# Reconnaissance geochemical exploration of map sheet 67 V 2 (67° to 68°N, 49°30′ to 52°W), West Greenland

Agnete Steenfelt and Else Dam

Open File Series 91/8

November 1991

GRØNLANDS GEOLOGISKE UNDERSØGELSE
Kalaallit Nunaanni Ujarassiortut Misissuisoqarfiat
GEOLOGICAL SURVEY OF GREENLAND

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ISSN 0903-7322

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# Reconnaissance geochemical exploration of map sheet 67 V 2 ($67^o$ to $68^oN$, $49^o30'$ to $52^o$ W), West Greenland

Agnete Steenfelt and Else Dam

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## Introduction

The exploration carried out in map sheet 67 V 2 is part of the Geological Survey of Greenland's geochemical mapping programme based on drainage samples. The purpose of this programme is to provide reconnaissance geochemical data which may be used together with geophysical and geological information to outline provinces or zones with potential for mineral resources.

The samples were collected during the period 2nd to 23rd of July 1990 by the authors who were based in Søndre Strømfjord and used a Bell 206 (Jet Ranger) helicopter for transportation.

Administratively the surveyed area belongs to the communities of Sisimiut (Holsteinsborg) and Kangaatsiaq, except for the extreme southeastern corner which belongs to the community of Maniitsoq (Sukkertoppen), see Fig. 1.

## Geology

The survey area lies within the Nagssugtoqidian mobile belt of the Precambrian Laurentian shield (Escher et al., 1976). The belt consists mainly of Archaean basement (gneiss with subordinate supracrustal sequences) which was reworked during the Proterozoic (Fig. 1). However, in the fjord zone between Arfersiorfik and Nordre Strømfjord some units of metasedimentary and calc-alkaline volcanic and plutonic rocks have been shown to be of Proterozoic juvenile origin (Kalsbeek et al., 1987).

Most of the Nagssugtoqidian (Proterozoic) deformation and magma generation is presently believed to be related to the collision between two Archaean continents about 1850 Ma ago (Kalsbeek et al., 1987; Bridgwater et al., 1990).

The area is covered by a 1:500 000 scale geological map (Escher, 1971). The coastal section of this map (west of the present survey area) and the fjord zones have been studied in various detail (Noe-Nygaard & Ramberg, 1961; see also Korstgård, 1979, for further references), and part has been mapped at 1:100 000 (Olesen, 1984); but the less accessible inland part of the map, including the southern part of the survey area, is poorly known and mainly based on interpretation of air photos.

The Archaean basement gneisses are in granulite or amphibolite facies as indicated in Fig. 2. Structurally the Nagssugtoqidian mobile belt is characterised by a number of ENE trending straight belts separating areas where large-scale open fold structures are preserved (Escher et al.,1976; see

Fig. 1) The most pronounced shear movements took place in the Nordre Strømfjord shear zone (Sørensen, 1983) which transects the northernmost part of the survey area (Fig. 2). A sinistral offset of 115 km has been estimated by Sørensen (1983).

In the southern part of the area two ENE trending thrusts are drawn on the 1:500 000 scale geological map. However, due to lack of previous field work in this region, the course of the thrusts is uncertain as indicated by question marks. Field observations during the present geochemical survey suggest that the southern of the two thrustlines is the most important linear tectonic feature as shown in Fig. 42, where it is termed the Taserssuaq Shear Zone (TSZ). The zone coincides with a very distinct boundary observed on the aeromagnetic map (Thorning, 1984) between high magnetic field strength north of the line and low south of it. No detailed studies were made of the nature of the linear feature; there are shearing and thrusting from the NNE but the amount of any lateral displacement is not known. Strong banding in the magnetic pattern immediately north of the linear feature suggests that shearing and thrusting affect a fairly wide zone, which may then be characterised as a thrust or shear belt.

## Physiography

The relief of the surveyed area is moderate with elevations mainly varying between 200 and 700 m above sea level. In the southern part the topography is dominated by east-west striking ridges reflecting the geological structure. The valleys between the ridges are wide and rich in lakes. The drainage is poorly developed, partly due to the terrain, partly due to low precipitation (c. 145 mm annually). The northern part is structurally more varied and the drainage systems are better developed.

The rate of erosion in the stream systems is very low except when streams are draining ice/snow fields. The streams are generally running from May to September, although those sustained only by melting snow usually dry up during July. The large amounts of meltwater from the Ice cap in the east are lead through large valley systems which truncates the landscape (Fig. 2).

Valleys and gentle slopes are generally covered by till and talus, and glaciofluvial deposits are widespread along recent as well as ancient outlets from the Ice cap. The vegetation coverage (herbs, grass, low scrubs) is high, and the degree of bedrock exposure is unusually low by Greenlandic standards.

## Sampling

Sixteen working days and 42 helicopter flying-hours were spent during the sampling of 352 sites distributed over 9300 square km. On average 22 samples were collected per day at a density of 1 site per 26 square km; 7 flying minutes were spent per sampling site, which is equal to 16 flying seconds per square km.

The poorly developed drainage pattern of the map sheet area is not ideal for a drainage survey. The sample sites were selected and marked on air photos prior to the sampling using criteria such as even distribution of the sites, a reasonable size of upstream drainage area, and a reasonable slope dip. However, many compromises were necessary in order to achieve a satisfactory coverage. Where proper streams were missing, substitute samples had to be taken at lake shores. In such cases sample sites were chosen at small lakes where weathering products from the surrounding hills were assumed to have accumulated.

At each station c. 500 g of stream sediment was collected in a paper bag and 100 ml of stream water in a polyethylene bottle. In addition the radioactivity (total gamma-radiation) was measured on the surface of outcrops or stream boulders using a scintillometer (Table 1). To increase the representativity each stream sediment sample was composed of subsamples from 5 to 10 different sites of sand and silt deposits in the stream bed or banks. Duplicate samples of both sediment and water were collected at 9 sites which corresponds to 2.5 % of the sites.

## Sample preparation and analysis

Sediment. The sample bags were air/sun-dried at the base-camp in Sdr. Strømfjord and then sent by ship to GGU, Copenhagen. Here the samples were further dried at 65° C and sieved into three grain size fractions using sieve apertures of 1 mm and 0.1 mm. The coarse fraction was discarded, the medium fraction archived and the fine fraction used for analysis. Samples were analysed at GGU by X-ray fluorescence and atomic absorption methods for major and some trace elements and at Activation Laboratories Ltd., Canada, by instrumental neutron activation method (INAA) for more trace elements, see Table 2.

Water. After collection the water samples (unfiltered and unacidified) were left at base camp for 24 hours to allow settling of eventual suspended matter and to acquire the same (room) temperature. Then the conductivity and fluoride concentration was measured (Table 1). The remaining 60 ml of each sample were sent to GGU, Copenhagen, and later analysed for uranium by laser induced scintillometry.

## Data presentation

The analytical results are shown in this report as element distribution maps at the scale of 1:1 000 000 together with summary statistical parameters and histograms of the frequency distribution for each element (Fig. 3 to 40). Elements with insignificant concentrations are not included. In cases where an element has been determined by both X-ray fluorescence and instrumental neutron activation methods only one of the data sets is presented.

The size of a dot is related to the element concentration of the sample as indicated below the histogramme. In cases where the frequency distribution approximates log-normal the maximum dot size corresponds to the 98th percentile of the distribution. Otherwise the scaling of the dot-size is chosen so that variations in the geochemical background are displayed as clearly as possible. Maximum values are found in the statistical parameters in the figures, and values regarded as geochemical anomalies are shown on the interpretation map (Fig. 42).

## Discussion and preliminary interpretation

### *Element distributions reflecting crustal structure*

Many of the element distributions display distinct changes in concentration level from north to south. The boundaries between low and high levels are often well defined. They coincide for some of the elements but differ for others as illustrated in Fig. 42 which shows major geochemical boundaries and provinces which may be distinguished in the survey area.

The southern area has a high level of ferromagnesian elements and low level of lithofile elements whereas the opposite is the case in the northern area. A central zone constitutes an intermediate position with relatively high contents of both ferromagnesian and lithofile elements. This kind of element distribution pattern indicates a shift upwards in crustal level going from south to north, according to the general concept of crustal differentiation of elements (e.g. Taylor & McLennan, 1985; Table 3). The observation is in general agreement with the change from granulite facies gneisses predominating in the south to amphibolite facies rocks in the north (Fig. 2), although minor discrepancies may be found when the geochemical and geological maps are compared in more detail.

Flat-lying north-dipping thrusts were observed during the sampling in the central eastern part of the area coinciding with the southernmost of the arcuate geochemical boundaries shown in Fig. 42. It is therefore suggested that all of the fairly sharp geochemical boundaries illustrated in Fig. 42 are of tectonic nature and probably represent thrust planes.

The northernmost part, close to 68° N, where Proterozoic infra- and supracrustal rocks occur, is particularly enriched in K, Rb, and U. By experience from geochemical mapping in other parts of Greenland it is thought that these three elements reflects granite or pegmatite intrusions. Frequent occurrence of pegmatites have previously been observed in the Nordre Strømfjord region and is indicated on the geological map. During the sampling it was noted that the mapped granite bodies had different gamma-radiation levels some fairly high and some low, see Fig. 37 (Gamma-radiation map). It is possible that the more radioactive granites are of Proterozoic origin, and the other ones Archaean.

The province marked with crosses is particularly low in ferromagnesian elements and rich in Th, light REE and F in water, and this would suggest predominance of high level granitic (or acid volcanic?) rocks. The geochemical character appears to disagree with the metamorphic facies which is granulite facies according to the geological map. Pegmatites were frequently observed and an intrusive granite vein at one locality, but more field work is needed to establish the relation between the lithological and geochemical character of this province.

A particular element association (P, Ba, LREE, Sr and Th) is enriched in a number of samples localised in a curved trend across the central part of the area, more or less parallel to the structural trend. This association suggests a relation to rocks of a alkaline/carbonatitic affinity (lamprophyre or kimberlite dykes?) but could also be derived from heavy mineral horizons in metasediments. Again more field work is needed.

*Elements indicating mineralisation*

The locations of samples with high contents of metals considered to be indicative of mineralisation are shown in Fig. 42.

Gold (Fig. 14). Most of the samples contained less Au than the analytical detection limit of 5 ppb. The one sample containing more than 10 ppb was collected near the Taserssuaq shear zone.

Arsenic (Fig. 13). Also As, which may be an indicator of gold mineralisation, is very sparse in the survey area and mostly below the detection limit of 2 ppm. The 4 samples with slightly higher As (5-14 ppm) occur just south of the Nordre Strømfjord shear zone.

Zinc (Fig. 27). The high Zn values (75-185 ppm) clustered in the western Nordre Strømfjord region are possibly associated with supracrustal rocks, which may be mineralised. Otherwise high Zn is encountered in the vicinity of the Taserssuaq shear zone and the assumed thrusts. Some of the analysed rock samples from the area are also fairly high in Zn (Table 4 and Fig. 41).

Copper (Fig. 19). The high Cu values (75-158 ppm) are located in the western Nordre Strømfjord - Arfersiorfik region as well as along the Taserssuaq shear zone. Like in the case of zinc the anomalies may be indicative of mineralisation.

Uranium (Fig. 25). The highest values (15-47 ppm in stream sediment and 0.20-0.67 ppb in stream water) are likely to be indicative of scattered occurrences of pitchblende or other (soluble) uraniferous minerals possibly associated with pegmatites in the Nordre Strømfjord region. Such type of mineralisation is not considered economic at the present time.

A considerable number of rust zones were observed in the central part of the area from the air during the sampling, and a few of these were inspected on ground. Small amounts of graphite, pyrite and pyrrhotite were found in the limonite rich zones hosted by gneiss or schist. Eight samples of rusty rocks were collected for analysis (Table 4 and Fig. 41). The high zinc values in some samples,in particular in 361525, confirm that mineralisation with zinc (probably of hydrothermal nature) is associated with the formation of the rust zones. The high barium content of 361501 and 361502 suggests presence of baryte.

The Nagsugtoqidian mobile belt has recently been geologically correlated with the Torngat Orogen, Churchill province, of northern Labrador and the Lapland Granulite Belt of northern Finland (Korstgård et al. 1987; Bridgwater et al. 1990). In northern Labrador Swinden et al. (1991) suggest the shear zones in the Torngat Orogen as a target for gold exploration because of occurrences of lake sediment Au anomalies. In Finland vein type gold mineralisation has been located in similar geological setting, namely the marginal thrust belt of the Lapland granulite belt (Puustinen, 1991). By analogy the Taserssuaq shear zone appears to represent a target for gold exploration, and the occurrence of the one stream sediment Au anomaly in the vicinity may be significant.

## Conclusion

The geochemical survey of map sheet 67 V 2 has provided new information on the structure of the Nagssugtoqidian mobile belt. Geochemical provinces are defined by the element distribution patterns and they are interpreted to reflect tectonically juxtaposed units representing different crustal levels. The interpretation agrees with the continent-continent collision type environment that has been suggested for the Nagssugtoqidian mobile belt (Kalsbeek et al. 1987) and for the probable extension of the belt in Labrador, the Torngat orogen (Hoffman, 1990; Wardle et al. 1990).

The most promising targets for gold and base metal exploration appear to be the major shear zones along which high values of Cu, Zn, As, and Au are located. High values of P, Ba, LREE, Sr and Th may indicate the presence of carbonatitic, lamprophyric or kimberlitic rocks in a centrally situated NE-trending zone.

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Table 1. Instrumentation at the Geological Survey of Greenland

Field measurement of gamma-radiation: Saphymo-Srat SPP-2 scintillometer
Water samples:
Conductivity: Chemotest JK 8800
Fluoride concentration: Orion EA 920 pH/ion analyzer
Uranium concentration: Scintrex UA-3 Uranium Analyzer
Stream sediment samples:
Major and trace elements (see Table 2): Philips PW 1606 Multichannel X-ray Fluorescence Spectrometer
Cu, $Na_2O$: Perkin Elmer 2280 Atomic Absorption Spectrometer

Table 2. Analytical detection limits.

Instrumental Neutron Activation Analysis (Activation Laboratories Ltd.)

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AU | 5. | PPB | AG | 5. | PPM | AS | 2. | PPM | BA | 100. | PPM |
| BR | 1. | PPM | CA | 1. | % | CO | 5. | PPM | CR | 10. | PPM |
| CS | 2. | PPM | FE | 0.02 | % | HF | 1. | PPM | HG | 1. | PPM |
| IR | 5. | PPB | MO | 5. | PPM | NA | 500. | PPM | NI | 50. | PPM |
| RB | 30. | PPM | SB | 0.2 | PPM | SC | 0.1 | PPM | SE | 5. | PPM |
| SN | 0.01 | % | SR | 0.05 | % | TA | 1. | PPM | TH | 0.5 | PPM |
| U | 0.5 | PPM | W | 4. | PPM | ZN | 50. | PPM | LA | 1. | PPM |
| CE | 3. | PPM | ND | 5. | PPM | SM | 0.1 | PPM | EU | 0.2 | PPM |
| TB | 0.5 | PPM | YB | 0.05 | PPM | LU | 0.05 | PPM | | | |

X-ray Fluorescence Spectrometry

| | % | | ppm |
|---|---|---|---|
| $SiO_2$ | 0.034 | V | 5 |
| $TiO_2$ | 0.002 | Cr | 5 |
| $Al_2O_3$ | 0.004 | Ni | 2 |
| $Fe_2O_3$ | 0.0014 | Zn | 10 |
| MnO | 0.0013 | Rb | 2 |
| MgO | 0.023 | Sr | 1 |
| CaO | 0.002 | Zr | 10 |
| $K_2O$ | 0.0026 | Ba | 30 |
| $P_2O_5$ | 0.004 | Zr | 10 |

Atomic Absorption Spectrometry

| | |
|---|---|
| $Na_2O$ | 0.05% |
| Cu | 5 ppm |

Table 3. Selected element concentrations in 67 V 2 compared with estimates for upper and lower crust by Taylor & McLennan (1985).

| | $SiO_2$ | $TiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | MnO | MgO | CaO | $Na_2O$ | $K_2O$ |
|---|---|---|---|---|---|---|---|---|---|
| 67 V 2 medians | 62.2 | 0.61 | 14.0 | 5.9 | 0.11 | 2.3 | 4.5 | 3.4 | 1.4 |
| Upper crust | 66.0 | 0.5 | 15.2 | 5.0 | 0.06 | 2.2 | 4.2 | 3.9 | 3.4 |
| Lower crust | 54.4 | 1.0 | 16.1 | 11.8 | 0.17 | 6.3 | 8.5 | 2.8 | 0.34 |

| | Sc | V | Cr | Co | Ni | Cu | Zn | Rb | Sr | Ba | Th | U |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 67 V 2 medians | 15 | 73 | 77 | 17 | 38 | 18 | 37 | 26 | 355 | 460 | 7 | 1 |
| Upper crust | 11 | 60 | 35 | 10 | 20 | 25 | 71 | 112 | 350 | 550 | 11 | 3 |
| Lower crust | 36 | 285 | 235 | 35 | 135 | 90 | 83 | 5 | 230 | 150 | 1 | 0.3 |

| | La | Ce | Nd | Sm | Eu | Yb | Lu |
|---|---|---|---|---|---|---|---|
| 67 V 2 medians | 40 | 72 | 28 | 5 | 1.20 | 1.9 | 0.29 |
| Upper crust | 30 | 64 | 26 | 4.5 | 0.88 | 2.2 | 0.32 |
| Lower crust | 11 | 23 | 13 | 3.2 | 1.17 | 2.2 | 0.29 |

