GGU

Open File Series No. 90/8

# Gold occurrences in supracrustal rocks of the Nuuk region, West Greenland

Peter W. Utterdijk Appel

December 1990

GRØNLANDS GEOLOGISKE UNDERSØGELSE
The Geological Survey of Greenland
ØSTER VOLDGADE 10, 1350 KØBENHAVN K, DANMARK

**Open File Series**

The Open File Series consists of un-edited reports and maps that are made available quickly in limited numbers to the public. They are a non-permanent form of publication that may be cited as sources of information. Certain reports may be replaced later by edited versions.

**Citation form**

*Open File Series Grønlands Geologiske Undersøgelse*

conveniently abbreviated to:
*Open File Ser. Grønlands geol. Unders.*

GGU's Open File Series består af uredigerede rapporter og kort, som publiceres hurtigt og i et begrænset antal. Disse publikationer er midlertidige og kan anvendes som kildemateriale. Visse af rapporterne vil evt. senere blive erstattet af redigerede udgaver.

ISSN 0903-7322

GRØNLANDS GEOLOGISKE UNDERSØGELSE
Open File Series 90/8

# Gold occurrences in supracrustal rocks of the Nuuk region, West Greenland

Peter W. Uitterdijk Appel

December 1990

LIST OF CONTENTS

## ABSTRACT

In the Nuuk region two generations of Archaean supracrustal rocks occur. The 3.760 Ga Isua supracrustal belt hosts quite extensive horizons of banded iron-formation. Grab samples of silicate facies iron-formation yield gold values of 1 ppm. Grab samples of other facies of iron-formation yield grades of gold in the order of 0.1 ppm.

In the younger Malene supracrustal rocks stratabound sulphide horizons are found. These horizons are locally tens of metres wide and can be traced intermittently for kilometres. Analysis of drill cores yield gold contents up to 2.5 ppm over 0.2 m. In the Malene supracrustal rocks an assemblage is found consisting of ultramafic and mafic lavas, metasediments, tourmalinites and stratabound scheelite mineralizations. Anthophyllite-gedrite zones locally rich in sulphides are locally found. These zones are interpreted as hydrothermal alteration zones. Scattered gold anomalies have been found associated with scheelite, and heavy mineral concentrates of stream sediments from a regional sampling programme indicate a positive correlation between gold and scheelite.

The analytical data as well as some of the other data presented in this open file report have been extracted from the GREENLAND MINERALIZATION DATA BANK. This data base contains detailed information on mineral occurrences in the Nuuk region; and eventually all available information on mineral occurrences in Greenland will be stored in this data base.

It should be borne in mind that as yet no prospecting for gold has been carried out in the Nuuk region. All gold anomalies discussed in this report have been found as "spin off" from other types of investigation.

# INTRODUCTION

Nuuk, the capital of Greenland, formerly called Godthåb, is situated in the central part of West Greenland (Fig. 1). The Nuuk region constitutes the easiest accessible area i Greenland with the best logistic support. The sea is mostly ice-free during the whole year, apart from the innermost part of the fiords, where ice may hamper sailing with smaller vessels.

Nuuk has about 12,000 inhabitants. Its international airport has frequent flight connections to Denmark and weekly connections with North America through Frobisher Bay. In Nuuk helicopters as well as fixed wing aircrafts can be chartered on an ad hoc basis. Nuuk has frequent ship connections with Denmark.

Only a limited amount of mineral exploration has been carried out in the Nuuk region. In the southern part a large anorthosite complex has been prospected for chromite and platinum during the seventies. The northern part of the area is virtually virgin ground from a mineral exploration viewpoint although the regional geology is well documented. Some exploration by a danish mining company has been carried out on a major iron-formation in the Isukasia area 150 km north east of Nuuk see below. A few short campaigns were carried out by danish and North American companies one for molybdenum near Nuuk, another in the Ivisârtoq area of the inner Godthåbsfjord and one for scheelite in the area east of Nuuk.

The Geological Survey of Greenland (GGU) has geologically mapped the Nuuk region and has carried out a regional stream sediment sampling programme mainly aimed at tungsten. The heavy mineral concentrates from the stream sediments have been investigated for scheelite and some of the samples have been analysed for gold as well as Sc, Cr, Fe, Co, Ni, Zn, As, Se, Rb, Mo, Ag, Cd, Sb, Cs, Ba, La, Eu, Tb, Yb, Hf, Ta, W, Ir, Th and U. There appears to be a good positive correlation between the scheelite and gold contents in the heavy mineral concentrates (Appel, 1989). The tungsten found as a result of the stream sediment sampling programme appear to be stratabound and occurring in banded amphibolites, tourmalinites and calc-silicate rocks of supracrustal origin (Appel, 1989, 1990).

GGU has carried out a stream sediment sampling programme where the fraction less than 0.1 mm was analysed for gold. The campaign covered the northern part of the Nuuk region only (Steenfelt, 1987)

Parts of the data presented in this report are extracted from the GREENLAND MINERALIZATION DATA BANK, which contains information on prospecting activities carried out by mining companies, as well as mineral investigations carried out by GGU and other research groups. Data from the GREENLAND MINERALIZATION DATA BANK as well as data from other GGU data banks are published in a thematic map series. At the present time thematic maps are available from the Nuuk area up to Maniitsoq that is between 64° North and 66° North. Further sets of thematic maps covering other parts of Greenland are planned (Schønwandt, 1990).

The present open file report describes the gold anomalies found in part of the Nuuk region. Silver occurrences are included on the Mineral occurrence map (Fig. 2) but these will not be described in this report.

## GENERAL GEOLOGY

The geology of the Nuuk area is well known and has been described by various authors. The reader is referred to Kalsbeek and Garde (1989). For the latest detailed informations and for an up to date reference list. The following is but a brief summary of the regional geology.

