p. 34) ” This area was so poorly explored that no specific recommendations can be made”. Gold assays on samples from pyritized rhyolites are recommended. These statements apply to the entire Kialined district.

Further information: GEUS: T.F.D. Nielsen
Københavns Universitet: C.K. Brooks.

References:

Research papers and descriptions:

Bernstein, S. & Bird, D.K. 2000: Formation of wehrlites through dehydration of metabasalt xenolith in layered gabbros of the Noe-Nygaard intrusion, Southeast Greenland. Geological Magazine **137**(2), 109-128.

Brooks, C.K. 1977: Example of magma mixing from the Kialineq district of East Greenland. Bulletin of the Geological Society of Denmark **26**, 11-83.

Company reports (all Kialineq area):

Brooks, C.K. 1972: Report on the prospecting of Group 5 in the Southern Concession Area (kangerdlugssuaq), 35 pp. Unpublished NM-Report. Copenhagen: Nordisk Mineselskab A/S (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20907).

Compiler: T.F.D. Nielsen.

Date: 2002-10-31.

11.5 Aliuarssik granite intrusion

Granite intrusion.
No mineralisations are reported.

Location:	66°55'40''N; 33°54'30''W.
Main references:	Bernstein & Bird (2000), Brown & Becker (1986) and Deer (1976).
Topographic maps:	KMS: 1:250 000: 66Ø1 Steenstrups Bræer.
Landsat image:	TM path row 231-013 and MSS250-013.
Aerial photographs:	1:150 000 KMS line 878E, nos. 236-238. 1:50 000 KMS flight line 861Q, nos 7386-7389. KMS flight line 861R, nos 7421-7423. 1:40 000 KMS flight line A33D, nos 151-154.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Bernstein & Bird (2000).
Geophysical maps:	Aeromagnetic Map of Greenland, sheet 3 (63°30' - 68°30'N, 23°00' - 41°00'W); 1:1 000 000 (Danmarks og Grønlands Geologiske Undersøgelse, 1988).
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	The Aliuarssik granite intrusion is exposed on Nuluk headland and the west coast of Aliuarssik island. The contacts are steep on Nuluk, but deep 30° outward onAliuarssik. The granite is believed to form a *c.* 5 km wide stock. Unpublished age information (K-Ar and Rb-Sr) suggests an age around 35 Ma (D.C. Rex, pers. comm., 1985). Gleadow & Brooks (1979) give fission track ages between 36 and 39 Ma. Detailed descriptions are given by Brown & Becker (1986).

Petrography: Deer (1976), Brown *et* al. (1977) and Brown & Becker (2000).

Geochemistry: Deer (1976), Brown *et* al. (1977), Brown & Becker (2000) and unpublished GEUS whole rock analyses (J.S. Myers).

Exploration activity: ***1971***: Nordisk Mineselskab A/S (Brooks, 1972). Reconnaissance.

Exploration results: No significant anomalies were found.

Comments and company recommendations: Brooks (1972) states (p. 31) that " No encouraging mineral indications have been found, but this may simply be a result of poor coverage" and (p. 34) " This area was so poorly explored that no specific recommendations can be made". Gold assays on samples from pyritized rhyolites are recommended.

Further information: GEUS: T.F.D. Nielsen
Københavns Universitet: C.K. Brooks.

References:

Research papers and descriptions:

Bernstein, S. & Bird, D.K. 2000: Formation of wehrlites through dehydration of metabasalt xenolith in layered gabbros of the Noe-Nygaard intrusion, Southeast Greenland. Geological Magazine 137(2), 109-128.

Brown, P.E. & Becker, S.M. 1986: Fractionation, hybridisation and magma-mixing in the Kialineq centre, east Greenland. Contributions to Mineralogy and Petrology 92, 57-70.

Brown, P.E., van Breemen, O., Noble, R.H. & Macintyre, R.M. 1977: Mid-Tertiary igneous activity in East Greenland - the Kialineq complex. Contributions to Mineralogy and Petrology 64, 109-122.

Deer, W.A. 1976: Tertiary igneous rocks between Scoresby Sund and Kap Gustav Holm, East Greenland. In: Escher, A. & Watt, W.S. (eds): Geology of Greenland, 404-429. Copenhagen: Grønlands Geologiske Undersøgelse.

Gleadow, A.J.W. & Brooks, C.K. 1979: Fission track dating, thermal histories and tectonics of igneous intrusions in east Greenland. Contributions to Mineralogy and Petrology 71, 45-60.

Company reports (all Kialineq area):

Brooks, C.K. 1972: Report on the prospecting of Group 5 in the Southern Concession Area (kangerdlugssuaq), 35 pp. Unpublished NM-Report. Copenhagen: Nordisk

Mineselskab A/S (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20907).

Compiler: T.F.D. Nielsen.

Date: 2002-10-31.

11.6 Kialineq Diorite intrusion

Large area dominated breccias and pillowed dyke complexes surrounding the Auluartik Granite intrusion.
No mineralisations are reported.