Table 4. Selected element concentrations of rock samples from rust zones within 67 V 2.

| | $SiO_2$ | $TiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | FeO | MnO | MgO | CaO | $Na_2O$ | $K_2O$ | $P_2O_5$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 361501 | 70.64 | 0.23 | 13.74 | 0.44 | 2.16 | 0.02 | 1.11 | 0.92 | 2.21 | 5.16 | 0.04 |
| 361502 | 58.97 | 0.48 | 18.33 | 0.72 | 3.26 | 0.08 | 2.34 | 2.79 | 3.66 | 5.47 | 0.74 |
| 361512 | 63.49 | 0.58 | 14.14 | 2.50 | 0.95 | 0.04 | 3.08 | 5.09 | 2.97 | 3.59 | 0.14 |
| 361520 | 66.51 | 0.67 | 14.53 | 3.45 | 3.62 | 0.07 | 2.58 | 2.25 | 2.41 | 2.35 | 0.06 |
| 361521 | 65.41 | 0.79 | 15.02 | 2.80 | 3.11 | 0.06 | 3.24 | 2.00 | 2.53 | 3.61 | 0.05 |
| 361525 | 50.90 | 0.78 | 24.37 | 5.37 | 3.56 | 0.02 | 3.79 | 0.62 | 1.17 | 5.25 | 0.07 |
| 361531 | 48.17 | 1.13 | 12.28 | 6.96 | 8.91 | 0.21 | 6.05 | 9.03 | 1.54 | 1.18 | 0.13 |
| 361534 | 48.34 | 1.69 | 13.73 | 8.50 | 4.84 | 0.20 | 5.63 | 11.66 | 0.86 | 0.35 | 0.14 |
| 361535 | 59.38 | 0.69 | 16.70 | 1.18 | 5.19 | 0.08 | 3.45 | 3.86 | 3.20 | 2.92 | 0.27 |

| | Au | As | Ba | Cr | Ni | Zn | Rock descriptions |
|---|---|---|---|---|---|---|---|
| 361501 | 13 | 0 | 1400 | 47 | 29 | 120 | Metasediment |
| 361502 | 15 | 0 | 2600 | 31 | 28 | 100 | do |
| 361512 | 10 | 0 | 930 | 80 | 25 | 63 | Tectonised hypersthene gneiss with graphite |
| 361520 | 24 | 0 | 450 | 86 | 72 | 140 | Sulphide mineralised biotite gneiss |
| 361521 | 29 | 0 | 620 | 100 | 62 | 200 | do |
| 361525 | 12 | 0 | 510 | 140 | 120 | 530 | Hydrothermally altered garnet amphibolite |
| 361531 | 5 | 0 | 200 | 90 | 36 | 150 | Amphibolite (sensu lato) |
| 361534 | 13 | 17 | 0 | 61 | 95 | 180 | Amphibolite (sensu lato) |
| 361535 | 10 | 45 | 830 | 95 | 67 | 150 | Metasediment or metavolcanic rock |

List of figures

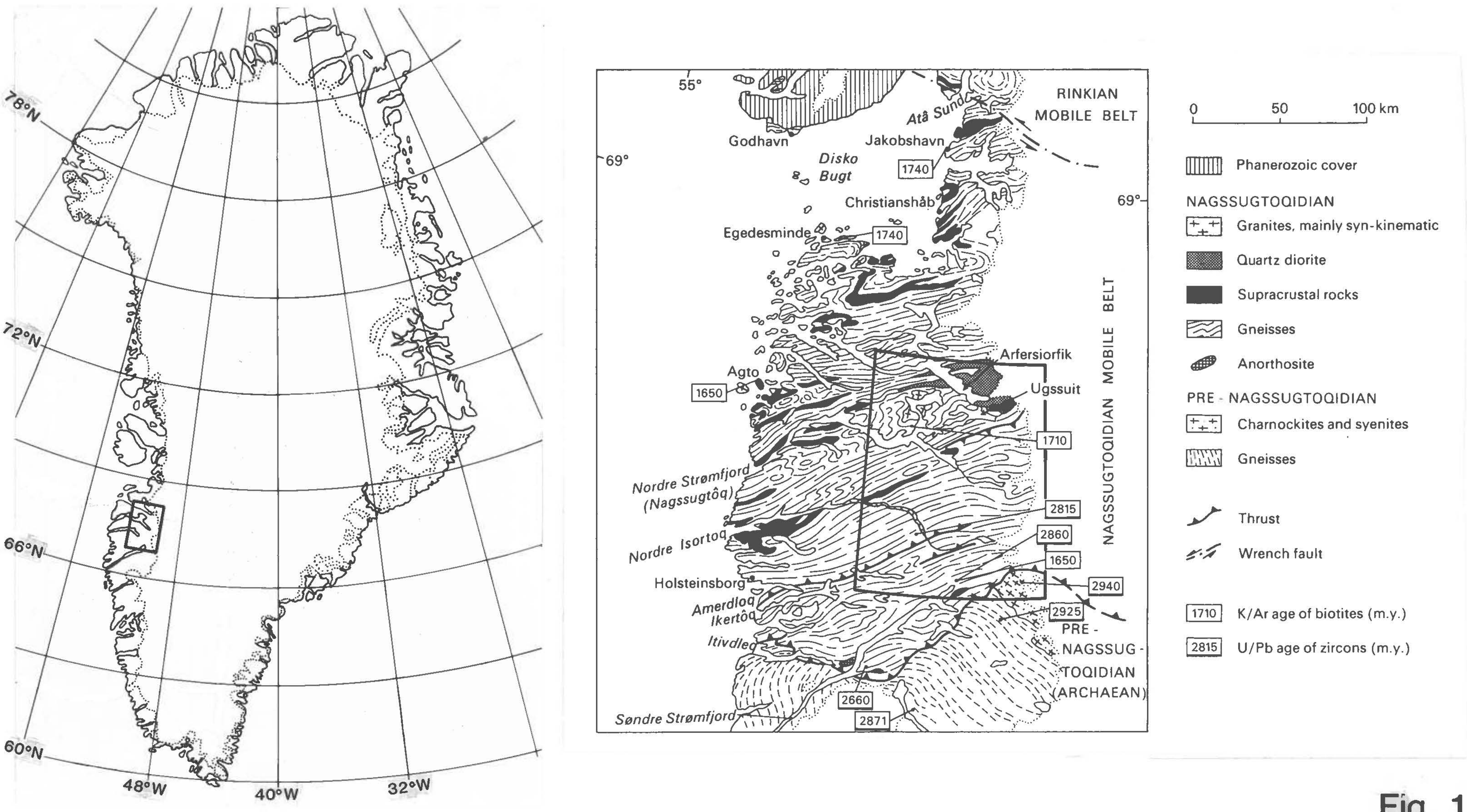
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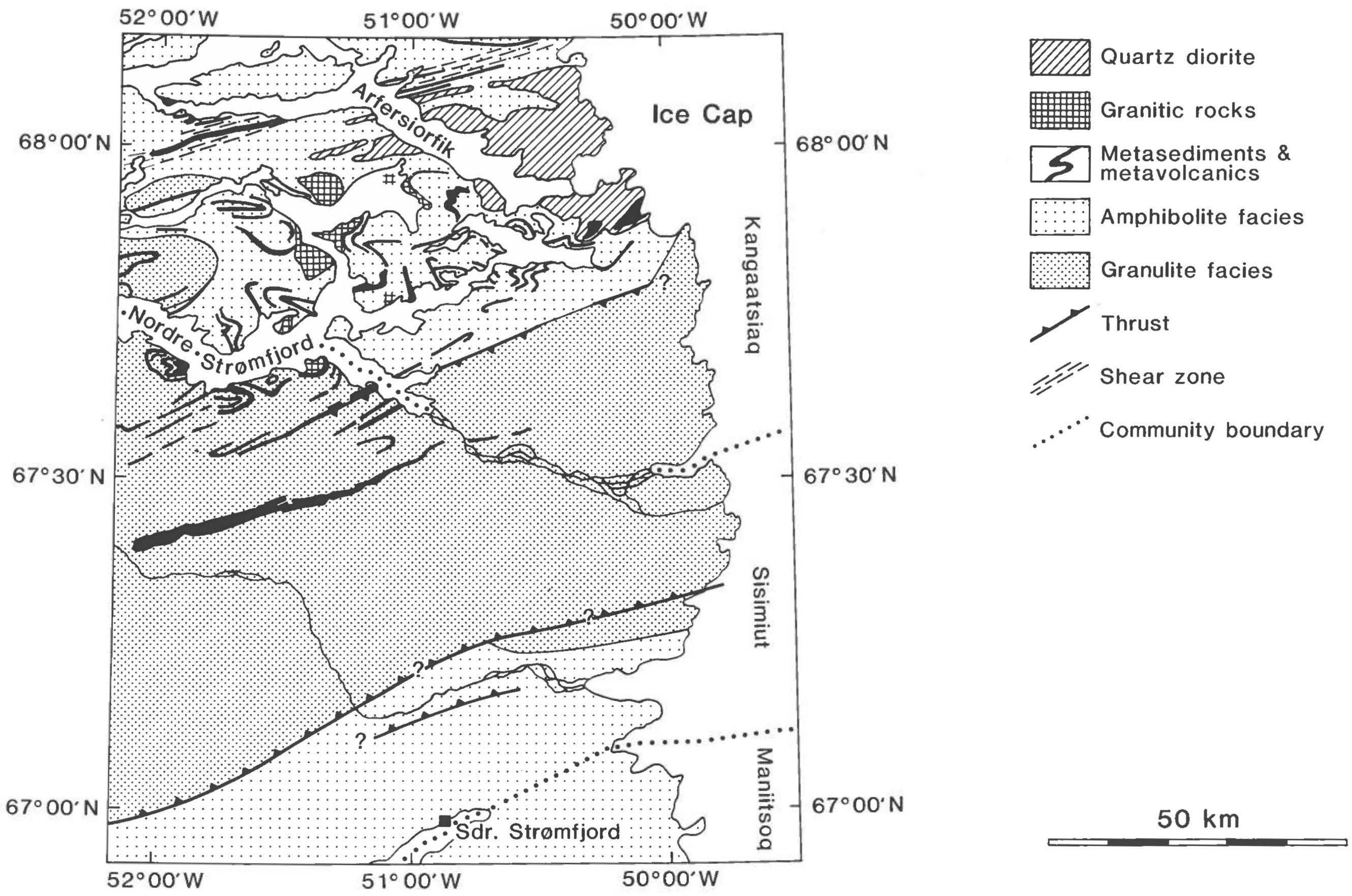
Fig. 1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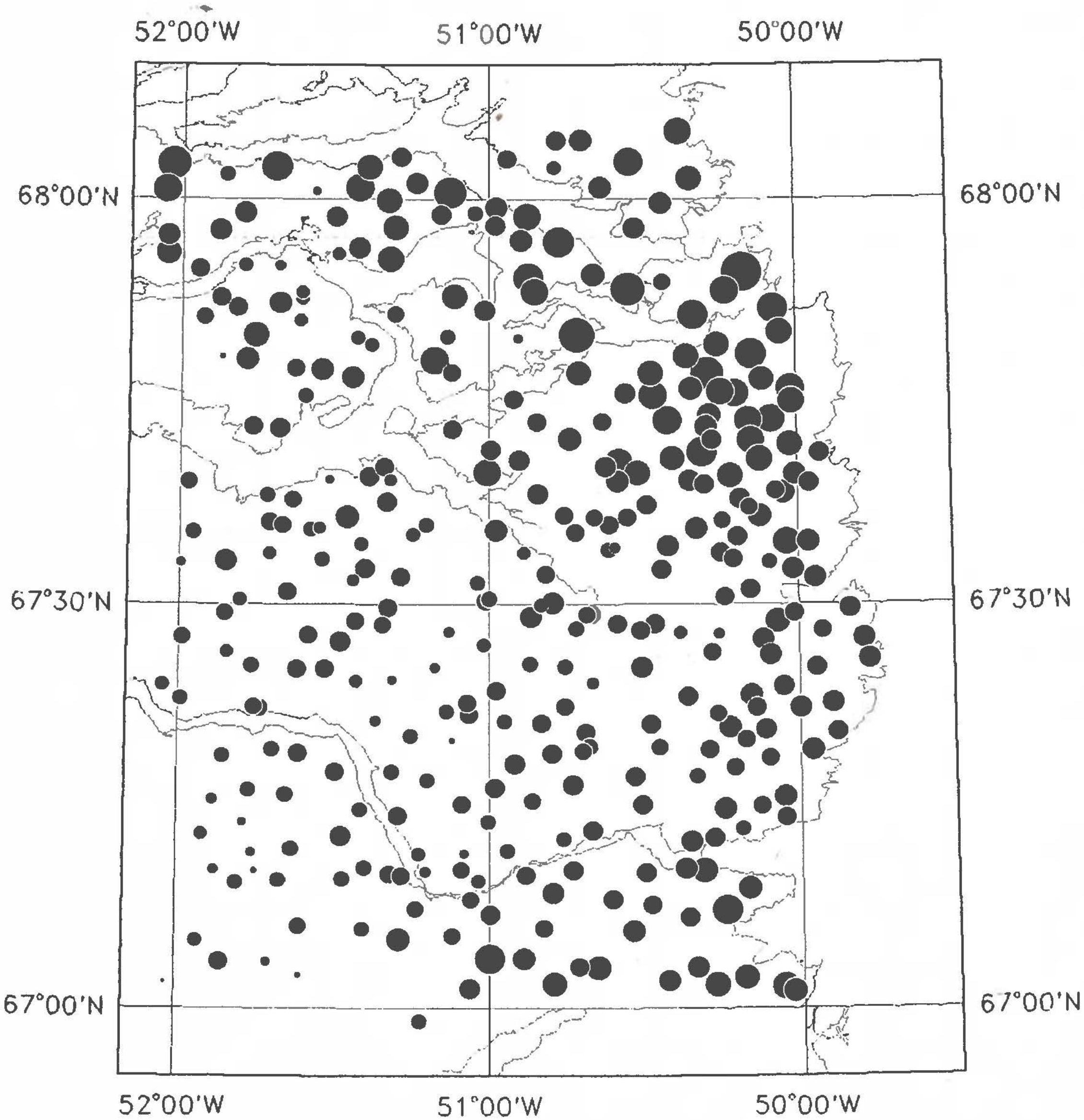
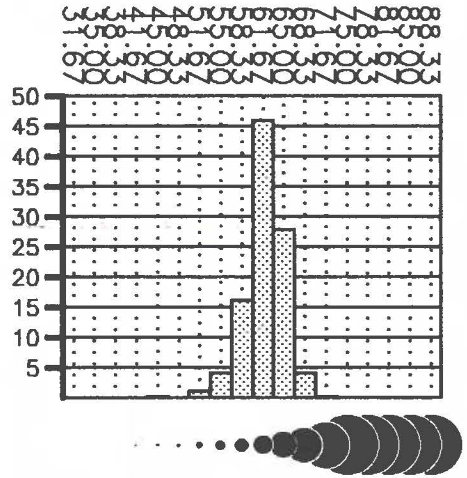
Sisimiut
Maniitsoq
Sdr. Strømfjord
Quartz diorite
Granitic rocks
Metasediments & metavolcanics
Amphibolite facies
Granulite facies
Thrust
Shear zone
Community boundary
50 km