The oldest rocks are the Isua supracrustals, which occur throughout large parts of the Nuuk region as enclaves in the 3.760 Ga old Amîtsoq gneisses. The enclaves range from metre size up to the 30 km long and up to 4 km wide enclave of Isua supracrustals at Isukasia (Fig. 1).

The Malene supracrustals, which occur as enclaves in the Nûk gneisses yield radiometric ages of 3.300 to 3.000 Ga. The Malene supracrustal enclaves are found over an area well over 30,000 $km^2$. There is, however, a standing controversy as to how many of these supracrustal enclaves actually are Malene supracrustals. In the present report all supracrustal enclaves younger than 3.600 Ga will be termed Malene supracrustals.

A major anorthosite complex was intruded into the Malene supracrustals. The largest outcrops occur in the Fiskenæsset area, south of Nuuk.

The last major rock forming event in the Nuuk area was emplacement of the Qôrqut granite some 2.500 Ga ago.

## GEOLOGY OF THE ISUA SUPRACRUSTAL ROCKS

Nutman (1986) has presented a detailed account of the geology of the Isua supracrustal rocks. The Isua iron-formation and associated sulphide occurrences have been described by Appel (1979, 1987). The following is a brief account only. The stratigraphy is schematically presented in Fig. 4 from Nutman (1986).

The Isua supracrustal rocks consist mainly of banded and massive amphibolites with interlayered metasediments. The amphibolites presumably represent mafic pillow lavas, intrusive sills and tuffs. The metasediments comprise quartzitic rocks some of which presumably represent metacherts, one horizon of staurolite schists is also seen. Some of the quartzites are fuchsite stained and contain locally up to 4.5 % barium. Furthermore an up to 5 m thick conglomerate horizon is seen, which can be traced for several hundred metres along strike. The pebbles are mainly metachert embedded in a carbonate-rich matrix. Some of the bedded acid rocks are presumed to be of rhyolitic origin. Ultramafic lenses and pods occur frequently. The origin of these is still debated.

Horizons of banded iron-formation are frequently found intercalated in the amphibolites. They range from a few centimetres in width up to a major iron-formation occurrence containing an estimated 2 billion tons of iron ore with 32 % Fe (Appel, 1987). The iron-formation occurs in different facies. Most common is oxide facies with magnetite-rich bands alternating with quartz bands (metachert). The bands are up to 10 cm in width. Carbonate facies iron-formation is found as up to 5 m thick layers with thin magnetite bands alternating with thicker siderite-rich bands. These layers can be traced intermittently for hundreds of metres. Graphite is quite common as thin flakes in carbonate facies iron-formation. Silicate facies iron-formation consisting of alternating bands of grunerite and magnetite is frequent in up to ten metre thick bands which can be traced for hundreds of metres along strike.

Iron and copper sulphides are quite common in the Isua supracrustal rocks, where they occur as thin bands, veins and veinlets in banded amphibolites. Copper-bearing sulphide facies iron-formation also has been recorded.

After deposition the Isua supracrustals have been repeatedly folded and metamorphosed under amphibolite facies conditions.

## GOLD OCCURRENCES IN THE ISUA SUPRACRUSTAL ROCKS

No prospecting for gold has been carried out in the Isua supracrustal rocks. The only gold assays available stem from neutron activation analyses mainly of iron-formation samples. These analyses were carried out by the author during a research project devoted to the genesis of iron-formations (Appel, 1987).

Gold has so far mainly been found in grab samples of iron-formation. Only one amphibolite sample has returned gold values. The gold-bearing grab samples are plotted on Fig. 2, and listed below:

Table 1. Neutron activation analyses of grab samples. Analysed by B. Spettel, Max-Planck-Institut für Chemie; Mainz, Germany. n.d. = not detected.

| Loc. | Rock type | Gold ppm | Silver ppm |
|---|---|---|---|
| Au13/1 | Silic. Iron-formation | 1.03 | n.d. |
| Au12/4 | Carb. Iron-formation | 0.2 | n.d. |
| Au12/7 | Shaly Iron-formation | 0.107 | n.d. |
| Au14/7 | Amphibolite | 0.25 | 16.3 |
| Au14/2 | Sulphide vein | n.d. | 122.3 |
| Au12/9 | Sulp. Iron-formation | 0.08 | 13.0 |
| Au12/10 | Silic. Iron-formation | 0.08 | n.d. |
| Au12/11 | Shaly Iron-formation | 0.06 | n.d. |

Sample 13/1 is from an iron-formation up to a couple of metres wide consisting of grunetite with specks, patches and thin bands of magnetite. The slightly rusty horizon can be traced with intervals for well over a hundred metres along strike.

Sample 12/4 is from an up to 5 metre wide carbonate facies iron-formation traceable with intervals for more than hundred metres, consisting of thin magnetite bands alternating with thick bands of siderite together with small amounts of graphite and pyrrhotite.

Sample 12/7 is from an up to one metre wide iron-formation consisting of magnetite, graphite and grunerite with small amounts of pyrrhotite and molybdenite.

Sample 14/7 is from a sulphide-bearing amphibolite, where the sulphides are pyrrhotite and pyrite.

Sample 14/2 is from a chalcopyrite vein, which is up to 10 cm wide and traceable for about one metre, but open in both ends.

Sample 12/9 is a grab sample from a peculiar iron-formation. This is up to 0.5 m. wide consisting of magnetite, actinolite and chalcopyrite.

Sample 12/10 Silicate facies iron-formation consisting of grunerite with thin bands of magnetite. Along strike continuation of 13/1.

Sample 12/11 Silicate facies iron-formation consisting of grunerite, magnetite and graphite.