Location:	66°53'N; 33°58W.
Main references:	Brown & Becker (1986).
Topographic maps:	1:250 000 KMS: 66Ø1 Steenstrups Bræer.
Landsat image:	TM path row 231-013 and MSS250-013.
Aerial photographs:	1:150 000 KMS line 878E, nos 236-238. 1:50 000 KMS flight line 861P, nos 7295-7300. KMS flight line 861Q, nos 7385-7390. KMS flight line 861R, nos 7420-7424. 1:40 000 KMS flight line A32B, nos 36-42. KMS flight line A32E, nos 79-83. KMS flight line A33D, nos 150-155.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Bernstein & Bird (2000). Unpublished maps: GEUS, sketch map by D.C. Rex
Geophysical maps:	Aeromagnetic Map of Greenland, sheet 3 (63°30' - 68°30'N, 23°00' - 41°00'W); 1:1 000 000 (Geological Survey of Greenland, 1988).
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	Large area of dioritic breccias and dikes and sheets of commingled basic and felsic melts surrounding the Aliuarssik Granite intrusion (see section 11.5). The dioritic breccias, and the commingled melts commonly referred to as the "Kialineq Diorite" of the "Skrækkensbugt Complex" (see section 11.0)

are exposed on the island of Uvingaleq, Aliuarssik, Lilleø and Pilagpik, on the headland Nûluk and the headland to the south of Pueratse bay and in inland areas on the south side of Laube Gletscher. Much of the suggested contact of this intrusive area is submerged and contacts in the inland areas are not well-defined.

The ”Kialineq Diorite” is intruded by the Aliuarssik granite intrusion (section 11.5). Unpublished age information (K-Ar and Rb-Sr) suggests Kialineq Diorite to be 34-36 Ma. old and broadly synchronous with the Aliuarssik Granite intrusion in the centre of the Kialineq Diorite intrusion (D.C. Rex, pers. comm., 1985).

It is not clear if the area assigned to the Kialineq Diorite intrusion in fact represents more centres of dioritic breccia and commingled material (see section 11.0).

Petrography: Deer (1976), Brown *et* al. (1977) and Brown & Becker (2000).

Geochemistry: Deer (1976), Brown and Becker (2000), Brown *et* al. (1977) and unpublished GEUS analyses (J.S. Myers).

Exploration activity: ***1971*****:** Nordisk Mineselskab A/S (Brooks, 1972). Reconnaissance.

Exploration results: No significant anomalies were found.

Comments and company recommendations: Brooks (1972) states (p. 31) that ” No encouraging mineral indications have been found, but this may simply be a result of poor coverage” and (p. 34) ” This area was so poorly explored that no specific recommendations can be made”. Gold assays on samples from pyritized rhyolites are recommended.

Further information: GEUS: T.F.D. Nielsen and S. Bernstein.
Københavns Universitet: C.K. Brooks.

References: Research papers and descriptions:

Bernstein, S. & Bird, D.K. 2000: Formation of wehrlites through dehydration of metabasalt xenolith in layered gabbros of the Noe-Nygaard intrusion, Southeast Greenland. Geological Magazine 137(2), 109-128.

Brooks, C.K. 1977: Example of magma mixing from the Kialineq district of East Greenland. Bulletin of the Geological Society of Denmark 26, 11-83.

Brown, P.E. & Becker, S.M. 1986: Fractionation, hybridisation and magma-mixing in the Kialineq centre, east Greenland.Contribtions to Mineralogy and Petrology 92, 57-70.

Brown, P.E., van Breeman, O., Noble, R.H. & Macintyre, R.M. 1977: Mid-Tertiary igneous activity in East Greenland - the Kialineq complex. Contributions to Mineralogy and Petrology 64, 109-122.

Deer, W.A. 1976: Tertiary igneous rocks between Scoresby Sund and Kap Gustav Holm, East Greenland. In: Escher, A. & Watt, W.S. (eds): Geology of Greenland, 404-429. Copenhagen: Grønlands Geologiske Undersøgelse.

Gleadow, A.J.W. & Brooks, C.K. 1979: Fission track dating, thermal histories and tectonics of igneous intrusions in east Greenland. Contributions to Mineralogy and Petrology 71, 45-60.

Company reports (all Kialineq area):

Brooks, C.K. 1972: Report on the prospecting of Group 5 in the Southern Concession Area (kangerdlugssuaq), 35 pp. Unpublished NM-Report. Copenhagen: Nordisk Mineselskab A/S (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20907).

Compiler: T.F.D. Nielsen.

Date: 2002-10-31.

11.7 Pilagpik syenite intrusion

Large syenite ring dyke.
No mineralisations are reported.

Location:	66°53'15''N; 34°01'30''W.
Main references:	Brown & Becker (1986).
Topographic maps:	1:250 000 KMS: 66Ø1 Steenstrups Bræer.
Landsat image:	TM path row 231-013 and MSS250-013.
Aerial photographs:	1:150 000 KMS flight line 878E, nos 237-239. 1:50 000 KMS flight line 861P, nos 7295-7298. KMS flight line 861Q, nos 7387-7391. 1:40 000 KMS flight line A32B, nos 36-39. KMS flight line A33D, nos 150-152.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988) Publication maps: Brown *et* al. (1977) Unpublished: GEUS, sketch map (D.C. Rex, pers comm., 1985).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	Little-known up to ca. 14 km long and 1 km wide syenite ring dike. The dike cuts through Pilagpik island, follows the south coast of Suvtiutsarqorôq bay and swings nortwest and north toward the south margin of Laube Gletscher. The ring dike seems intruded in the western contact between basement and the Kialineq diorite. In accordance with the field information a K-Ar hornblende age of 32 Ma is suggested (D.C. Rex. pers. comm., 1985). Rex also gives a mineral isochron with an age of 37+/-2 Ma. This age is probably too old.

No detailed information is published.

Petrography: No data is available.

Geochemistry: Unpublished GEUS analyses (J.S. Myers).

Exploration activity: ***1971:*** by Nordisk Mineselskab S/S (Brooks, 1972). Regional reconnaissance.

Exploration results: No mineralisations are reported.