Fig. 2

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: SiO2 in stream sediment




SiO2 pct

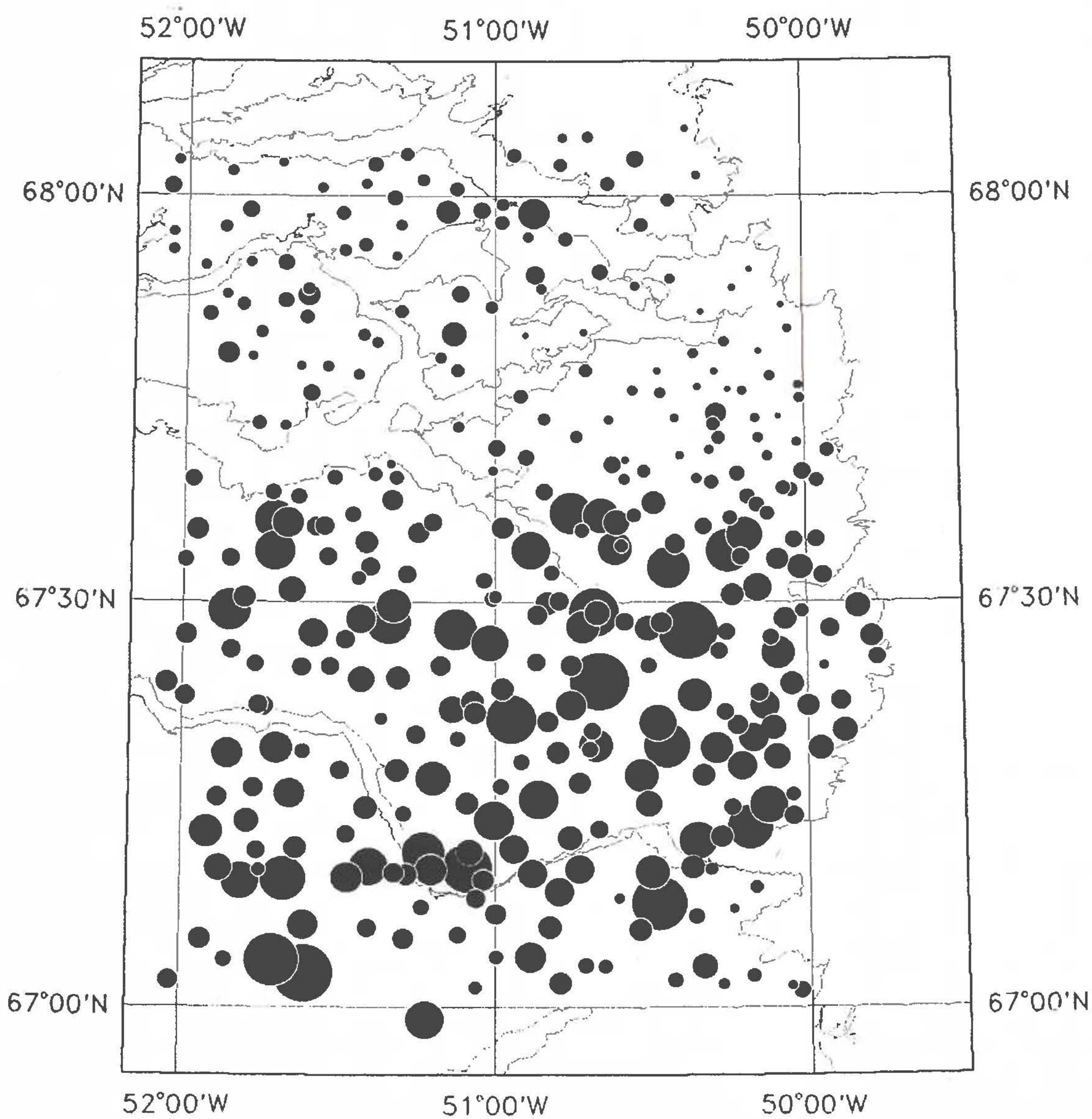
**X-ray Fluorescence Analysis**

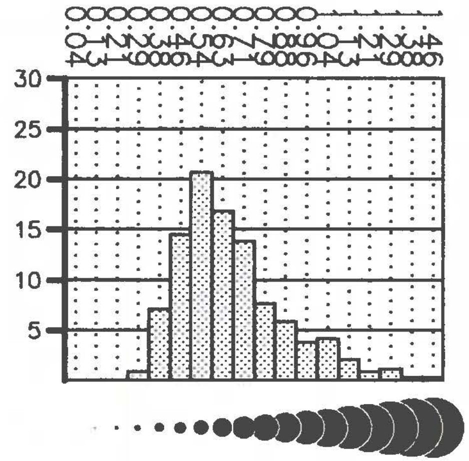
| | |
|---|---|
| Number of samples: | 341 |
| Min. value: | 46.42 |
| Max. value: | 70.32 |
| Mean: | 62.01 |
| Median: | 62.22 |
| Variance: | 9.53 |
| Std. Dev.: | 3.09 |


Fig. 3

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: $TiO_2$ in stream sediment




$TiO_2$ pct

**X-ray Fluorescence Analysis**

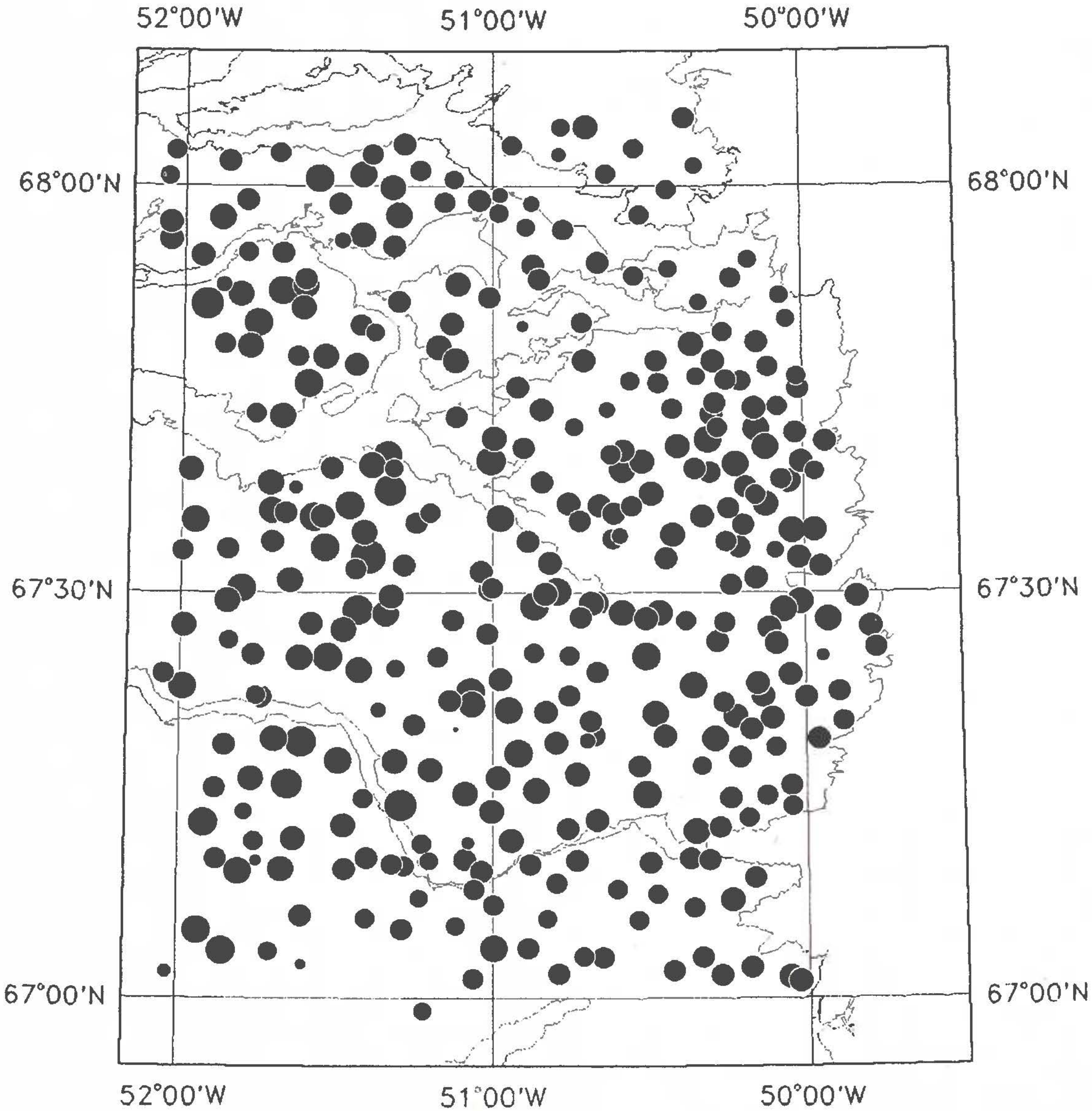
| | |
|---|---|
| Number of samples: | 341 |
| Min. value: | 0.30 |
| Max. value: | 2.08 |
| Mean: | 0.67 |
| Median: | 0.61 |
| Variance: | 0.05 |
| Std. Dev.: | 0.23 |

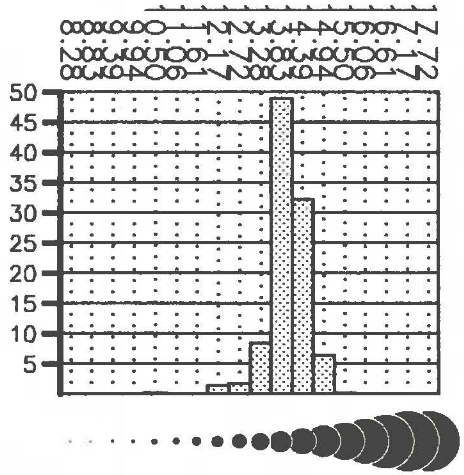
50 km

Fig. 4

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: Al2O3 in stream sediment




Al2O3 pct

**X-ray Fluorescence Analysis**

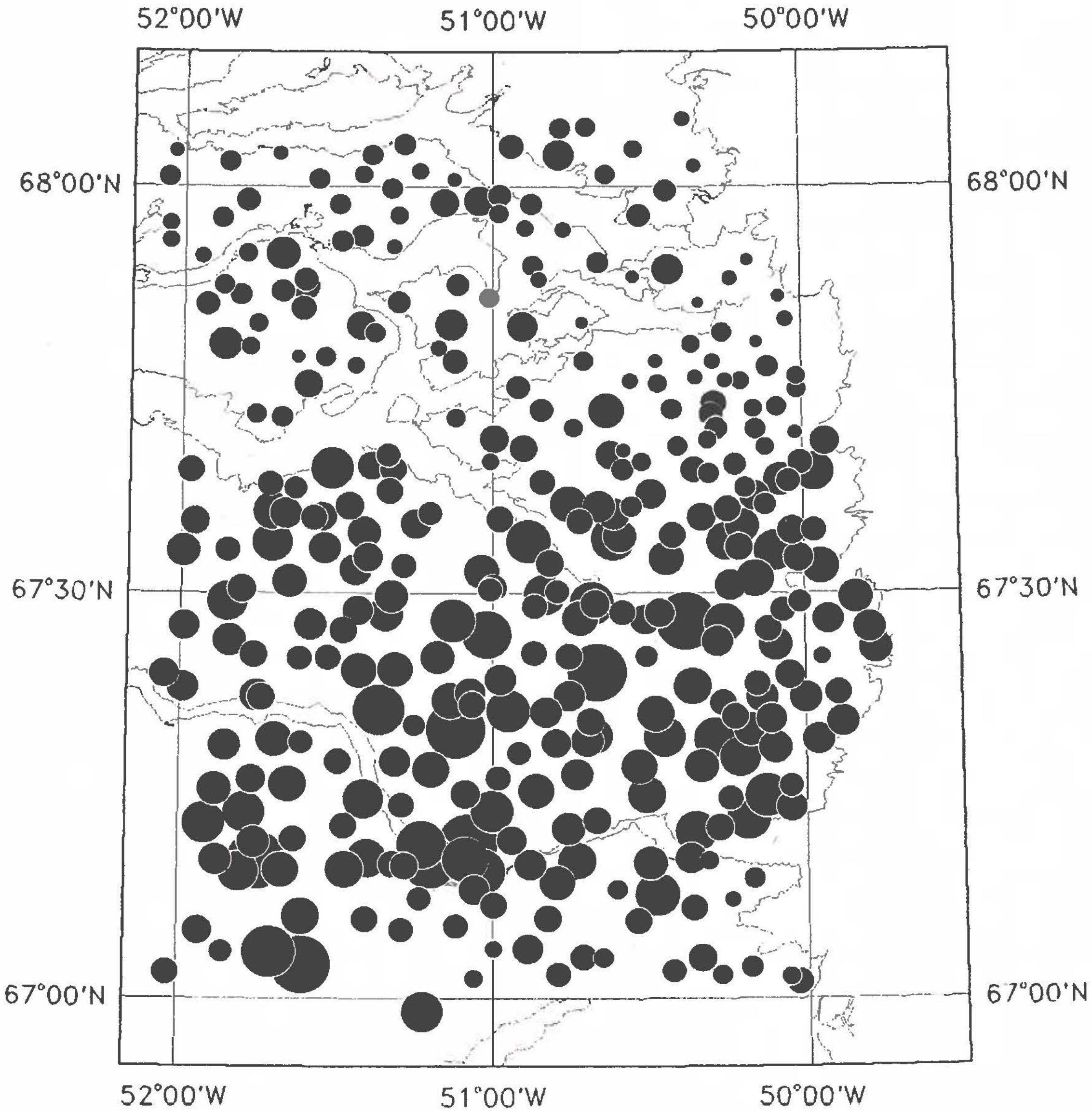
| | |
|---|---|
| Number of samples: | 341 |
| Min. value: | 10.45 |
| Max. value: | 15.27 |
| Mean: | 13.99 |
| Median: | 14.03 |
| Variance: | 0.25 |
| Std. Dev.: | 0.50 |

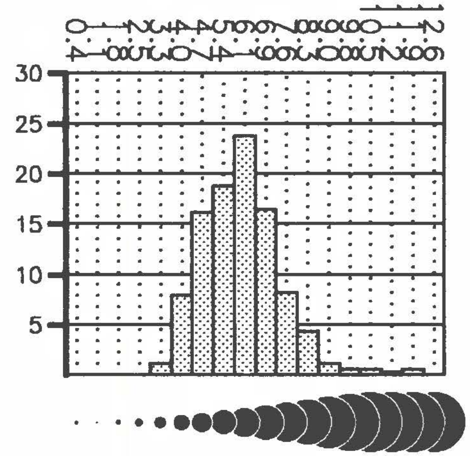
50 km

Fig. 5

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: Fe2O3 in stream sediment




Fe2O3 pct

**X-ray Fluorescence Analysis**

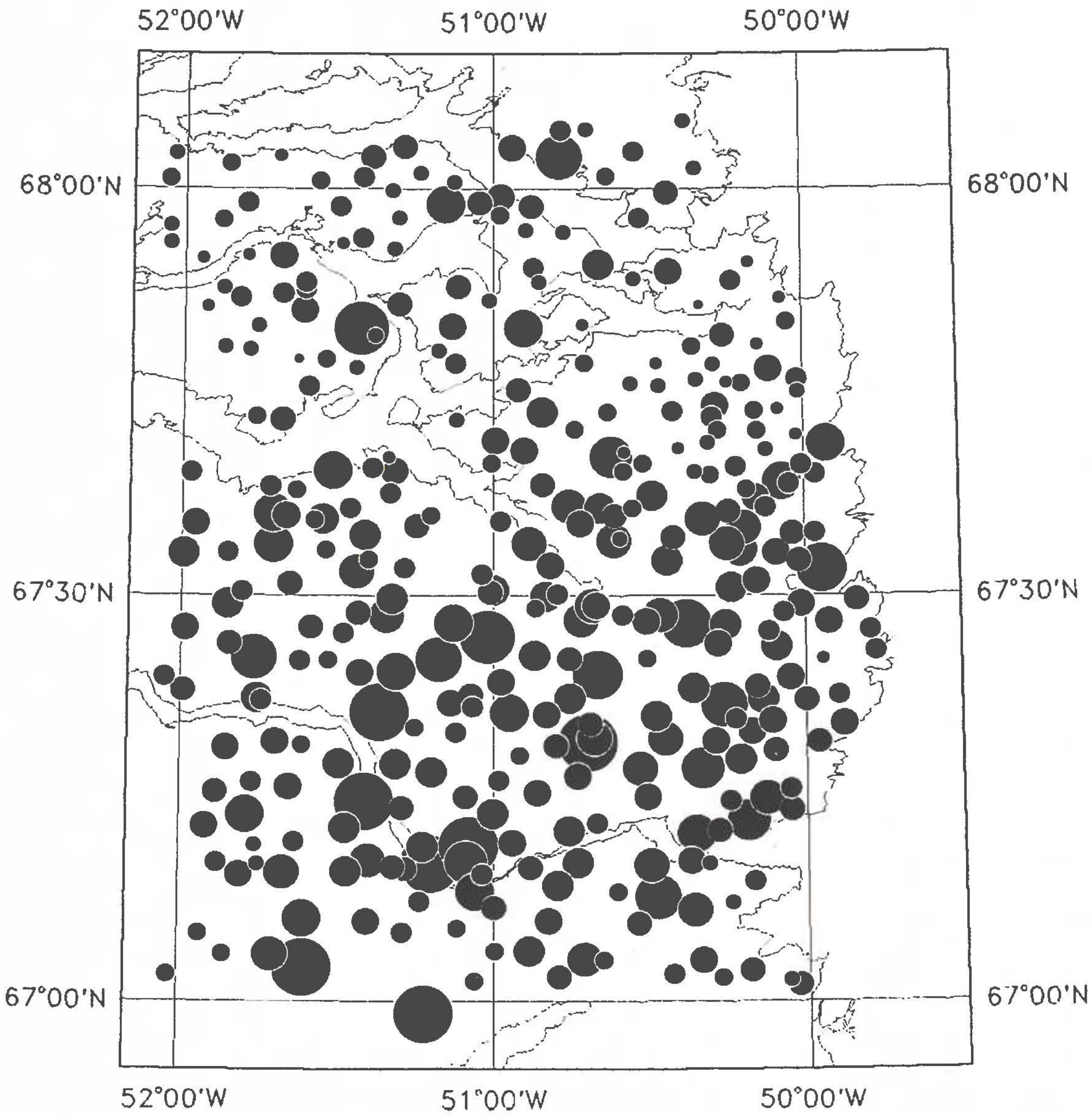
| | |
|---|---|
| Number of samples: | 341 |
| Min. value: | 3.3 |
| Max. value: | 12.2 |
| Mean: | 6.0 |
| Median: | 5.9 |
| Variance: | 1.9 |
| Std. Dev.: | 1.4 |