## GEOLOGY OF THE MALENE SUPRACRUSTAL ROCKS

The supracrustal rocks described under this heading comprise all supracrustal rocks younger than 3600 Ga. The Malene supracrustal rocks throughout the Nuuk area may not all have been formed contemporaneously neither may they be spatially related. However, in this report all Malene supracrustal enclaves will be described together.

The most prominent type of lithology of Malene supracrustal rocks is mafic to ultramafic volcanic rocks. These occur as thick piles of pillow lavas with abundant mafic sills and gabbroic intrusions. Ultramafic lavas with presumed spinifex textures have been discovered on Bjørneøen northeast of Nuuk (Fig. 1). Intercalated in the volcanics are sedimentary sequences consisting of mica quartzites, which are often pyritiferous. Furthermore frequent horizons of cordierite-sillimanite schists with relic staurolite have been recorded. Of lesser volumetric significance, but with great metallogenetic significance are the tourmalinites. These are best preserved at Malene Mountain next to Nuuk, where they occurs as up to metre wide layers consisting of tourmaline and plagioclase +/- quartz locally with appreciable amounts of scheelite (Appel, 1988a; Appel & Garde, 1986). Tourmalinites are also found in quartz-sillimanite schists, where tourmaline occurs as disseminated grains, which locally amount to 75 % of the rock.

In the Malene supracrustals anthophyllite-gedrite-rich rocks are found in up to metre thick layers. These layers contain magnetite, pyrrhotite, chalcopyrite, molybdenite and gahnite. They contain furthermore anomalous amounts of zinc, tungsten and tin (Appel, 1988b).

Marble horizons are quite rare in the Malene supracrustal enclaves. In the Sermilik area, however, granulite facies metamorphosed supracrustals contain up to one metre thick marble bands. Normally, however, calc-rich layers have been metamorphosed and appear as calc-silicate horizons, which are quite abundant especially in the L. Narssaq area south of Nuuk, and in the Ivisârtoq area of inner Godthåbsfjord (Fig. 1).

The Malene supracrustal rocks have been repeatedly deformed and metamorphosed several times. Most areas have been metamorphosed under amphibolite facies conditions, whereas some areas e.g. Sermilik area and parts of the Fiskenæsset area, were affected by granulite facies metamorphism.

Gold occurrences have been found in different parts of the Malene supracrustal enclaves of the Godthåbsfjord area. They will be described below.

Furthermore heavy mineral concentrates from stream sediments have shown gold anomalies in the southernmost part of the Nuuk area. These anomalies will be dealt with separately below.

## MALENE SUPRACRUSTAL ROCKS IN THE IVISARTOQ AREA

The supracrustal enclave in the Ivisârtoq area of the inner Godthåbsfjord, appears to be particular interesting from a gold mineralization point of view. The area has been mapped in detail by Chadwick (1986) and the economic potential has been reviewed by Appel (1990).

The Ivisârtoq supracrustal rocks (Fig. 1) occur in an enclave which is well over 30 km long and up to a couple of kilometres wide. Fig. 5 shows a section where the supracrustal pile is best preserved. The main rock type is mafic pillow lava, which appears to have erupted during several periods of volcanic activity. Within the mafic volcanics ultramafic pillow lavas are found (Chadwick, 1986). The volcanic sequences are separated by up to tens of metre thick peridotite marker horizons. The two lower volcanic sequences are separated not only by a peridotite marker, which is locally magnetite-rich, but also by tens of metre thick metasediments deposited in the interlude between the two volcanic cycles. The metasediments comprise calc-silicate horizons, thin quartzites often pyritiferous and very thin tourmalinites. In this magnetite-rich zone lapilli structures have been observed (Chadwick, 1986). Two of the peridotite marker horizons separating the mafic volcanic cycles host extensive stratabound scheelite mineralizations (Appel, 1990). In the thick piles of mafic pillow lavas rust-zones are frequently met. Most of the zones are inextensive patches of disseminated pyrrhotite and pyrite, but extensive sulphide zones with massive to semi-massive sulphides are locally observed, see below.

The Ivisârtoq supracrustal pile has been metamorphosed under amphibolite facies conditions and repeatedly deformed. Contemporaneously with the deformation major pegmatite bodies were intruded into the supracrustal sequence.

## GOLD OCCURRENCES IN THE MALENE SUPRACRUSTAL ROCKS AT IVISARTOQ

In the Ivisârtoq area sulphide-rich zones are quite frequent. Although none of them have been prospected thoroughly for gold some scattered investigations have been carried out.

The lowermost sequence of pillow lavas contains an extensive pyrite-rich zone. This is up to 50 m wide, and can be traced intermittently for 15 km Along strike. The zone outcrops on a fairly steep south-facing slope, and gives rise to a pronounced red rusty colouration visible for kilometres. The zone comprise up to metre wide bands of massive pyrite as well as thin pyrite bands alternating with thin quartz bands (metachert), which locally are fuchsite stained. Intercalated in the zone are pyrite banded amphibolites.