Comments and company recommendations: Brooks (1972) states (p. 31) that ” No encouraging mineral indications have been found, but this may simply be a result of poor coverage” and (p. 34) ” This area was so poorly explored that no specific recommendations can be made”. Gold assays on samples from pyritized rhyolites are recommended.

Further information: GEUS: T.F.D. Nielsen and S. Bernstein.
Københavns Universitet: C.K. Brooks.

References:

Research papers and descriptions:

Brown, P.E. & Becker, S.M. 1986: Fractionation, hybridisation and magma-mixing in the Kialineq centre, east Greenland. Contributions to Mineralogy and Petrology 92, 57-70.

Brown, P.E., van Breeman, O., Noble, R.H. & Macintyre, R.M. 1977: Mid-Tertiary igneous activity in East Greenland - the Kialineq complex. Contributions to Mineralogy and Petrology 64, 109-122.

Company reports (all Kialineq area):

Brooks, C.K. 1972: Report on the prospecting of Group 5 in the Southern Concession Area (kangerdlugssuaq), 35 pp. Unpublished NM-Report. Copenhagen: Nordisk Mineselskab A/S (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20907).

Compiler: T.F.D. Nielsen.

Date: 2002-11-04

11.8 Laube Gletscher syenite intrusion

Large, little-known syenite intrusion.
No mineralisations are reported.

Location:	66°58'N; 34°15'W.
Main references:	None.
Topographic maps:	1:250 000 KMS: 66Ø1 Steenstrups Bræer.
Landsat image:	TM path row 231-013 and MSS250-013.
Aerial photographs:	1:150 000 KMS flight line 878E, nos 236-238. KMS flight line 878F, nos 306-307. 1:50 000 KMS flight line 861N, nos 6972-6974. KMS flight line 861O, nos. 6874-6877. KMS flight line 861P, nos 7298-7299. 1:40 000 KMS flight line A32G, nos 132-134.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Bernstein & Bird (2000). Unpublished maps: GEUS, sketch map (D.C. Rex, pers. comm., 1985).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	The Laube Gletscher syenite is exposed in the mountain ridge on the north side of Laube Gletsher and in nunataks to the WNW. It covers an ellipsoidal area 10 km (WNW-ESE) and up to 5 km (NNE-SSW). A few samples have been investigated, but no data has been published. The syenite is emplaced into the Precambrian basement. An unpublished biotite K-Ar age of *c.* 35 Ma is given by Rex (D.C. Rex, pers. comm., 1985).

Petrography: None.

Geochemistry: None.

Exploration activity: ***1971***: Nordisk Mineselskab A/S (Brooks, 1972). Reconnaissance.

Exploration results: No significant anomalies were found.

Comments and company recommendations: Brooks (1972) states (p. 31) that ” No encouraging mineral indications have been found, but this may simply be a result of poor coverage” and (p. 34) ” This area was so poorly explored that no specific recommendations can be made”. Gold assays on samples from pyritized rhyolites are recommended.

Further information: GEUS: T.F.D. Nielsen and S. Bernstein.
Københavns Universitet: C.K. Brooks.

References:

Research papers and descriptions:

Bernstein, S. & Bird, D.K. 2000: Formation of wehrlites through dehydration of metabasalt xenolith in layered gabbros of the Noe-Nygaard intrusion, Southeast Greenland. Geological Magazine **137**(2), 109-128.

Company reports (all Kialineq area):

Brooks, C.K. 1972: Report on the prospecting of Group 5 in the Southern Concession Area (kangerdlugssuaq), 35 pp. Unpublished NM-Report. Copenhagen: Nordisk Mineselskab A/S (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20907).

Compiler: T.F.D. Nielsen.

Date: 2002-10-31.

11.9 Noe-Nygaard intrusion

Gabbro and wehrlite stock.
No mineralisations are reported.

Location:	66°54'N; 34°12'W.
Main references:	Bernstein & Bird (2000).
Topographic maps:	1:250 000 KMS: 66Ø1 Steenstrups Bræer.
Landsat image:	TM path row 231-013 and MSS250-013.
Aerial photographs:	1:150 000 KMS flight line 878E, nos 237-239. 1:50 000 KMS flight line 861P, nos 7295-7298. KMS flight line 861Q, nos 7388-7391. 1:40 000 KMS flight line A32B, nos 37-39.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Bernstein & Bird (2000).
Geophysical maps:	None.
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	The Noe-Nygaard gabbro and wehrlite intrusion is ellipsoidal in shape and 4 km N-S and 2.5 km E-W. It is emplaced into Precambrian basement. The gabbros are rich in basaltic inclusions. The gabbro is replaced and intruded by wehrlite believed formed by dissolution of plagioclase in gabbros. No radiometric age information is available. Detailed information is given in Bernstein & Bird (2000).
Petrography:	Bernstein & Bird (2000).
Geochemistry:	Bernstein & Bird (2000).

Exploration activity: None.

Exploration results: None.

Comments and company recommendations: None.

Further information: GEUS: S. Bernstein.

References: Research papers and descriptions:

Bernstein, S. & Bird, D.K. 2000: Formation of wehrlites through dehydration of metabasalt xenolith in layered gabbros of the Noe-Nygaard intrusion, Southeast Greenland. Geological Magazine 137(2), 109-128.

Compiler: T.F.D. Nielsen.

Date: 2002-11-04.

11.10 Imilik gabbro complex

Large, replenished, layered tholeiitic gabbro complex.
No mineralisations are reported.