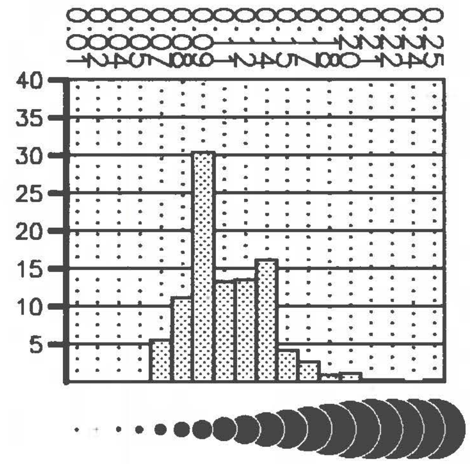

Fig. 6

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: MnO in stream sediment

GGU




MnO pct

**X-ray Fluorescence Analysis**

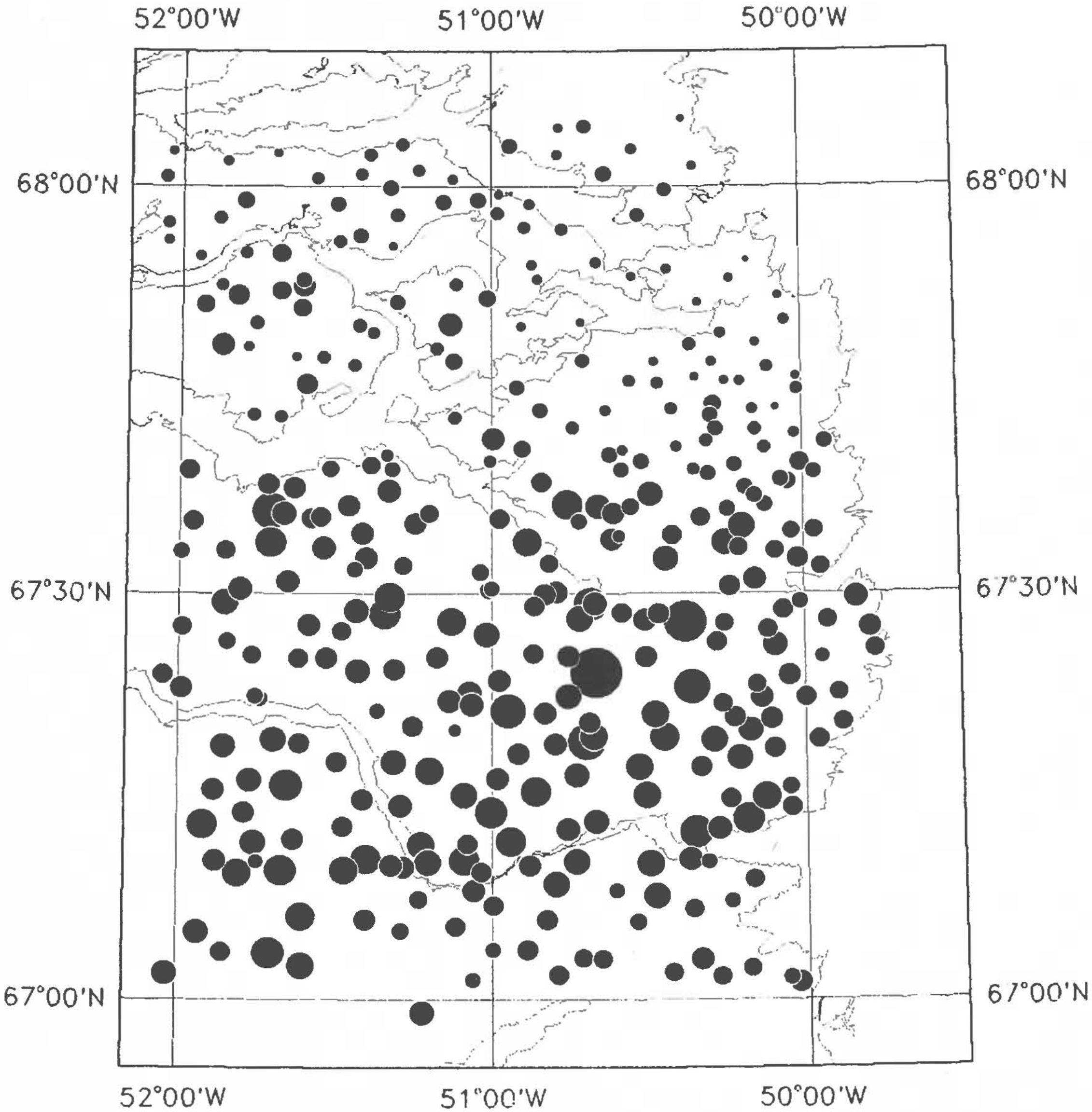
| | |
|---|---|
| Number of samples: | 341 |
| Min. value: | 0.06 |
| Max. value: | 0.44 |
| Mean: | 0.11 |
| Median: | 0.11 |
| Variance: | 0.00 |
| Std. Dev.: | 0.03 |

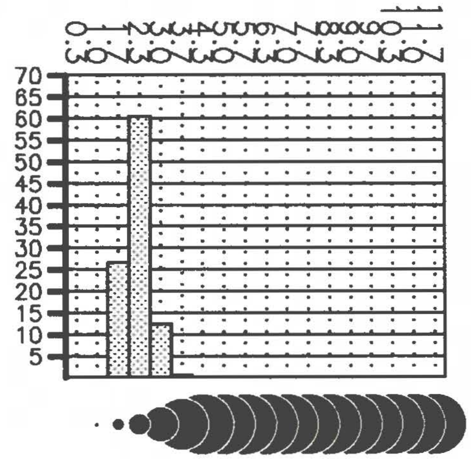
50 km

Fig. 7

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: MgO in stream sediment




**X-ray Fluorescence Analysis**

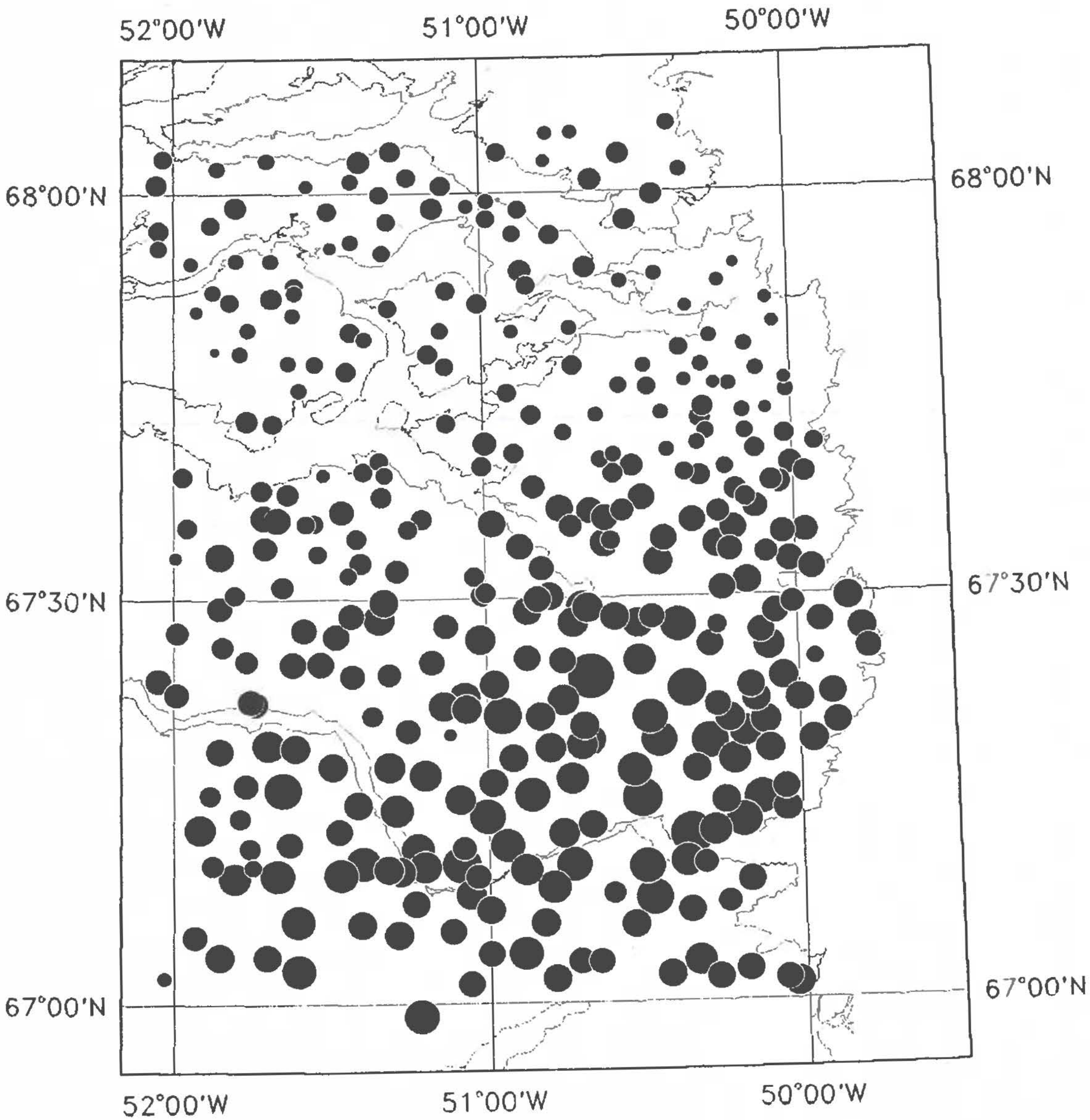
| | |
|---|---|
| Number of samples: | 341 |
| Min. value: | 1.4 |
| Max. value: | 3.7 |
| Mean: | 2.2 |
| Median: | 2.3 |
| Variance: | 0.1 |
| Std. Dev.: | 0.4 |

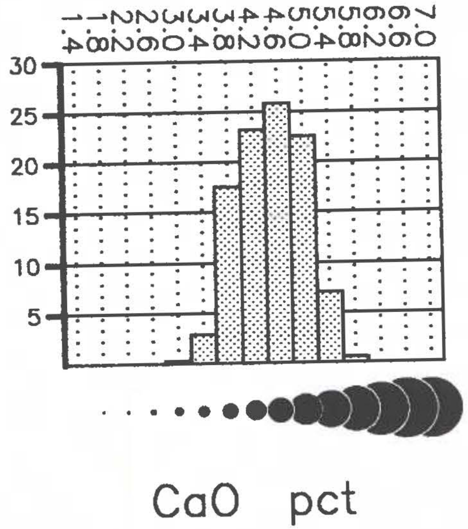
50 km

Fig. 8

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: CaO in stream sediment




**X-ray Fluorescence Analysis**

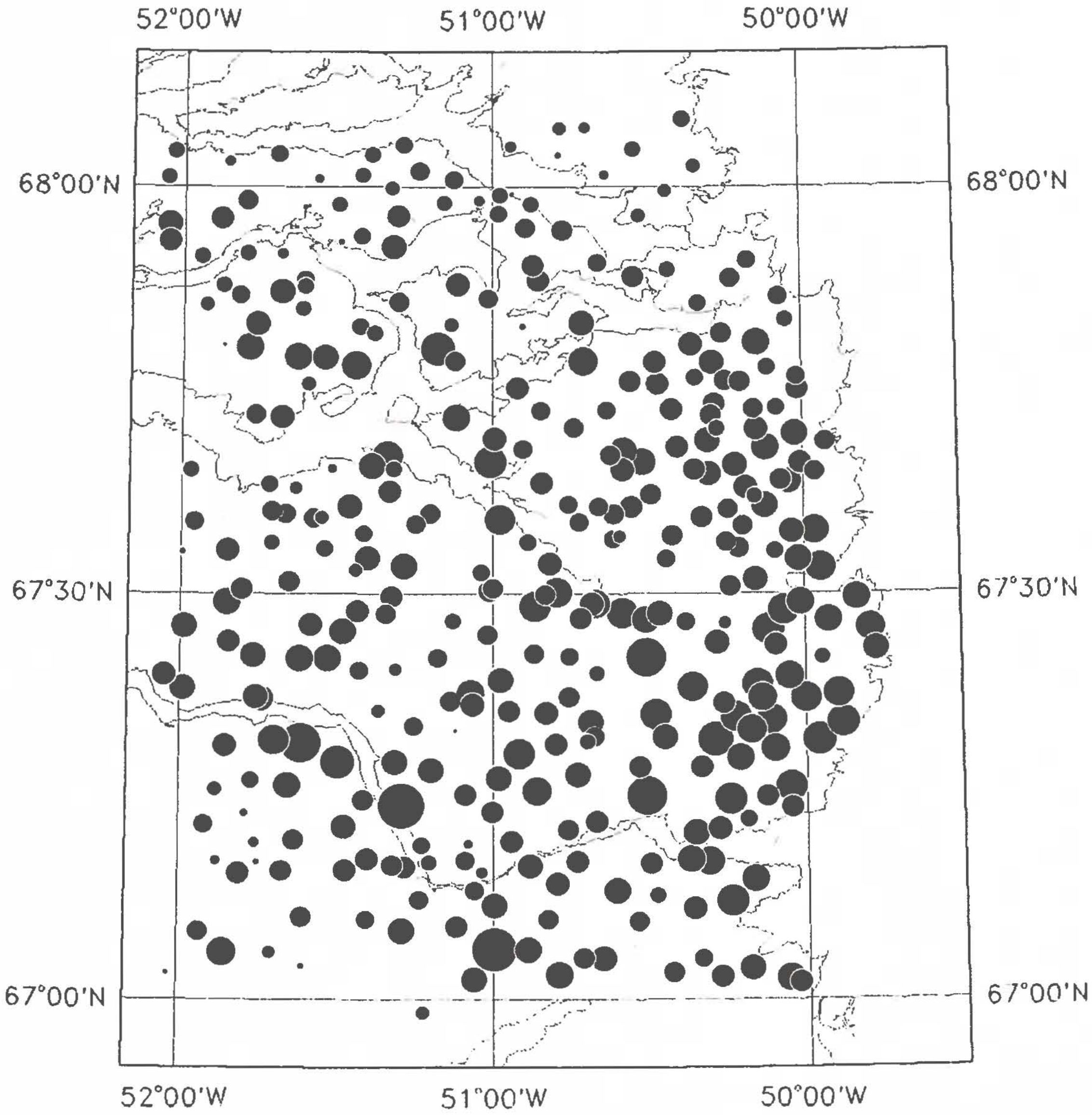
Number of samples: 341
Min. value: 3.0
Max. value: 5.9
Mean: 4.5
Median: 4.5
Variance: 0.3
Std. Dev.: 0.5