The pyrite zone was initially investigated by Kryolitselskabet Øresund A/S in the 1960s. The company drilled a few holes (141/1 on Fig. 2 and 5) in prospecting for molybdenite. However, no commercial grades of molybdenum were discovered. In 1982 GGU carried out a small sampling programme comprising blasting in order to obtain fresh samples. Eight samples were analysed for gold + 20 elements by Bondar-Clegg. The highest gold value obtained was 20 ppb. However, barium contents up to 1.32 % were encountered. Kidd Creek Mines Ltd., Canada carried out a brief investigation of the pyrite-zone. One grab sample analysed yielded 225 ppb gold (Loc. 144/1 on Fig. 2 and 5). Recently, the some of the drill cores from the Kryolitselskabet Øresund A/S stored in GGU's core library were analysed by Nunaoil A/S and a few core splits each representing 20 cm core length were analysed by Bondar-Clegg for Au + 33 elements yielding quite interesting results, showing 141/1 on Fig. 2 and 5. Of the 16 samples analysed 3 samples proved to contain more than 200 ppb gold, with a maximum of 2520 ppb over a width of 0.20 m. The best result was from drill core ITQ-1 which yielded a grade of 557 ppb Au over a width of 1 metre. The average background value of gold in the pyrite zone is about 25 ppb. Furthermore 8 grab samples collected by the Kryolitselskabet Øresund A/S were analysed for Nunaoil A/S by Bondar-Clegg for Au + 33 elements. The maximum gold return was 20 ppb. This set of analyses yielded barium contents with a maximum of 1.3 % Ba with an average of about 0.3 % Ba. The contents of Au, Ba, Co, Cr, Fe, Mo, Na, Ni, Rb, Se and Zn of the 25 drill core samples are presented in Table 2. The highest gold contents of 2520 and 1760 ppb were found in amphibolites with approximately 10 % pyrite as disseminated grains and discordant veinlets.

The peridotite marker separating the two lowermost mafic pillow lava cycles occur together with calc-silicates occurring in tens of metres thick bands traceable for kilometres along strike. These calc-silicates contain appreciable amounts of scheelite (Appel, 1990). Well over one hundred channel samples across these scheelite-bearing calc-silicates have been analysed by Bondar-Clegg for Au + 33 elements. One sample yielded 25 ppb gold, wheras the rest gave values < 5 ppb.

Kidd Creek Mines Ltd. carried out a short reconnaissance programme in the Godthåbsfjord area. One of the samples they analysed was a calc-silicate, presumably from the above mentioned calc-silicates between the two lowermost volcanic cycles. The grab sample contained 1420 ppb gold, showing 144/2 on Fig. 2 and 5 (Unpublished Kidd Creek Report).

## GOLD ANOMALIES IN MALENE SUPRACRUSTALS IN THE GODTHÅBSFJORD AREA

During the Kidd Creek Ltd. reconnaissance programme a biotite amphibole schist with 110 ppb gold was found on Bjørneøen (Loc. 144/3 on Fig. 2). No information as to size or continuity of the showing is available.

On the Malene Mountain next to Nuuk a Malene supracrustal enclave has been investigated in some detail by GGU. The work was mainly aimed at the occurrence of scheelite in amphibolites and tourmalinites. Neutron activation analyses of some of the collected samples revealed a few gold anomalies. In an up to 1 metre wide tourmalinite, traceable for 20 metres along strike, gold content up to 210 ppb was found in a grab sample (Loc. 144/4 on Fig. 2). In a pyroxene-bearing amphibolite a grab sample yielded 180 ppb Au.

On Storø in Godthåbsfjorden a banded amphibolite up to 1 metre wide and traced intermittently for 100 metres was sampled for scheelite. One grab sample contained 71 ppb gold (Loc. 143/8 on Fig. 2).

On the island Sermitsiaq north-east of Nuuk a scheelite-bearing amphibolite with up to 0.83 % tungsten and 65 ppb gold was found (Loc. 143/9 on Fig. 2.) The amphibolite is up to 2 metres wide and traceable for 20 metres along strike, but open in both ends.

## GOLD IN HEAVY MINERAL CONCENTRATES FROM STREAM SEDIMENTS

A fairly extensive stream sediment sampling programme has been carried out in the coastal areas of the Nuuk region. Heavy mineral concentrates from the stream sediment samples have been investigated for scheelite and analysed by spectrographic methods for a number of elements (Appel, 1989). A limited amount of these heavy mineral concentrates were analysed by neutron activation methods by Bondar-Clegg. Only a few samples yielded gold contents above 100 ppb.

In the Bjørnesund area (Fig. 1) three samples collected in streams draining a large supracrustal enclave, yielded gold contents above 100 ppb in the heavy mineral concentrates.

In the Grædefjord area (Fig. 1) a single sample contained more than 100 ppb gold (Appel, 1989).

In appraising these results it should be borne in mind that the stream sediments collected rarely amounted to more than 10 kg sand and gravel each.

## CONCLUSION

Considering the fact that no gold prospecting has been carried out in the Nuuk area, it is promising that so many gold anomalies have been found. The geologic setting in the Isua supracrustals is favourable for gold deposits. The same can be said for at least some of the younger supracrustal enclaves collectively named here the Malene supracrustals. Of particular interest from the gold point of view are the Malene supracrustal rocks in the Godthåbsfjord area and in the Bjørnesund area in the southern part of the Nuuk region.

## REFERENCES

Appel, P. W. U. 1979: Stratabound copper sulfides in a banded iron-formation and in basaltic tuffs in the Early Precambrian Isua supracrustal belt, West Greenland. *Econ. Geol.* 74, 45-52.

Appel, P. W. U. 1987: Geochemistry of the Early Archaean Isua Iron-formation, West Greenland. *In* Appel, P. W. U. & LaBerge, G. L. (ed.) *Precambrian iron-formations*. Athens: Theophrastus Publications, 31-69.

Appel, P. W. U. 1988a: Stratiform tourmalinites in the Archaean Tungsten Province of West Greenland. *Contr. Miner. Petrol.* 39, 79-91.

Appel, P. W. U. 1988b: On an Sn-W-Bearing Iron-formation in the Archaean Malene supracrustals, West Greenland. *Precambrian Res.* 39, 131-137.

Appel, P. W. U. 1989: Investigations of heavy mineral concentrates from stream sediment samples collected during the period 1982 to 1986 in the Nuuk area, West Greenland. *Open File Ser. Grønlands geol. Unders.* 89/1, 17 pp.

Appel, P. W. U. 1990: Tungsten mineralization in the Nuuk region, West Greenland. *Open File Ser. Grønlands geol. Unders.* 90/4, 51 pp.