Location:	66°48'N; 33°55'W.
Main references:	Brown & Farmer (1972), Brown *et* al. (1977), Myers (1980) and Bernstein *et* al. (1998).
Topographic maps:	1:250 000 KMS: 66Ø1 Steenstrups Bræer.
Landsat image:	TM path row 231-013 and MSS250-013.
Aerial photographs:	1:150 000 KMS flight line 878D, nos 208-214. 1:50 000 KMS flight line 861R, nos 7417-7421. KMS flight line 861S, nos 7383-7493. 1:40 000 KMS flight line A32C, nos 51-53. KMS flight line A32E, nos 82-86. KMS flight line A34F, nos 107-111 and 113-115.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Brown & Farmer (1972).
Geophysical maps:	Aeromagnetic Map of Greenland, sheet 3 (63°30' - 68°30'N, 23°00' - 41°00'W); 1:1 000 000 (Geological Survey of Greenland, 1988).
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	The Imilik gabbro complex has been known for several decades, but nevertheless only quite limited information has been published. The gabbers are believed to represent 3 individual pulses of relatively It-poor, tholeiitic magma that produced three overlying successions of cumulates separated by unconformities (Myers, 1980). The Imilik gabbros are exposed on headlands and islands from Nûgtuaq, over Imilik island

and the larger unnamed island to the west and possibly to the island Lille Tindholm about 16 km to the northeast.

Tegner at al. (1998) refer to the three units in the Imilik Gabbro complex as Imilik Intrusions I-III. Imilik II has given an Ar-Ar age of 56.2 +/- 0.2 Ma, whereas Imilik intrusion III gives ages of 49-52 Ma. No age is available for the oldest unit, Imilik Intrusion I.

Petrography: Limited data in Brown & Farmer (1972) and Brown *et* al. (1977).

Geochemistry: Deer (1976), Bernstein *et* al. (1998) and unpublished GEUS analyses (J.S. Myers).

Exploration activity: None.

Exploration results: None.

Comments and company recommendations: None.

Further information: GEUS: S. Bernstein
Københavns Universitet: C.K. Brooks.

References: Research papers and descriptions:

Bernstein, S., Kelemen, P.B., Tegner, C., Kurz, M.D., Blusztajn, J. & Brooks, C.K. 1998: Post-breakup basaltic magmatism along the East Greenland Tertiary rifted margin. Earth and Planetary Science Letters **160**, 845-862.

Brown, P.E. & Farmer, D.G. 1972: Size-graded layering in the Imilik gabbro, East Greenland. Geological Magazine **108**, 465-476.

Brown, P.E., van Breeman, O., Noble, R.H. & Macintyre, R.M. 1977: Mid-Tertiary igneous activity in East Greenland - the Kialineq complex. Contributions to Mineralogy and Petrology **64**, 109-122.

Deer, W.A. 1976: Tertiary igneous rocks between Scoresby Sund and Kap Gustav Holm, East Greenland. In: Escher, A. & Watt, W.S. (eds): Geology of Greenland, 404-429. Copenhagen: Grønlands Geologiske Undersøgelse.

Myers, J.S. 1980: Structure of the coastal dyke swarm and associated plutonic intrusions of East Greenland. Earth and Planetary Science Letters **47**, 407-418.

Tegner, C., Duncan, R.A., Bernstein, S., Brooks, C.K., Bird, D.K. & Storey, M. 1998: 40Ar-39Ar geochronomlogy of

Tertiary mafic intrusions along the East Greenland rifted margin: Relation to flood basalts and the Icelandic hot-spot track. Earth and Planetary Science Letters **156**, 75-88.

Compiler: T.F.D. Nielsen.

Date: 2002-11-05.

11.11 Pueratse complex

Diorite breccia complex with syenite ring dykes.
No mineralisations are reported.

Location: 66°58'N; 34°04'W.

Main references: None.

Topographic maps: 1:250 000
KMS: 66Ø1 Steenstrups Bræer.

Landsat image: TM path row 231-013 and MSS250-013.

Aerial photographs: 1:150 000
KMS flight line 878E, nos 236-238.
1:50 000
KMS flight line 861P, nos 7298-7299.
1:40 000
KMS flight line A32B, nos 39-41.

Geological maps: Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988).
Publication maps: Bernstein & Bird (2000).
Unpublished maps: GEUS, sketch map (D.C. Rex, pers. comm., 1985).

Geophysical maps: None.

Hyperspectral data: None.

Geochemical maps: None.

Short description: The Pueratse complex is not well-defined. Two ring dykes, Pueratse Syenite 1 and Pueratse Syenite 2 are emplaced into dioritic breccias and commingled acid and basic melts. The breccias and commingled melts are all part of the "Skrækkensbugt complex", but they may constitute an intrusion of "Kialineq Diorite" in its own rights (see section 11.0). Bernstein & Bird (2000) shows the ellipsoidal outline of a plutonic centre at the head of Pueratse bay. The complex would be *c.* 5.5 km N-S and 4 km E-W.

The syenitic ring dykes are shown in the unpublished sketch map (D.C. Rex, pers. comm., 1985). The outer ring dike (Pu

eratse Syenite 1) almost circumscribe the entire complex and is up to 2 km wide. The second ring dike (Pueratse Syenite 2) is only partially developed in the central part of the complex and only up to 0.5 km wide.

Petrography: None.

Geochemistry: Unpublished GEUS analyses (J.S. Myers).

Exploration activity: ***1971***: Nordisk Mineselskab A/S (Brooks, 1972). Reconnaissance.

Exploration results: No significant anomalies were found.