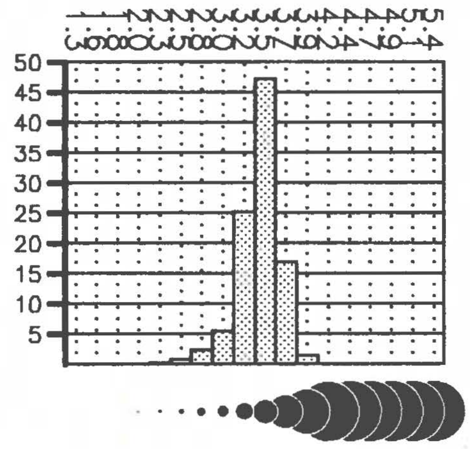
50 km

Fig. 9

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: Na2O in stream sediment




Na2O pct

**Atomic Absorption Spectometry**

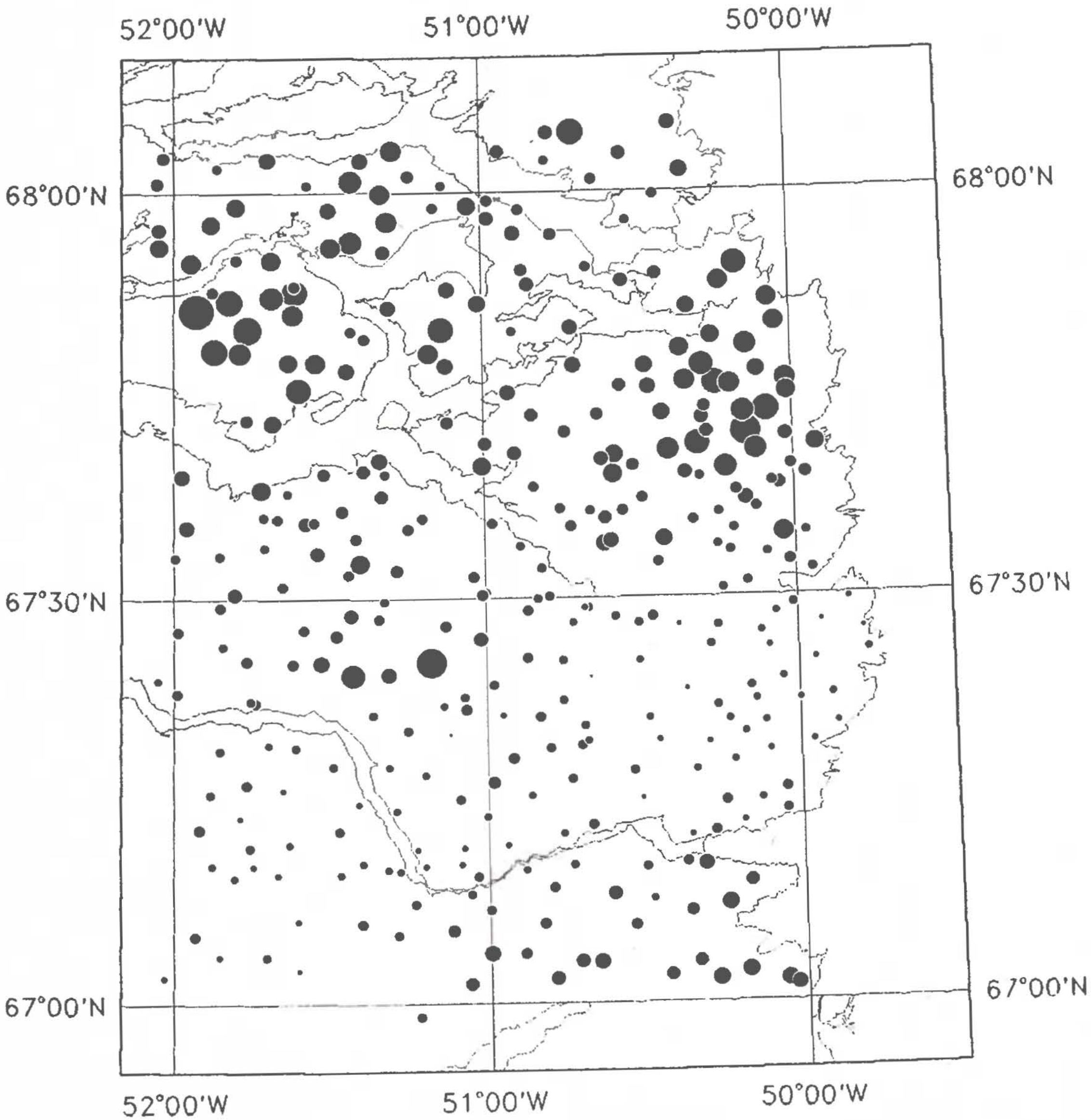
| | |
|---|---|
| Number of samples: | 341 |
| Min. value: | 2.4 |
| Max. value: | 4.0 |
| Mean: | 3.4 |
| Median: | 3.4 |
| Variance: | 0.1 |
| Std. Dev.: | 0.2 |

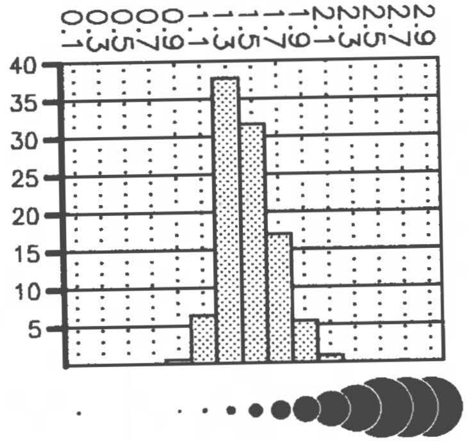
50 km

Fig. 10

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: K2O in stream sediment




K2O pct

**X-ray Fluorescence Analysis**

| | |
|---|---|
| Number of samples: | 341 |
| Min. value: | 0.9 |
| Max. value: | 2.1 |
| Mean: | 1.5 |
| Median: | 1.4 |
| Variance: | 0.0 |
| Std. Dev.: | 0.2 |

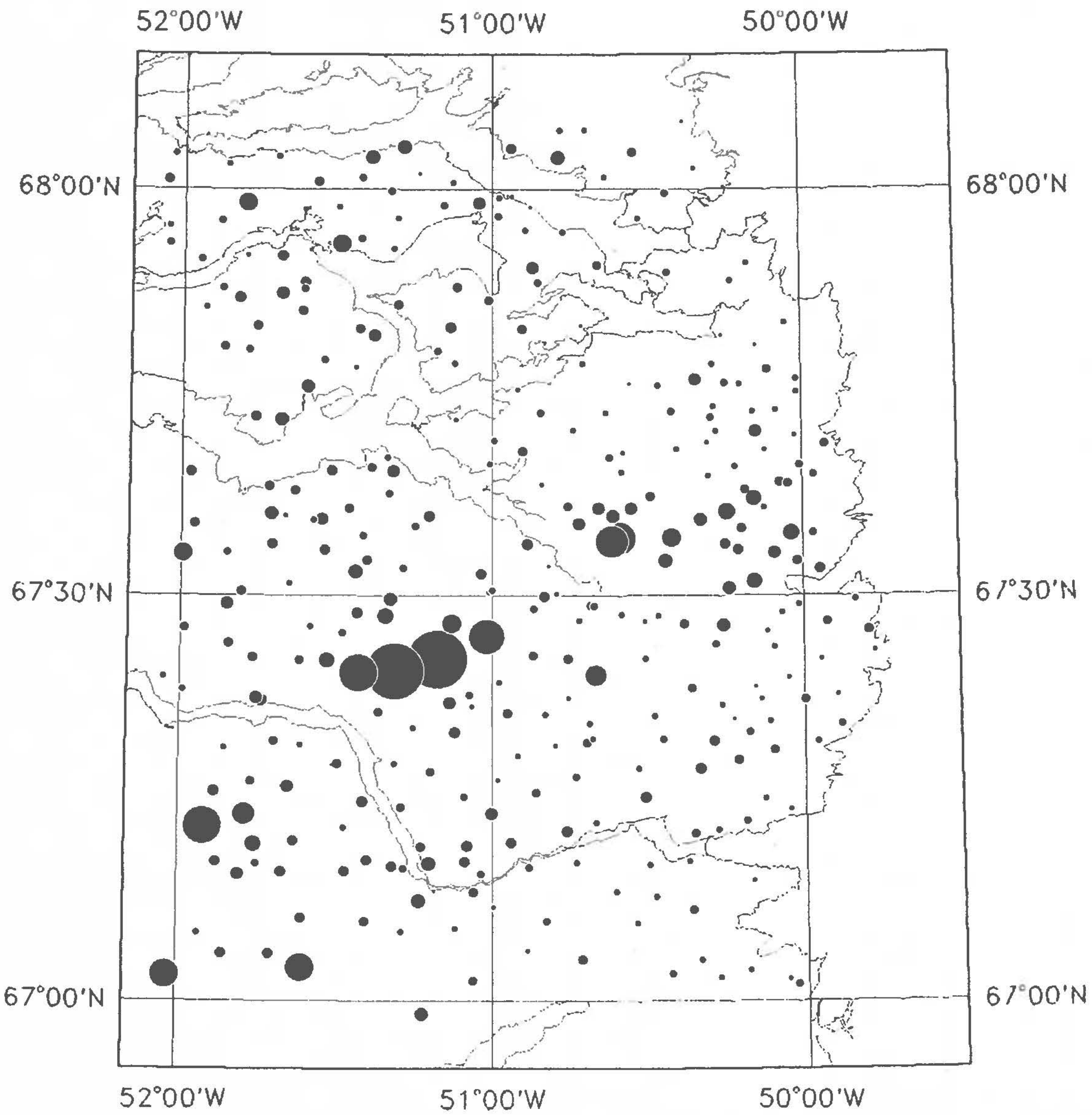
50 km

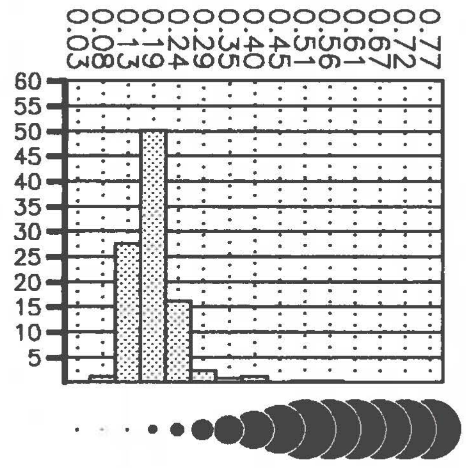
Fig. 11

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: P2O5 in stream sediment

GGU




P2O5 pct

**X-ray Fluorescence Analysis**

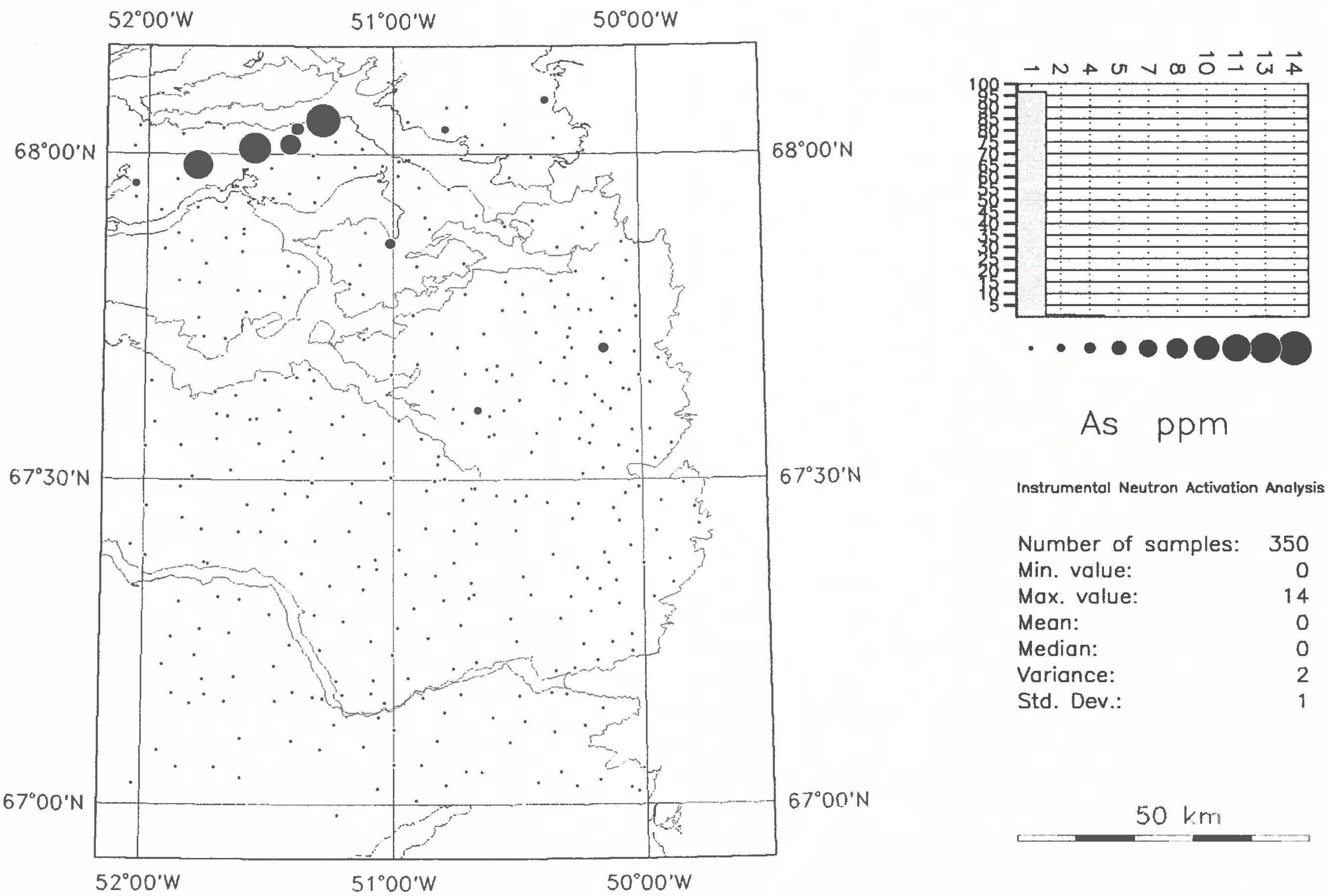
| | |
|---|---|
| Number of samples: | 341 |
| Min. value: | 0.08 |
| Max. value: | 0.56 |
| Mean: | 0.19 |
| Median: | 0.18 |
| Variance: | 0.00 |
| Std. Dev.: | 0.05 |

50 km

Fig. 12

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: As in stream sediment




Instrumental Neutron Activation Analysis

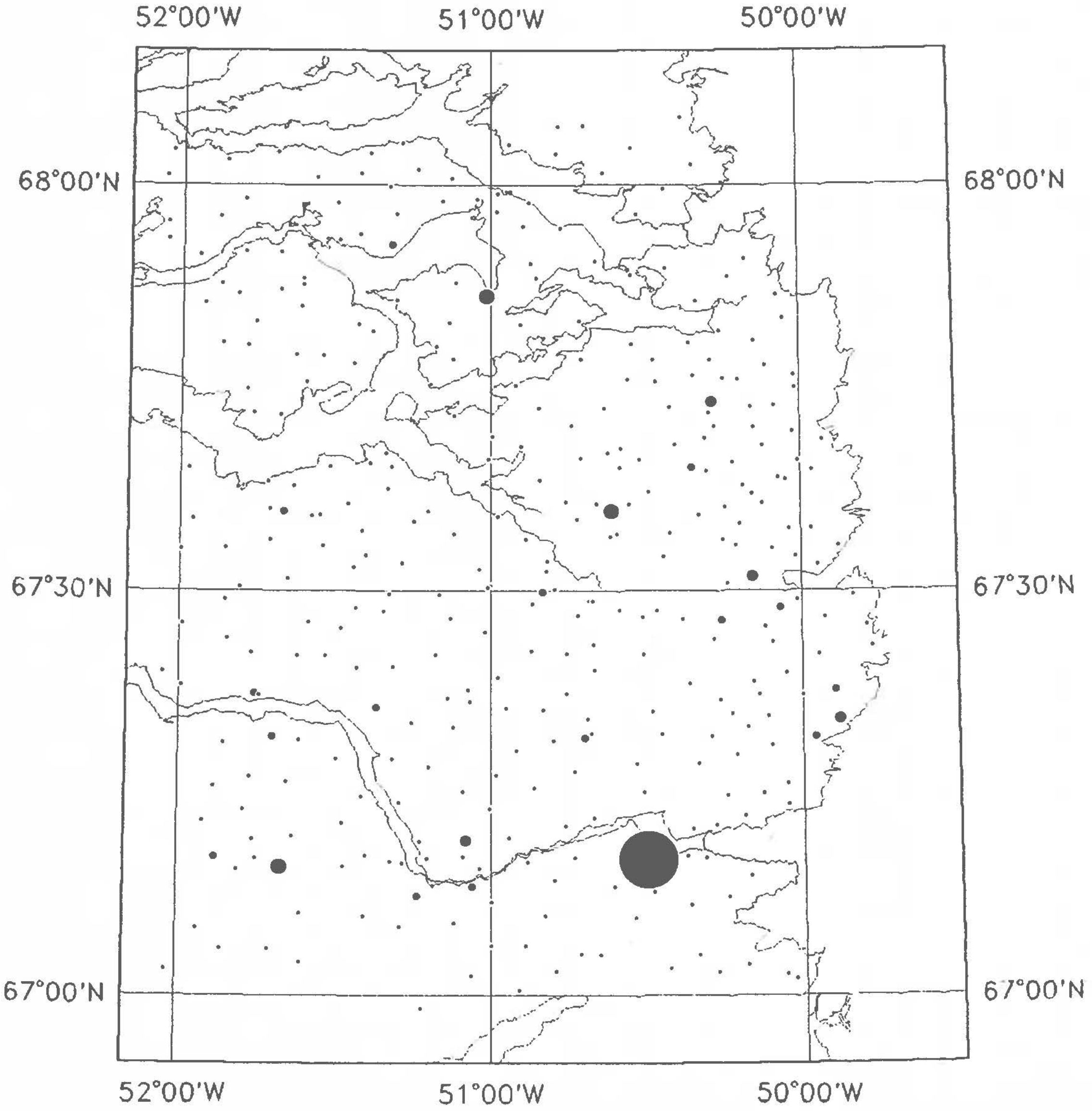
| | |
|---|---|
| Number of samples: | 350 |
| Min. value: | 0 |
| Max. value: | 14 |
| Mean: | 0 |
| Median: | 0 |
| Variance: | 2 |
| Std. Dev.: | 1 |