Chadwick, B. 1986: Malene stratigraphy and late Archaean structure: new data from Ivisârtoq, inner Godthåbsfjord, southern West Greenland. *Rapp. Grønlands geol. Unders.* 130, 74-85.

Kalsbeek, F. & Garde, A. A. 1989: Descriptive text to 1:500 000 sheet 2, Frederikshåb Isblink - Søndre Strømfjord, 36 pp. Copenhagen: Grønlands Geologiske Undersøgelse.

Downes, M. J. & Gardinev, W. W. 1986: Report on field work - 1985: Greenland tungsten project. Unpublished. Kidd Creek Mines Ltd. Internal Report (released).

Nutman, A. P. 1986: The early Archaean to Proterozoic history of the Isukasia area, southern West Greenland. *Bull. Grønlands geol. Unders.* 154, 80 pp.

Schønwandt, H. K. 1990: Activities within the field of mineral resources. *Rapp. Grønlands geol. Unders.* 148, 37-40.

Steenfelt, A. 1987: Gold in the fine fraction of stream sediments from supracrustal sequences in West Greenland. *Open File Ser. Grønlands geol. Unders.* 87/2, 10 pp.

Table 2. Assey results of drill core samples and grab samples from a pyrite zone at Ivisârtoq.

| Sample description | Au ppb | Ba ppm | Co ppm | Cr ppm | Fe % | Mo ppm | Na ppm | Ni ppm | Rb ppm | Se ppm | Zn ppm |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ITQ-1:7,05 | 2520 | 1000 | 35 | 480 | 7.12 | <5 | 21000 | 75 | <30 | 28 | 100 |
| ITQ-1:7,65 | 266 | 500 | 37 | 790 | 5.65 | <5 | 19500 | 220 | 40 | <5 | 250 |
| ITQ-1:11,80 | 1760 | 940 | 25 | 130 | 6.88 | <5 | 15100 | <50 | 110 | 8 | 140 |
| ITQ-1:14,20 | 107 | 1800 | 10 | 280 | 2.87 | INT | 17700 | <50 | 34 | <5 | <50 |
| ITQ-1:19,40 | 192 | 3000 | 12 | 190 | 3.60 | INT | 35600 | <50 | 60 | 21 | 130 |
| ITQ-1:23,60 | 52 | 350 | <5 | 260 | 1.02 | INT | 30500 | <50 | <30 | <5 | <50 |
| ITQ-2:6,00 | 38 | 390 | 12 | 330 | 4.87 | <5 | 12400 | <50 | <30 | <5 | <50 |
| ITQ-2:14,55 | 200 | 3100 | 23 | 290 | 6.84 | 38 | 15000 | <50 | 360 | 6 | 110 |
| ITQ-4:9,75 | 26 | 1600 | 100 | 630 | 13.3 | <5 | 2090 | <50 | 770 | 14 | 280 |
| ITQ-4:12,30 | 23 | 6600 | 58 | 730 | 9.11 | 6 | 22100 | <50 | 250 | 15 | 93 |
| ITQ-4:13,10 | 25 | 3800 | 44 | 720 | 8.68 | <5 | 22400 | 190 | 67 | 15 | 71 |
| ITQ-5:6,55 | <5 | 2100 | 13 | 200 | 3.45 | INT | 869 | <50 | 480 | <5 | 220 |
| ITQ-5:11,50 | 16 | 4100 | 82 | 200 | 24.6 | 17 | 997 | 300 | 160 | 27 | <50 |
| ITQ-7:0.80 | 67 | 990 | 8 | 130 | 1.94 | INT | 41600 | <50 | 95 | <5 | <50 |
| ITQ-7:4,00 | 29 | 2200 | 75 | 150 | 10.5 | 45 | 1930 | <50 | 600 | 12 | 140 |
| ITQ-7:5,40 | 20 | 2300 | 30 | 160 | 10.1 | <5 | 15300 | <50 | 230 | 26 | 53 |
| KO.-PR:1928 | 20 | 4300 | 9 | 140 | 3.09 | 9 | 44300 | <50 | 130 | 8 | <50 |
| KO.-PR:1932 | 20 | 1500 | 39 | 260 | 5.99 | <5 | 29100 | 130 | 120 | 13 | <50 |
| KO.-PR:1935 | 25 | 490 | 27 | 300 | 11.0 | 8 | 3220 | 110 | 200 | 28 | 130 |
| KO.-PR:1948 | 13 | 9000 | 45 | 680 | 8.61 | <5 | 18700 | 120 | 210 | 13 | 98 |
| KO.-PR:1978 | 12 | 970 | 21 | 17000 | 2.47 | <5 | 8880 | <50 | 91 | <5 | 660 |
| KO.-PR:1988 | 14 | 2700 | 30 | 330 | 7.29 | 1600 | 24200 | <50 | 130 | <5 | <50 |
| KO.-PR:1990 | <5 | 7800 | 17 | 380 | 4.96 | 2800 | 34200 | <50 | 150 | <5 | <50 |
| KO.-PR:1993 | 10 | 13000 | 170 | 470 | 7.83 | 540 | 3970 | <50 | 48 | 26 | 81 |

ITQ denotes drill core split. Position of drill core split is at about 10 cm on each side of the figure, e.g. ITQ-1:7,05, is a drill core split sample from depth ca. 6.95 to 7.15 metres in drill hole ITQ 1. KO.-PR denotes grab sample. Neutron activation analyses by Bondar Clegg.