Comments and company recommendations: Brooks (1972) states (p. 31) that " No encouraging mineral indications have been found, but this may simply be a result of poor coverage" and (p. 34) " This area was so poorly explored that no specific recommendations can be made". Gold assays on samples from pyritized rhyolites are recommended.

Further information: GEUS: S. Bernstein.
Københavns Universitet: C.K. Brooks.

References:

Research papers and descriptions:

Bernstein, S. & Bird, D.K. 2000: Formation of wehrlites through dehydration of metabasalt xenolith in layered gabbros of the Noe-Nygaard intrusion, Southeast Greenland. Geological Magazine **137**(2), 109-128.

Company reports (all Kialineq area):

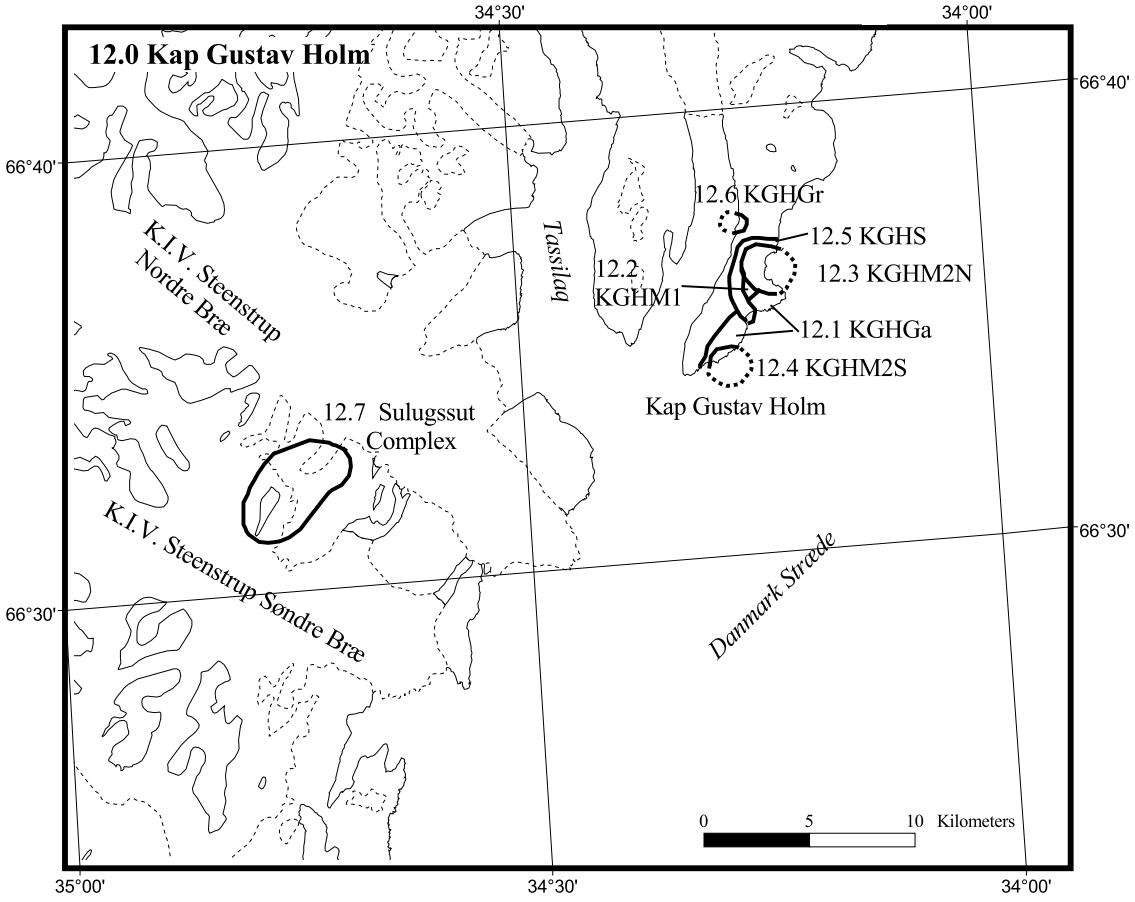
Brooks, C.K. 1972: Report on the prospecting of Group 5 in the Southern Concession Area (kangerdlugssuaq), 35 pp. Unpublished NM-Report. Copenhagen: Nordisk Mineselskab A/S (in archive of Danmarks og Grønlands Geologiske Undersøgelse, GRF no. 20907).

Compiler: T.F.D. Nielsen.

Date: 2002-11-05.

12. Kap Gustav Holm region

The Kap Gustav Holm region encompasses the most southerly intrusions and complexes of the Palaeogene magmatic province along the east coast of Greenland. The area is located c. 190 km south of the Kangerlussuaq triple junction. A regional is given by Myers (1980) and of the Kap Gustav Holm by Myers *et* al. (1993).



12.1 KGHGa: Kap Gustav Holm Gabbro intrusion (gabbro).
12.2 KGHM1: Kap Gustav Holm Monzonite 1 intrusion.
12.3 KGHM2N: Kap Gustav Holm Monzonite 2 North intrusion.
12.4 KGHM2S: Kap Gustav Holm Monzonite 2 South intrusion.
12.5 KGHS: Kap Gustav Holm Syenites.
12.6 KGHGr Kap Gustav Holm Granite intrusion.

All intrusions and complexes, with the exception of the Sulugssut complex can be referred to the ”Kap Gustav Holm center” located in centrally in a segment of the coast parallel dyke

swarm. The ”Kap Gustav Holm center” includes the layered and replenished Kap Gustav Holm Gabbro intrusion (data sheet 12.1) and syenite, granite and monzonite intrusion, of which only the Kap Gustav Holm gabbro and the Kap Gustav Holm Monzonite 2 North intrusion (data sheet 12, 3) have a significant volume onshore. All the intrusions in the ”Kap Gustav Holm centre” are between 50 and 55 Ma old.