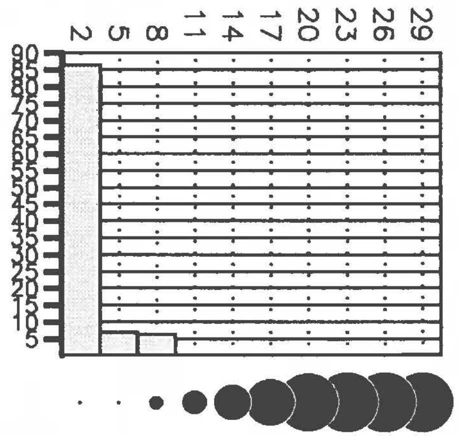
50 km

Fig. 13

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: Au in stream sediment




Au ppb

**Instrumental Neutron Activation Analysis**

| | |
|---|---|
| Number of samples: | 350 |
| Min. value: | 0 |
| Max. value: | 27 |
| Mean: | 1 |
| Median: | 0 |
| Variance: | 6 |
| Std. Dev.: | 2 |

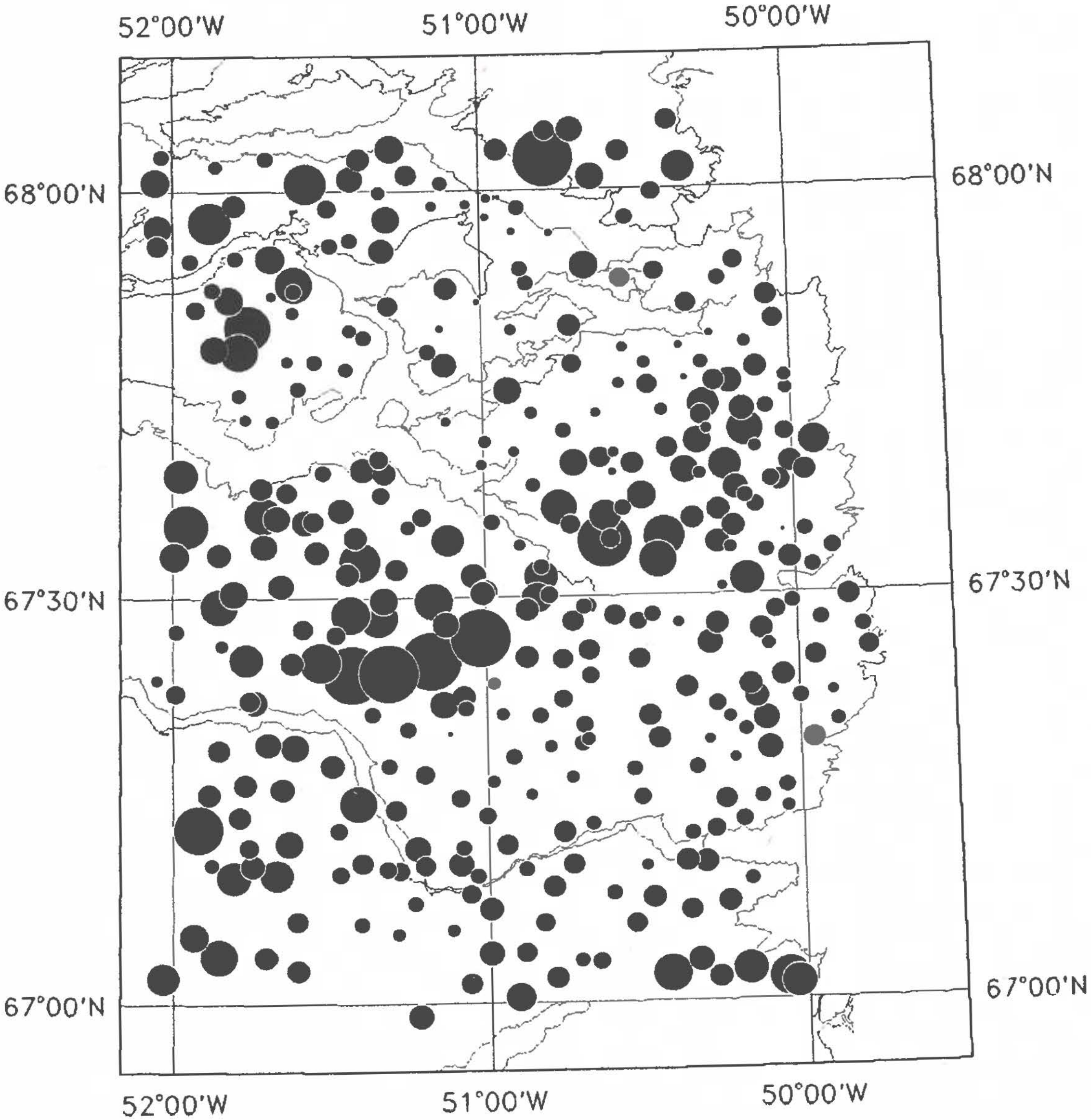
50 km

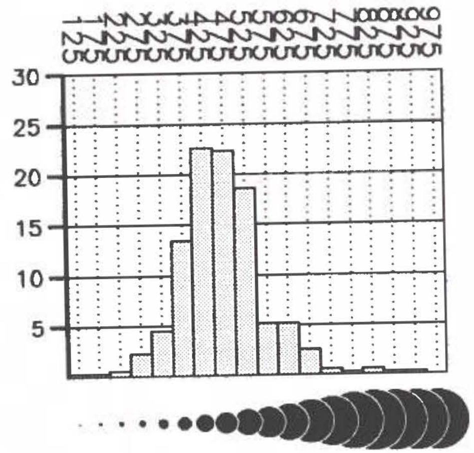
Fig. 14

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: Ba in stream sediment

GGU




Ba ppm

Instrumental Neutron Activation Analysis

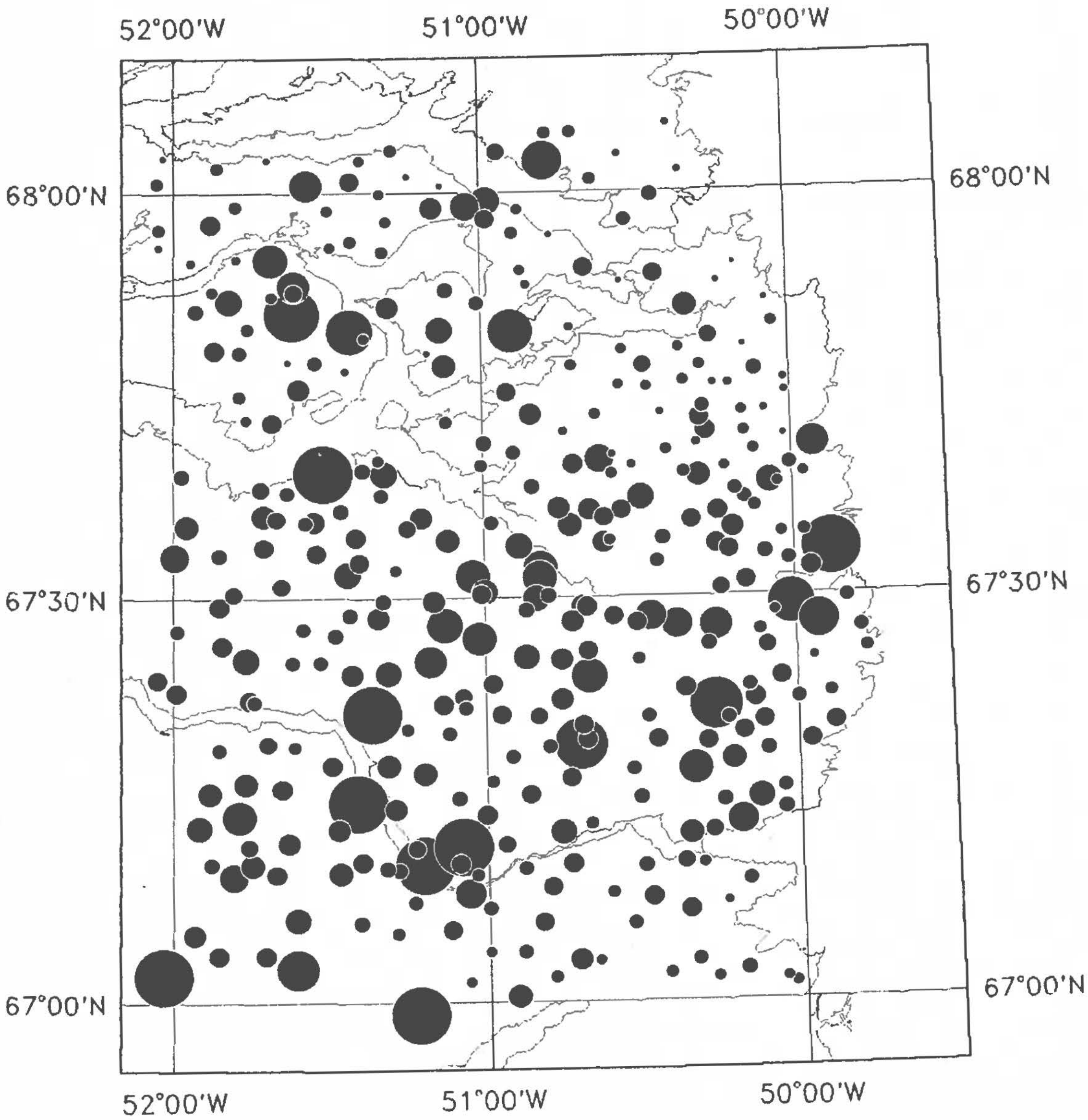
| | |
|---|---|
| Number of samples: | 350 |
| Min. value: | 120 |
| Max. value: | 1300 |
| Mean: | 468 |
| Median: | 460 |
| Variance: | 12073 |
| Std. Dev.: | 110 |

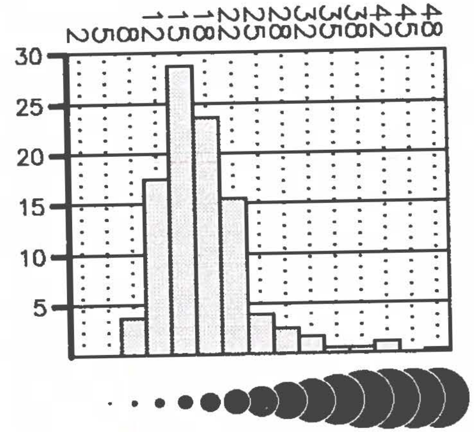
50 km

Fig. 15

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: Co in stream sediment




Co ppm

**Instrumental Neutron Activation Analysis**

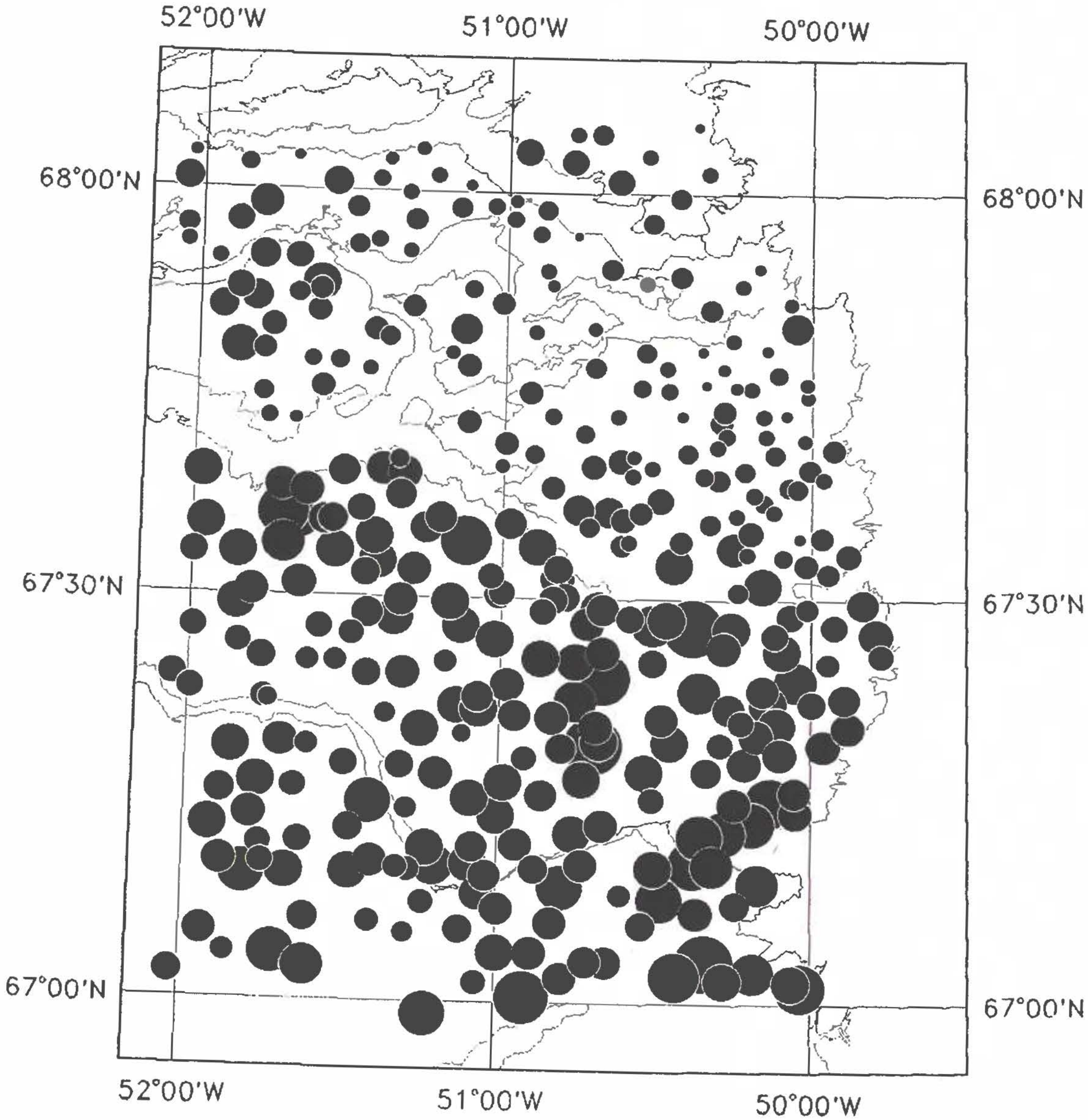
| | |
|---|---|
| Number of samples: | 350 |
| Min. value: | 7 |
| Max. value: | 54 |
| Mean: | 18 |
| Median: | 17 |
| Variance: | 41 |
| Std. Dev.: | 6 |