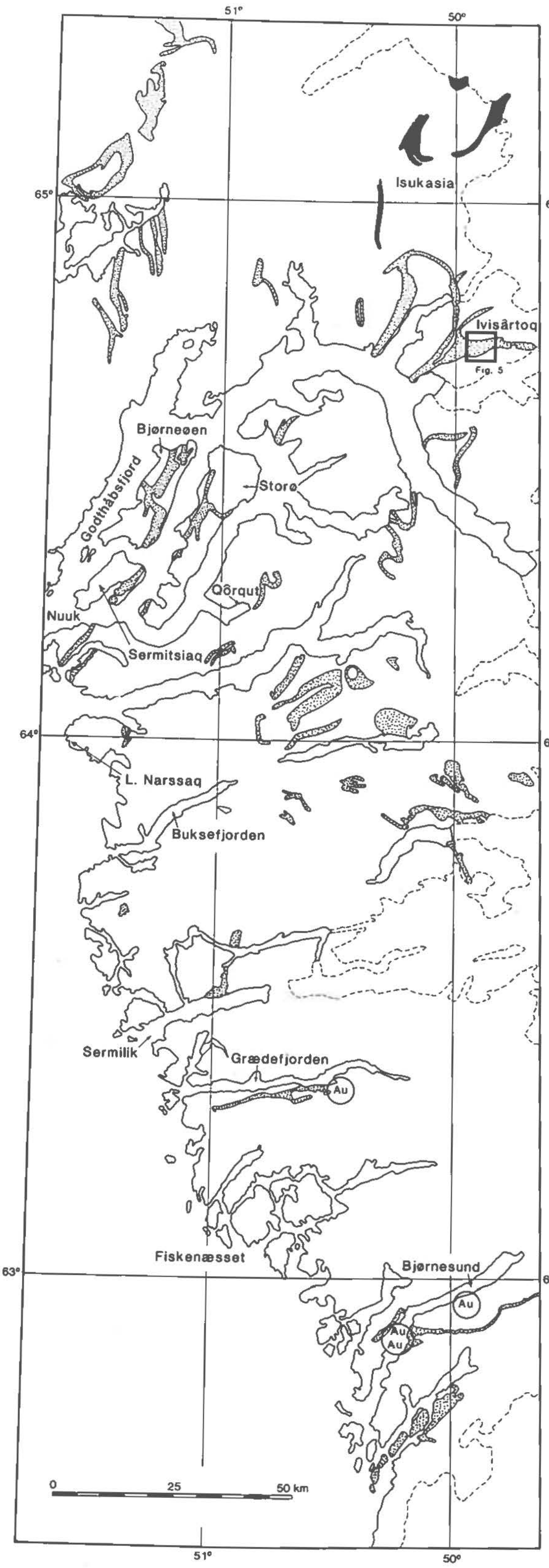


Fig. 1: Index map of Nuuk region showing Isua supracrustals in black and Malene suprscrustals dotted. Au = gold anomaly in heavy mineral concentrates from stream sediments

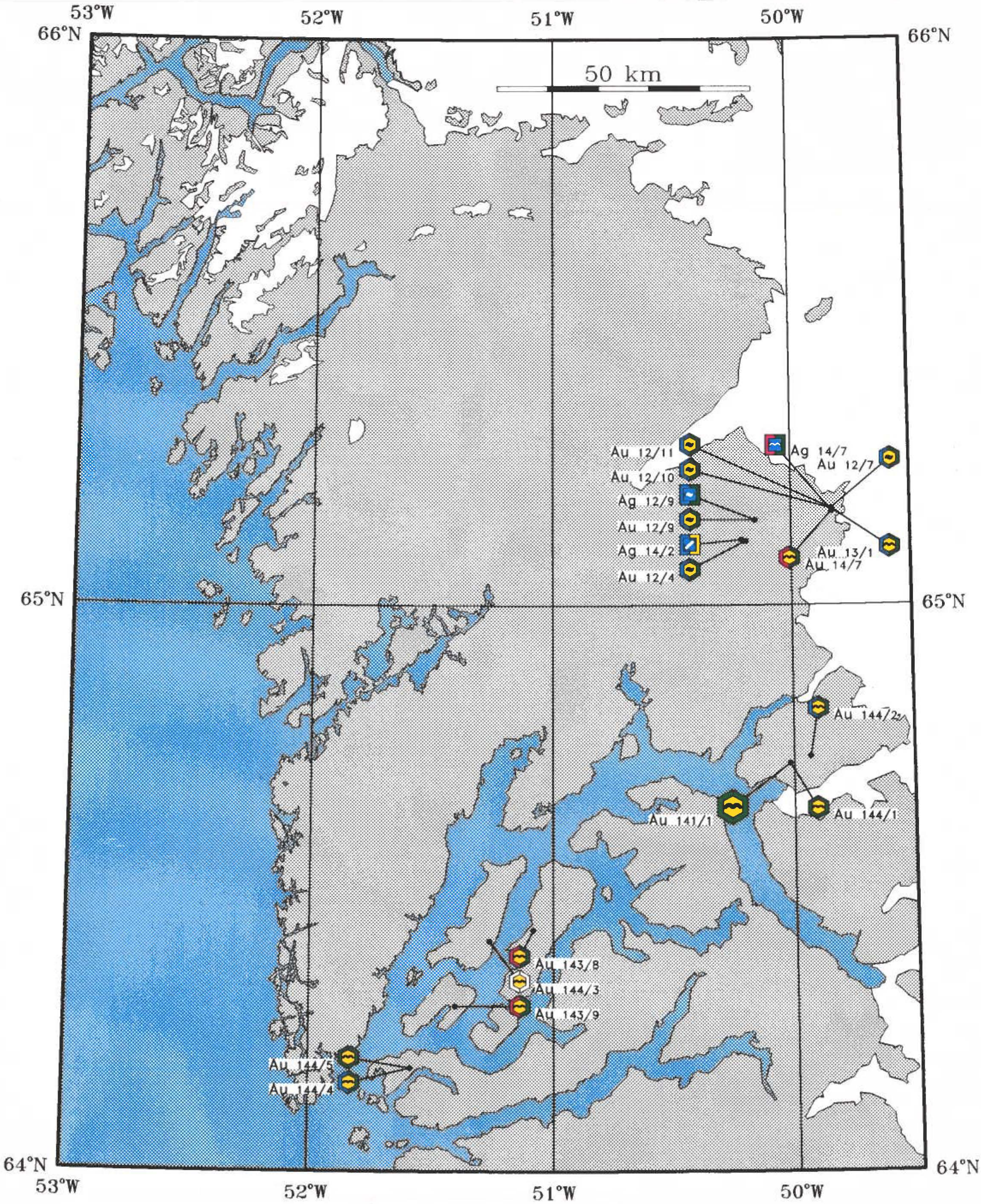
53°W
52°W
51°W
50°W
66°N
66°N
50 km
Au 12/11
Au 12/10
Ag 12/9
Au 12/9
Ag 14/2
Au 12/4
Ag 14/7
Au 12/7
Au 13/1
Au 14/7
65°N
65°N
Au 144/2
Au 141/1
Au 144/1
Au 143/8
Au 144/3
Au 143/9
Au 144/5
Au 144/4
64°N
64°N
53°W
52°W
51°W
50°W