The nephelinitic Sulugssut complex (Brooks *et* al., 1989) is located 20 km SW of Kap Gustav Holm on the continental side of the coast parallel flexure.

References

Brooks, C.K, Dawes, P.R. & Soper, N.J. 1989: The Sulugssut intrusive complex: a new Tertiary alkaline centre in East Greenland. Rapport Grønlands Geologiske Undersøgelse **146**, 95-102.

Myers, J.S., Gill, R.C.O., Rex, D.C. & Charnley, N.R. 1993: The Kap Gustav Holm Tertiary Plutonic Centre, East Greenland. Journal of the Geological Society London **150**, 259-276.

12.1 Kap Gustav Holm Gabbro intrusion

Layered gabbro intrusion.
No mineralisations are reported.

Location: 66°34'30''N; 34°19'20''W.

Main references: Myers *et* al. (1993).

Topographic maps: 1:250 000
KMS: 66Ø1 Steenstrups Bræer.

Landsat image: TM path row 231-013 and MSS 250-013.

Aerial photographs: 1:150 000
KMS flight line 878D, nos 205-207.
1:50 000
KMS flight line 861R, nos 7410-7414.
KMS flight line 861S, nos 7497-7500.
1:40 000
KMS flight line A32E, nos 90-92.

Geological maps: Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988).
Publication maps: Myers *et* al. (1993).

Geophysical maps: Aeromagnetic Map of Greenland, sheet 3 (63°30' - 68°30'N, 23°00' - 41°00'W); 1:1 000 000 (Geological Survey of Greenland, 1988).

Hyperspectral data: None.

Geochemical maps: None.

Short description: The Kap Gustav Holm Gabbro intrusion is exposed on the southeast coast of Kap Gustav Holm and 3 km to the east on the small island Nanertalik. Most of the intrusion is submerged, but it may have be 5 or more kilometres across. The intrusion has been tilted seawards in the coast parallel flexure. To the north the gabbro is truncated by later not tilted monzonite intrusions and intruded by syenite dykes. Based on the relation to the coast parallel dike swarm the age is supposed to be *c.* 55 Ma (Myers *et* al., 1993). The Kap Gustav Holm Monzonite 2 South intrusion that cuts the gabbros at the

southeast coast of Kap Gustav Holm has given a biotite Rb-Sr age of 50 +/- 3 Ma. (D.C. Rex, pers. comm., 1985).

The gabbros are described in detail by Myers *et* al. (1993). They identify: (1) a 100 m thick basal contact zone of olivine gabbros with evidence for syn-magmatic deformation and re-crystallisation, (2) the Lower Series of massive olivine gabbros up to 1500 m thick, (3) the Upper Series of gabbros up to at least 700 m thick and (4) gabbro permatites that are emplaced in units (1)-(3). Reversals in the compositions of liquidus phase suggests repeated pulses of new magma.

Petrography: Myers *et* al. (1993).

Geochemistry: Myers *et* al. (1993).

Exploration activity: None. Reconnaissance Pt, Pd and Au analyses for a limited number of samples (GEUS: T.F.D. Nielsen, unpublished).

Exploration results: No significant anomalies were found (GEUS, T.F.D. Nielsen, unpublished).

Comments and company recommendations: None.

Further information: GEUS: T.F.D. Nielsen and S. Bernstein.
Københavns Universitet: C.K. Brooks.

References: Research papers and descriptions:

Myers, J.S., Gill, R.C.O., Rex, D.C. & Charnley, N.R. 1993: The Kap Gustav Holm Tertiary Plutonic Centre, East Greenland. Journal of the Geological Society London 150, 259-276.

Compiler: T.F.D. Nielsen.

Date: 2002-11-13.

12.2 Kap Gustav Holm Monzonite 1 intrusion

Monzonite intrusion.
No mineralisations are reported.

Location:	66°36'N; 34°18'W.
Main references:	Myers *et* al. (1993).
Topographic maps:	1:250 000 KMS: 66Ø1 Steenstrups Bræer.
Landsat image:	TM path row 231-013 and MSS 250-013.
Aerial photographs:	1:150 000 KMS flight flight line 878D, nos 205–207. 1:50 000 KMS flight line 861R, nos 7411-7414. 1:40 000 KMS flight line A32E, nos 90-92.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Myers *et* al. (1993).
Geophysical maps:	Aeromagnetic Map of Greenland, sheet 3 (63°30' - 68°30'N, 23°00' - 41°00'W); 1:1 000 000 (Geological Survey of Greenland, 1988).
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	Part of hornblende monzonite intrusion at the northwestern margin of the Kap Gustav Holm Gabbro intrusion. The intrusion has steep contacts. It is cut by the later Kap Gustav Holm Monzonite 2 North intrusion and the Kap Gustav Holm Syenites.
Petrography:	Myers *et* al. (1993).
Geochemistry:	Myers *et* al. (1993).
Exploration activity:	None.

Exploration results: None.

Comments and company recommendations: None.

Further information: GEUS: T.F.D. Nielsen and S. Bernstein.
Københavns Universitet: C.K. Brooks.

References: Research papers and descriptions:

Myers, J.S., Gill, R.C.O., Rex, D.C. & Charnley, N.R. 1993: The Kap Gustav Holm Tertiary Plutonic Centre, East Greenland. Journal of the Geological Society London 150, 259-276.

Compiler: T.F.D. Nielsen.