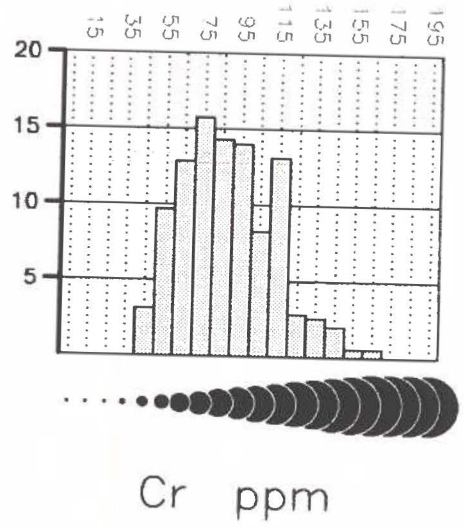
50 km

Fig. 16

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: Cr in stream sediment




Instrumental Neutron Activation Analysis

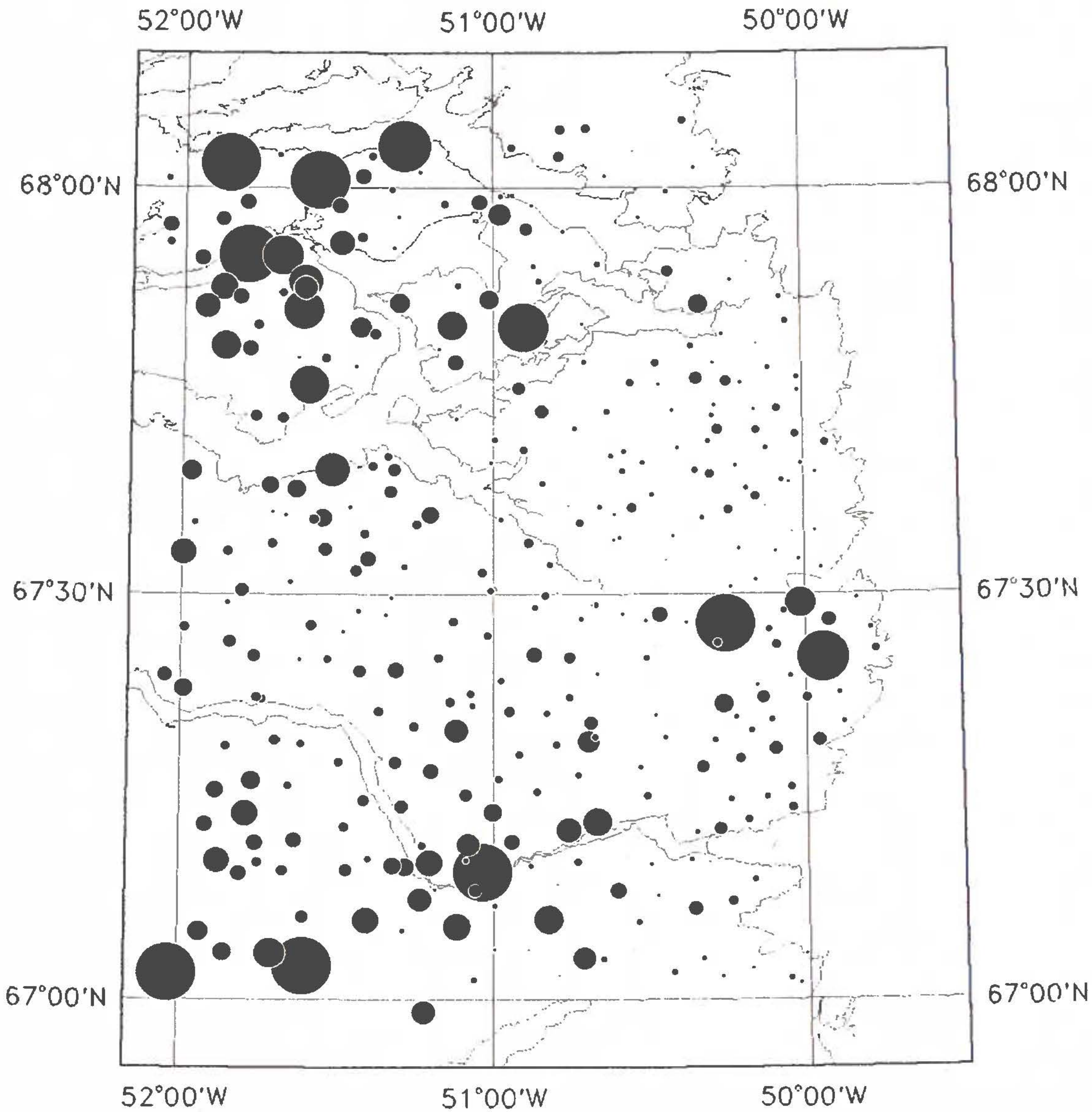
| | |
|---|---|
| Number of samples: | 350 |
| Min. value: | 42 |
| Max. value: | 500 |
| Mean: | 88 |
| Median: | 85 |
| Variance: | 1022 |
| Std. Dev.: | 32 |

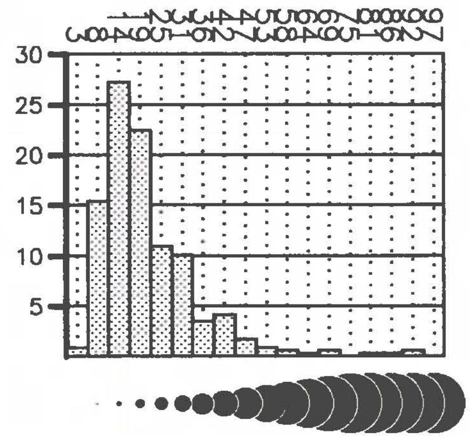
50 km

Fig. 17

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: Cu in stream sediment




Cu ppm

**Atomic Absorption Spectometry**

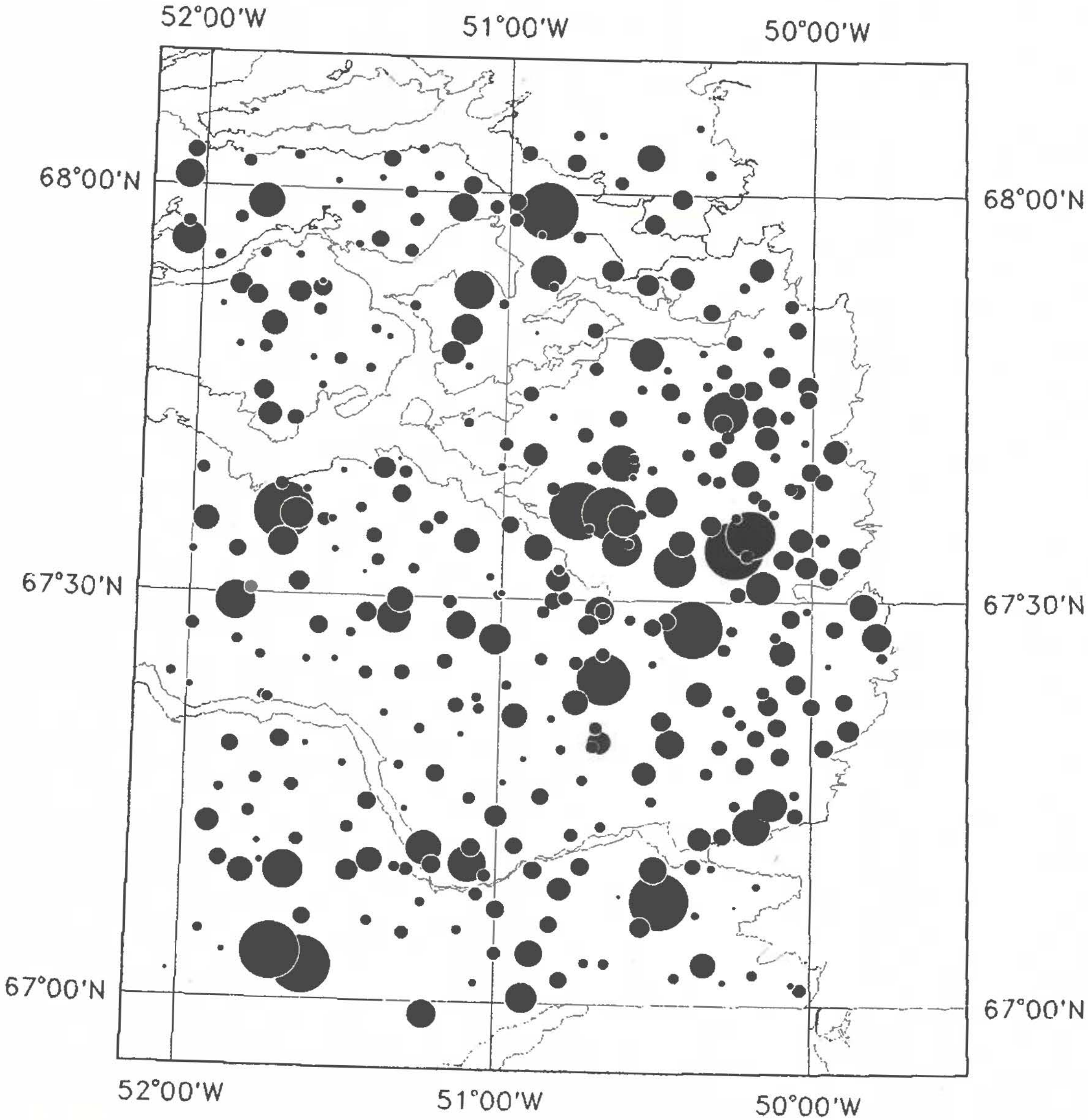
| | |
|---|---|
| Number of samples: | 341 |
| Min. value: | 4 |
| Max. value: | 158 |
| Mean: | 22 |
| Median: | 18 |
| Variance: | 272 |
| Std. Dev.: | 16 |

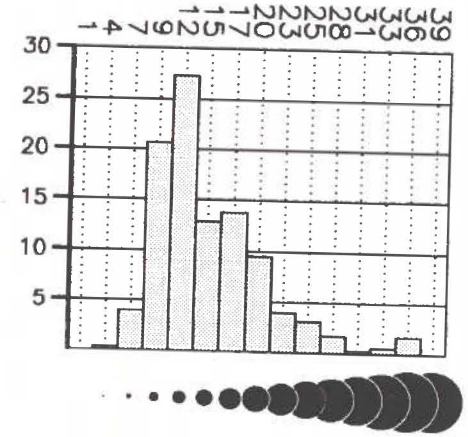
50 km

Fig. 18

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: Hf in stream sediment




Hf ppm

Instrumental Neutron Activation Analysis

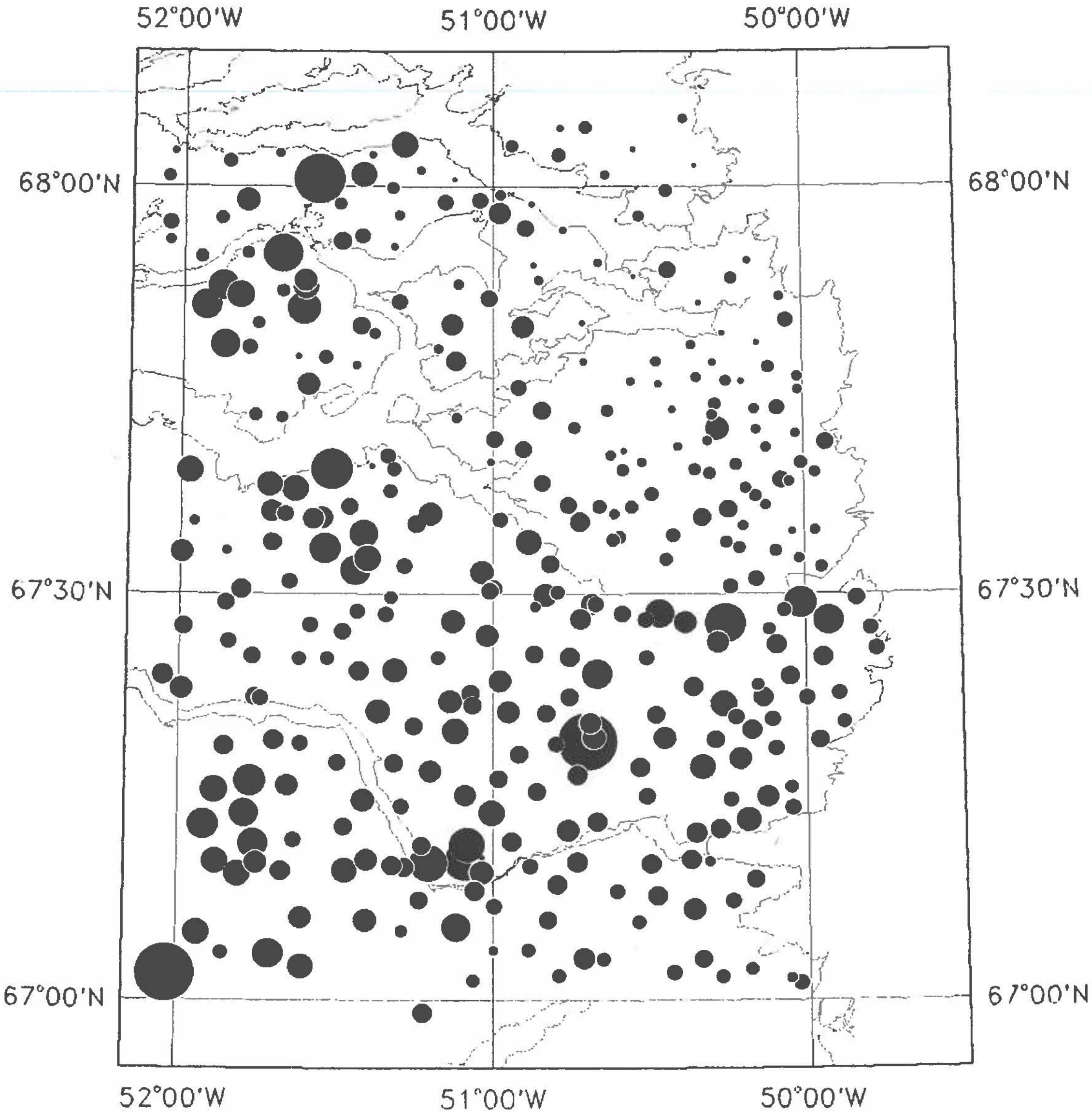
| | |
|---|---|
| Number of samples: | 350 |
| Min. value: | 5 |
| Max. value: | 53 |
| Mean: | 15 |
| Median: | 13 |
| Variance: | 41 |
| Std. Dev.: | 6 |

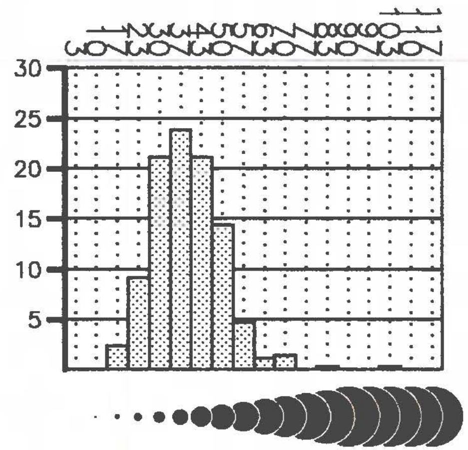
50 km

Fig. 19

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: Ni in stream sediment




Ni ppm

**X-ray Fluorescence Analysis**

| | |
|---|---|
| Number of samples: | 341 |
| Min. value: | 16 |
| Max. value: | 133 |
| Mean: | 39 |
| Median: | 38 |
| Variance: | 148 |
| Std. Dev.: | 12 |

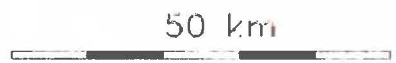
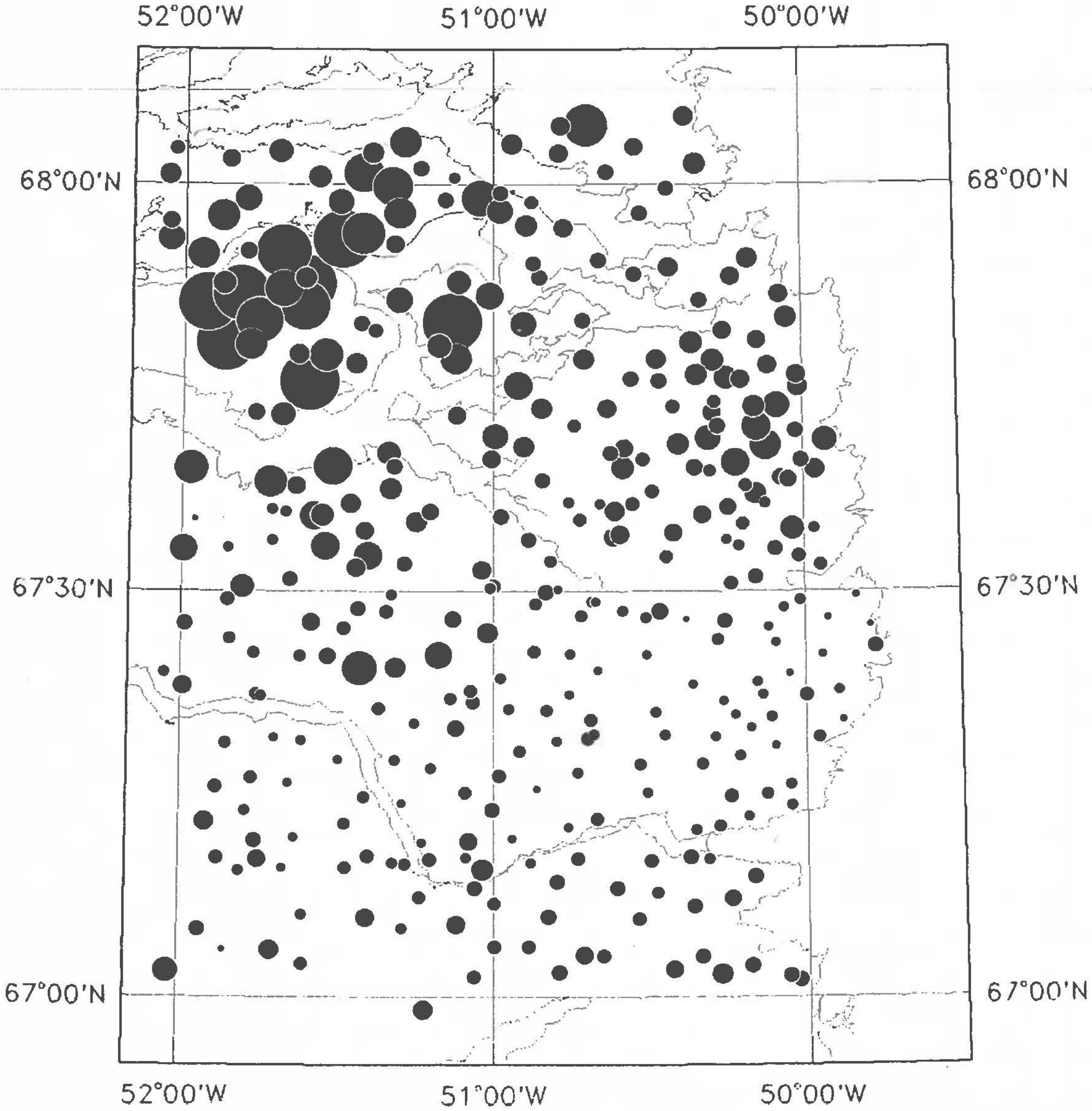
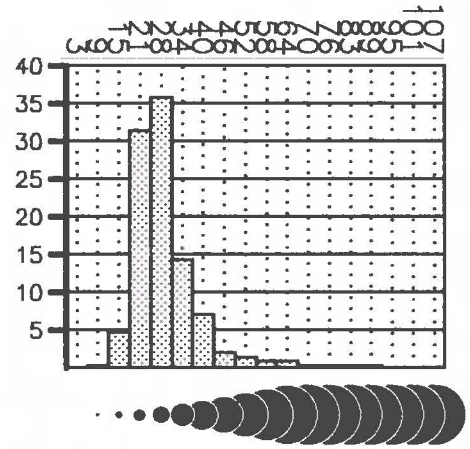