Fig. 2

Page intentionally left empty in printed version

Open File Series 90/8 Gold occurrences in supracrustal rocks of the Nuuk region, West Greenland Peter W. Uitterdijk Appel

## LEGEND

### HOST ROCK

Metamorphic
Volcanic
Igneous
Sedimentary
Unknown

### GENETIC ENVIRONMENT

Magmatic
Volcanogenic
Igneous
Sedimentary
Syngenetic
Epigenetic
Hydrothermal
Unknown

### MORPHOLOGY

Stratiform
Stratabound
Lenticular
Massive
Disseminated
Vein
Pipe
Stockwork
Other

### RESOURCE

Fe, V, Ti, Mn, Cr
PGE, Au
Mo, W, Sn, Hg, Sb ,Bi
Pb, Zn, Ag
Gemstone, indust. mineral
Cu, Ni, Co
U, Th, Zr, Nb, REE

### MINERALOGY

Sulphide
Native element
Gemstone
Silicate
Other
Oxide
Sulphate
Phosphate Carbonate Indust. min.

## DATA SOURCE

The Greenland mineral occurrence database.

The data have been compiled from Survey reports, industry mineral assessment reports and published and unpublished research data.

All localities represent mineral occurrences observed on surface, in drill holes or mine workings.

### SYMBOL SIZE

### ECONOMIC IMPORTANCE

Mine
Prospect
Showing

### EXAMPLE

Disseminated lead sulphide(s) of hydrothermal origin hosted by volcanic rock(s). More detailed information available from the Greenland mineral occurrence database, occurrence ID: 24/13. Underlining indicates the presence of several occurrence IDs on the same site.

Pb 24/13

Projection: Lambert conformal conic
Standard parallel: 66° 30' N
Scale factor: 0.99700
Ellipsoid: Hayford
Datum: Qornoq
Scale: 1:1 000 000

Ice margins and coast lines digitized from 1:250 000 topographic maps. Permission No: KMS A.200/87

Released: 01–DEC–90



GRØNLANDS GEOLOGISKE UNDERSØGELSE
Geological Survey of Greenland
Øster Voldgade 10 DK–1350 København K Danmark