Date: 2002-11-05.

12.3 Kap Gustav Holm Monzonite 2 North intrusion

Monzonite stock.
No mineralisations are reported.

Location:	66°36''N; 34°15'W.
Main references:	Myers *et* al. (1993).
Topographic maps:	1:250 000 KMS: 66Ø1 Steenstrups Bræer.
Landsat image:	TM path row 231-013 and MSS 250-013.
Aerial photographs:	1:150 000 KMS flight line 878D, nos. 206-207. 1:50 000 KMS flight line 861R, nos 7411-7414. KMS flight line 861S, nos 7497-7499. 1:40 000 KMS flight line A32E, nos 89-91.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Myers *et* al. (1993).
Geophysical maps:	Aeromagnetic Map of Greenland, sheet 3 (63°30' - 68°30'N, 23°00' - 41°00'W); 1:1 000 000 (Geological Survey of Greenland, 1988).
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	The circular Kap Gustav Holm Monzonite 2 North intrusion is semi-circular and 2.5 km across. It intrudes the Kap Gustav Holm Gabbro intrusion and the Kap Gustav Holm Monzonite 1. It appears emplaced after the tilting of Palaeogene sediments and volcanics and the Kap Gustav Holm intrusion. The monzonite carries inclusions of basaltic volcanics and is suggested emplaced by stoping. The intrusion has not been dated, but is suggested to be contemporaneous with the Kap Gustav Holm Monzonite 2 North intrusion.

Petrography:	Myers *et* al. (1993).
Geochemistry:	Myers *et* al. (1993).
Exploration activity:	None.
Exploration results:	None.
Comments and company recommendations:	None.
Further information:	GEUS: T.F.D. Nielsen and S. Bernstein. Københavns Universitet: C.K. Brooks.
References:	Research papers and descriptions:

Myers, J.S., Gill, R.C.O., Rex, D.C. & Charnley, N.R. 1993: The Kap Gustav Holm Tertiary Plutonic Centre, East Greenland. Journal of the Geological Society London 150, 259-276.

Compiler:	T.F.D. Nielsen.
Date:	2002-11-05.

12.4 Kap Gustav Holm Monzonite 2 South intrusion

Rim of syenite intrusion.
No mineralisations are reported.

Location:	66°34'20''N; 34°18'50''W.
Main references:	Myers *et* al. (1993).
Topographic maps:	1:250 000 KMS: 66Ø1 Steenstrups Bræer.
Landsat image:	TM path row 231-013 and MSS 250-013.
Aerial photographs:	1:150 000 KMS flight line 878D, nos 205-206. 1:50 000 KMS flight line 861S, nos 7498-7500. 1:40 000 KMS flight line A32E, nos 91-92
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Myers *et* al. (1993).
Geophysical maps:	Aeromagnetic Map of Greenland, sheet 3 (63°30' - 68°30'N, 23°00' - 41°00'W); 1:1 000 000 (Geological Survey of Greenland, 1988).
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	The Kap Gustav Holm Monzonite 2 South intrusion is only exposed on the SE coast of Kap Gustav Holm. The monzonites intrude the Kap Gustav Holm gabbros. Only a small part of what seems to be a semi-circular intrusion, *c.* 2.5 km across is exposed. The monzonites have steep contacts to the Kap Gustav Holm gabbros and the monzonite is believed emplaced after the formation of the coast parallel flexure by stoping. Myers *et* al. (1993) gives a biotite K-Ar age of 51 +/- 2 Ma.

	The monzonite is very similar to the Kap Gustav Holm Monzonite 2 North intrusion (section 12.3).
Petrography:	Myers *et* al. (1993).
Geochemistry:	Myers *et* al. (1993).
Exploration activity:	None.
Exploration results:	None.
Comments and company recommendations:	None.
Further information:	GEUS: T.F.D. Nielsen and S. Bernstein. Københavns Universitet: C.K. Brooks.
References:	Research papers and descriptions: Myers, J.S., Gill, R.C.O., Rex, D.C. & Charnley, N.R. 1993: The Kap Gustav Holm Tertiary Plutonic Centre, East Greenland. Journal of the Geological Society London 150, 259-276.
Compiler:	T.F.D. Nielsen.
Date:	2002-11-05.

12.5 Kap Gustav Holm Syenites

Syenite ring dykes.
No mineralisations are reported.

Location:	66°36'54''N; 34°17'38''W.
Main references:	Myers *et* al. (1993).
Topographic maps:	1:250 000 KMS: 66Ø1 Steenstrups Bræer.
Landsat image:	TM path row 231-013 and MSS 250-013.
Aerial photographs:	1:150 000 KMS flight line 878D, nos 205-207. 1:50 000 KMS flight line 861R, nos 7411-7414. 1:40 000 KMS flight line A32E, nos 89-92.
Geological maps:	Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988). Publication maps: Myers *et* al. (1993).
Geophysical maps:	Aeromagnetic Map of Greenland, sheet 3 (63°30' - 68°30'N, 23°00' - 41°00'W); 1:1 000 000 (Geological Survey of Greenland, 1988).
Hyperspectral data:	None.
Geochemical maps:	None.
Short description:	The syenites of the Kap Gustav Holm area form ring dikes (Syenite 1 and steep short dikes (Syenite 2). *Kap Gustav Holm Syenite 1* ring dykes surround the Kap Gustav Holm Monzonite 2 North intrusion. It can be followed over a distance of *c.* 5 km and is up to > 100 m wide. Some disrupted microdiorite dykes are enclosed in the syenite and relate the syenites to the characteristic bimodal felsic-basic magmatism of the East Greenland continental margin. The age is not known, but the Kap Gustav Holm Syenite 1 is younger than the Kap Gustav Holm Monzonite 2 North intrusion.

Several smaller parallel ring dykes occur and range from granite to syenite. The main ring dyke is composed of fayalite-bearing syenite.

Kap Gustav Holm Syenite 2 comprises several short and stubby segments of aenigmatite-bearing quartz-syenite grading into microgranite emplaced into the centre of the Kap Gustav Holm Monzonite 2 North intrusion. Individual segments are on field maps shown to be up to 1/2 km long and 100 m wide.

Petrography: Myers *et* al. (1993).

Geochemistry: Myers *et* al. (1993).

Exploration activity: None.

Exploration results: None.

Comments and company recommendations: None.

Further information: GEUS: T.F.D. Nielsen and S. Bernstein.
Københavns Universitet: C.K. Brooks.

References: Research papers and descriptions:

Myers, J.S., Gill, R.C.O., Rex, D.C. & Charnley, N.R. 1993: The Kap Gustav Holm Tertiary Plutonic Centre, East Greenland. Journal of the Geological Society London 150, 259-276.

Compiler: T.F.D. Nielsen.

Date: 2002-11-13.

12.6 Kap Gustav Holm Granite intrusion

Small granitic stock with associated granite ring dikes.
No mineralisations are reported.

Location: 66°37'14''N; 34°17'38''W.

Main references: Myers *et* al. (1993).

Topographic maps: 1:250 000
KMS: 66Ø1 Steenstrups Bræer.

Landsat image: TM path row 231-013 and MSS 250-013.

Aerial photographs: 1:150 000
KMS flight line 878D, nos 206-207.
1:50 000
KMS flight line 861R, nos 7412-7414.
1:40 000
KMS flight line A32E, nos 89-91.
KMS flight line A34B, nos 54-55.

Geological maps: Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988).
Publication maps: Myers *et* al. (1993).

Geophysical maps: Aeromagnetic Map of Greenland, sheet 3 (63°30' - 68°30'N, 23°00' - 41°00'W); 1:1 000 000 (Geological Survey of Greenland, 1988).

Hyperspectral data: None.

Geochemical maps: None.

Short description: Small, 1 km wide granite stock surrounded by ring dikes of fine-grained granite and microdiorite (Myers *et* al., 1993). The contacts to Precambrian basement dip away from the granite stock. Contact relations suggest the microdiorite ring dike (oldest), the granite ring dikes and granite stock (youngest) to be emplaced within a short time as suggested by cruspate contacts and illustrate the intimate association between dioritic and felsic magmas.

The granitic stock has been dated to *c.* 50 Ma. (K-Ar, Myers *et* al., 1993).

Petrography:	Myers *et* al. (1993).
Geochemistry:	Myers *et* al. (1993).
Exploration activity:	None.
Exploration results:	None.
Comments and company recommendations:	None.
Further information:	GEUS: T.F.D. Nielsen and S. Bernstein. Københavns Universitet: C.K. Brooks.
References:	Research papers and descriptions:

Myers, J.S., Gill, R.C.O., Rex, D.C. & Charnley, N.R. 1993: The Kap Gustav Holm Tertiary Plutonic Centre, East Greenland. Journal of the Geological Society London 150, 259-276.

Compiler:	T.F.D. Nielsen.
Date:	2002-11-13.

12.7 Sulugssut complex

Nephelinitic complex with dyke swarms.
No mineralisations are reported.

Location: 66°31'N; 34°46'W.

Main references: Brooks *et* al. (1989).

Topographic maps:
1:250 000
KMS: 66Ø1 Steenstrups Bræer.
1:25 000
GEUS (no name). The map is also available in 1:50 000.

Landsat image: TM path row 231-013 and MSS 250-013.

Aerial photographs:
1:150 000
KMS flight line 878E, nos 244-246.
1:50 000
KMS flight line 861P, nos 7284-7286.
KMS flight line 861Q, nos 7404-7406.
KMS flight line 862U, nos 7504.7506.
KMS flight line 862V, nos 7997-8000.
1:40 000
KMS flight line A32G, nos 146-149.

Geological maps:
Regional map: 1:500 000, Sheet 13, Kangerdlugssuaq (Geological Survey of Greenland, 1988).
Publication maps: Brooks *et* al. (1993).

Geophysical maps: None.

Hyperspectral data: None.

Geochemical maps: None.

Short description: The Sulugssut nephelinite complex is exposed between K.I.V Steenstrup Nordre Bræ and K.I.V Steenstrup Søndre Bræ. The complex has been visited and traversed, but no detailed map is published. The intrusive core of the complex is largely composed of ijolitic (nepheline-clinopyroxene rocks) rocks. These and the enclosing basement are intruded by an intense swarm of alkaline dykes dominated by tinguaites.

	No age is published, but the complex is believed to be around 50 Ma old based on relations to regional dyke swarms.
Petrography:	Brooks *et* al. (1989).
Geochemistry:	Brooks *et* al. (1989).
Exploration activity:	None.
Exploration results:	None.
Comments and company recommendations:	None.
Further information:	GEUS: S. Bernstein. Københavns Universitet: C.K. Brooks.
References:	Research papers and descriptions: Brooks, C.K, Dawes, P.R. & Soper, N.J. 1989: The Sulugssut intrusive complex: a new Tertiary alkaline centre in East Greenland. Rapport Grønlands Geologiske Undersøgelse 146, 95-102.
Compiler:	T.F.D. Nielsen.
Date:	2002-11-05.

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