Fig. 3

Page intentionally left empty in printed version

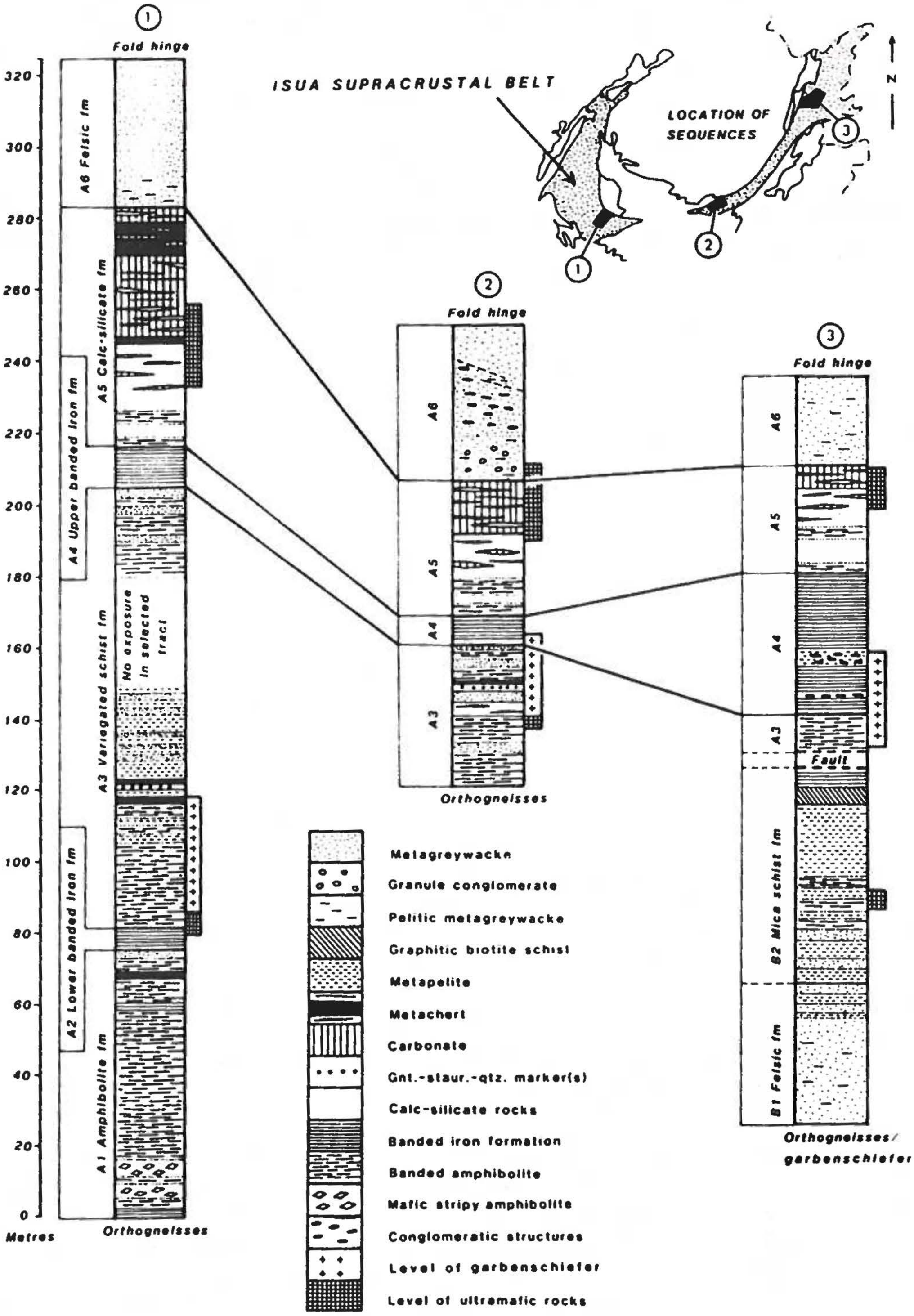


Fig. 4. Schematic stratigraphic sequences in the Isua supracrustal belt (Nutman, 1986).

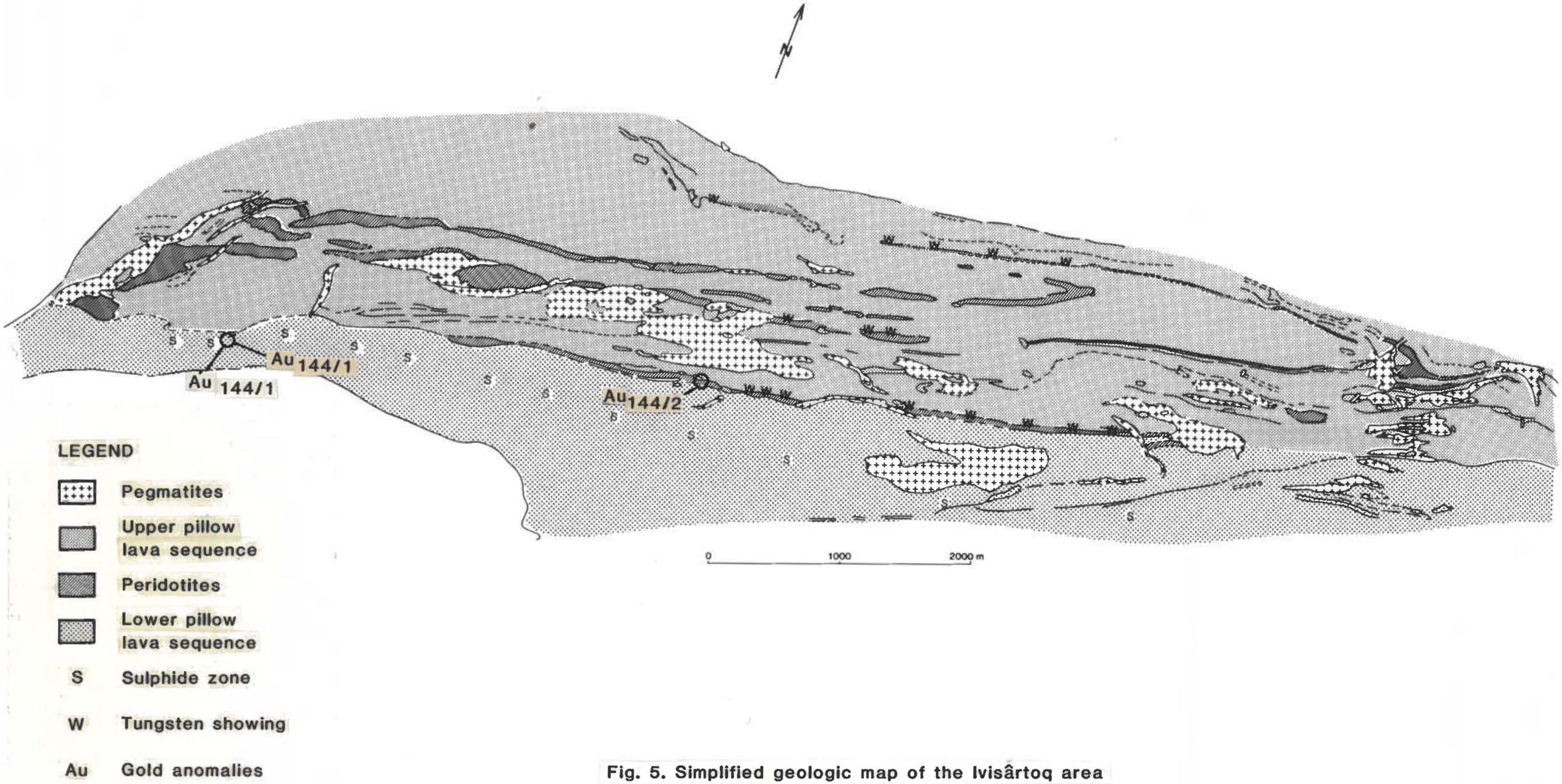


Fig. 5. Simplified geologic map of the Ivisârtoq area

ISSN 0903-7322