Fig. 20

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: Rb in stream sediment




Rb ppm

**X-ray Fluorescence Analysis**

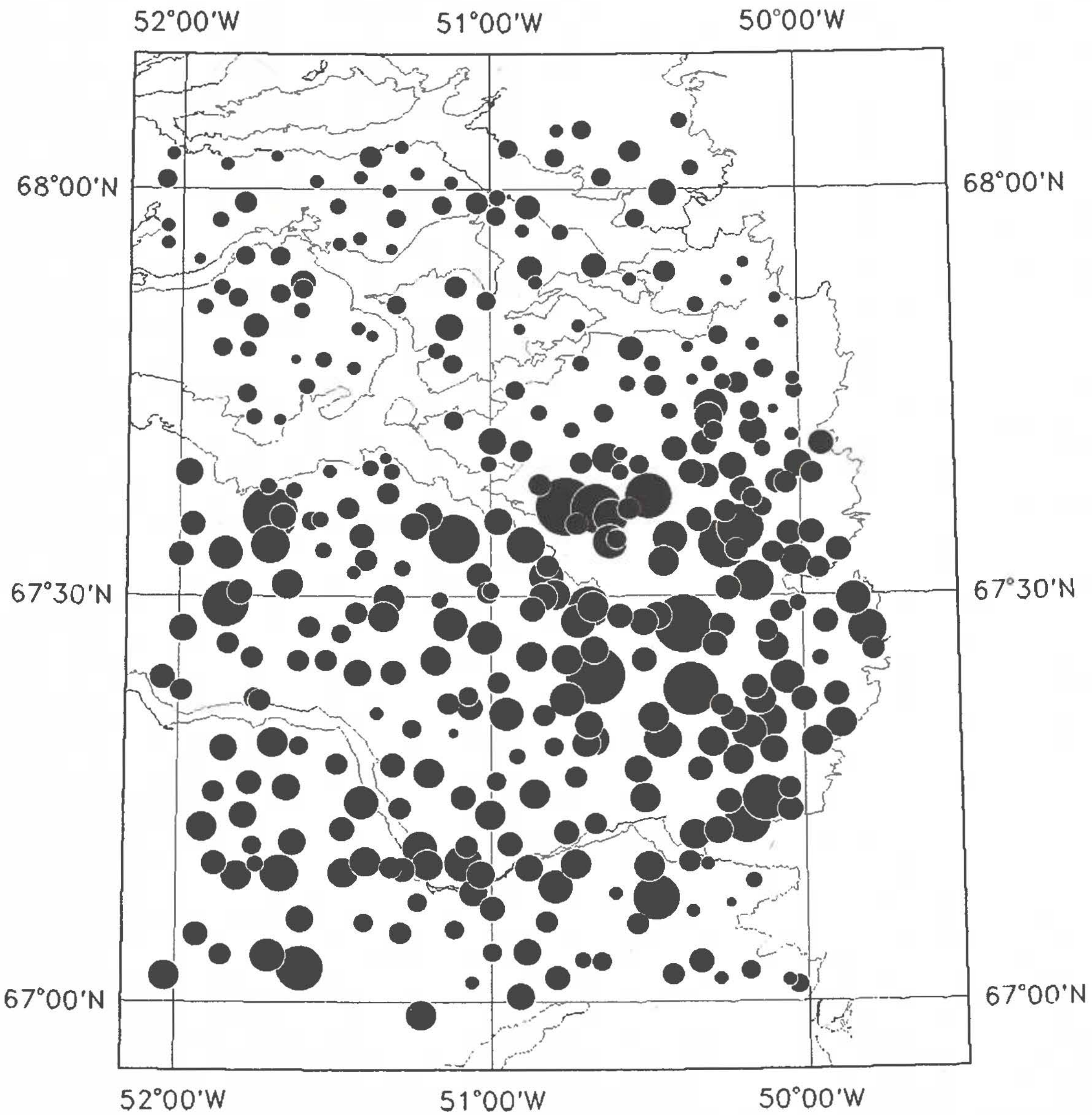
| | |
|---|---|
| Number of samples: | 341 |
| Min. value: | 7 |
| Max. value: | 91 |
| Mean: | 29 |
| Median: | 26 |
| Variance: | 102 |
| Std. Dev.: | 10 |

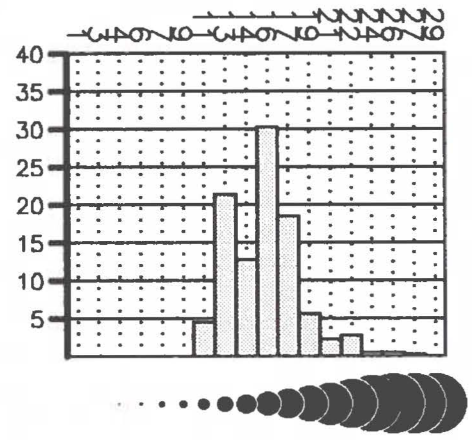
50 km

Fig. 21

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: Sc in stream sediment




Sc ppm

**Instrumental Neutron Activation Analysis**

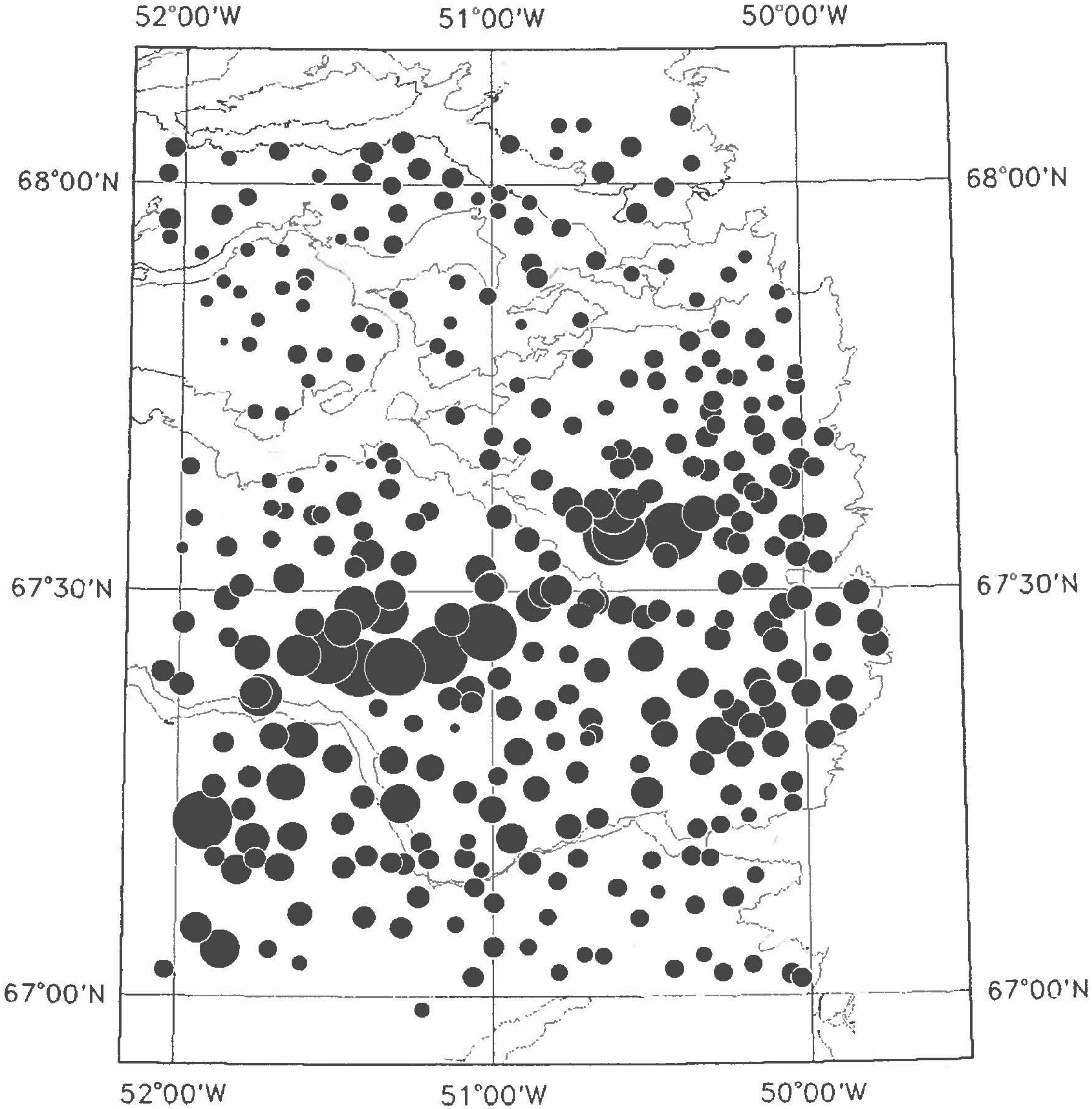
| | |
|---|---|
| Number of samples: | 350 |
| Min. value: | 10 |
| Max. value: | 28 |
| Mean: | 15 |
| Median: | 15 |
| Variance: | 8 |
| Std. Dev.: | 3 |

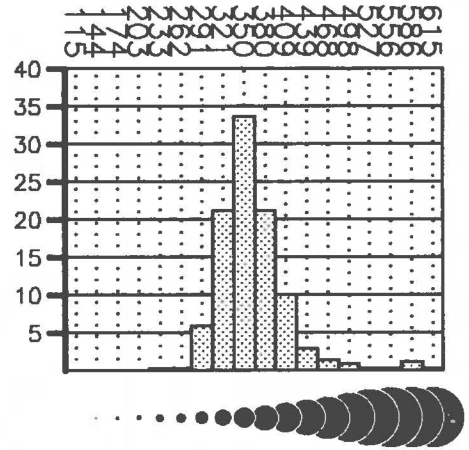
50 km

Fig. 22

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: Sr in stream sediment




Sr ppm

**X-ray Fluorescence Analysis**

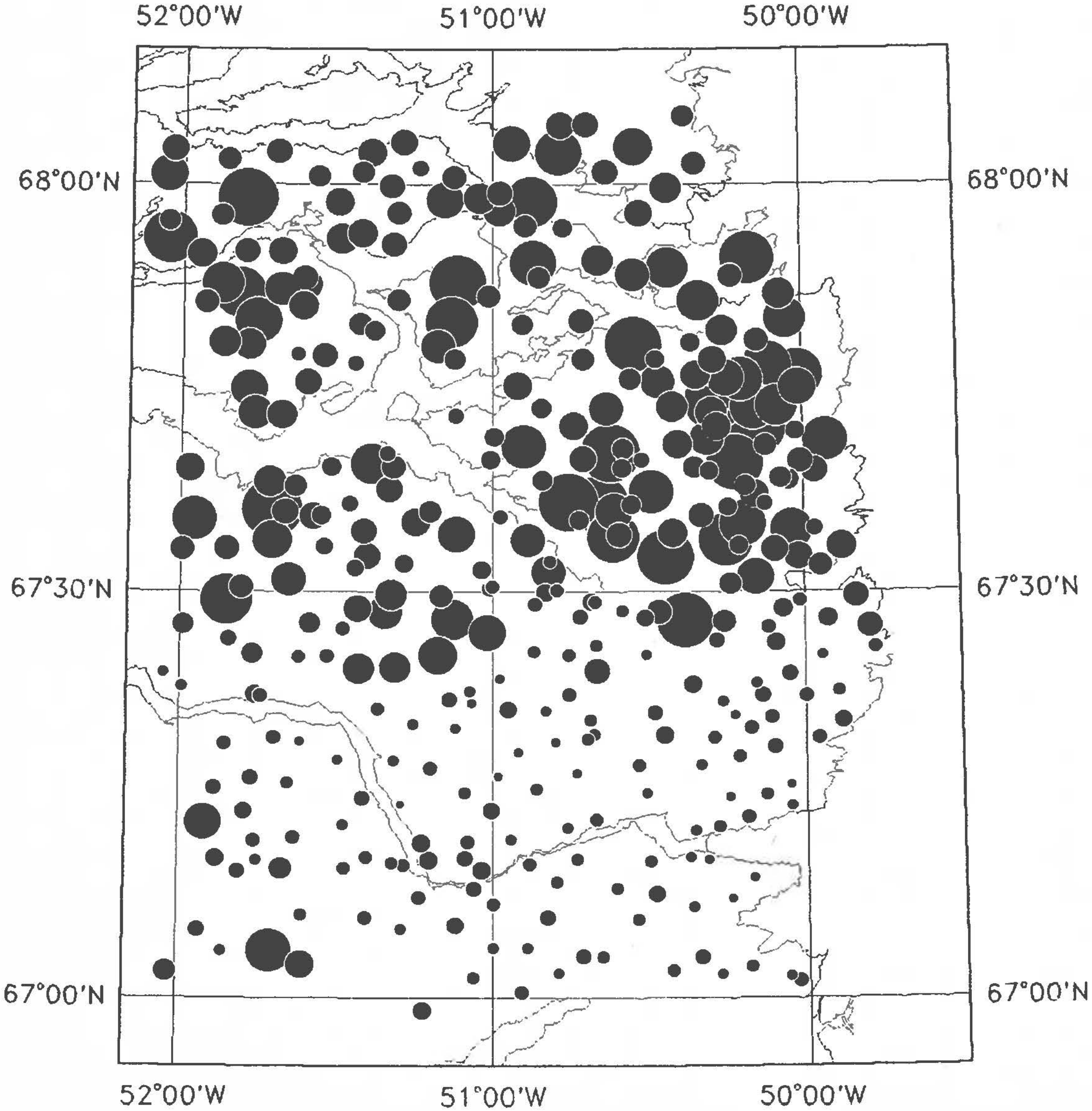
| | |
|---|---|
| Number of samples: | 341 |
| Min. value: | 237 |
| Max. value: | 885 |
| Mean: | 365 |
| Median: | 355 |
| Variance: | 3610 |
| Std. Dev.: | 60 |

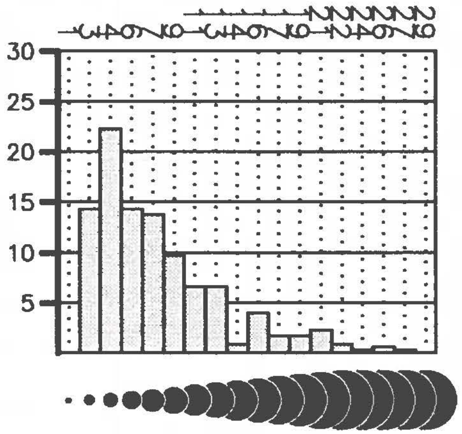
50 km

Fig. 23

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: Th in stream sediment




Th ppm

**Instrumental Neutron Activation Analysis**

| | |
|---|---|
| Number of samples: | 350 |
| Min. value: | 2 |
| Max. value: | 28 |
| Mean: | 8 |
| Median: | 7 |
| Variance: | 25 |
| Std. Dev.: | 5 |

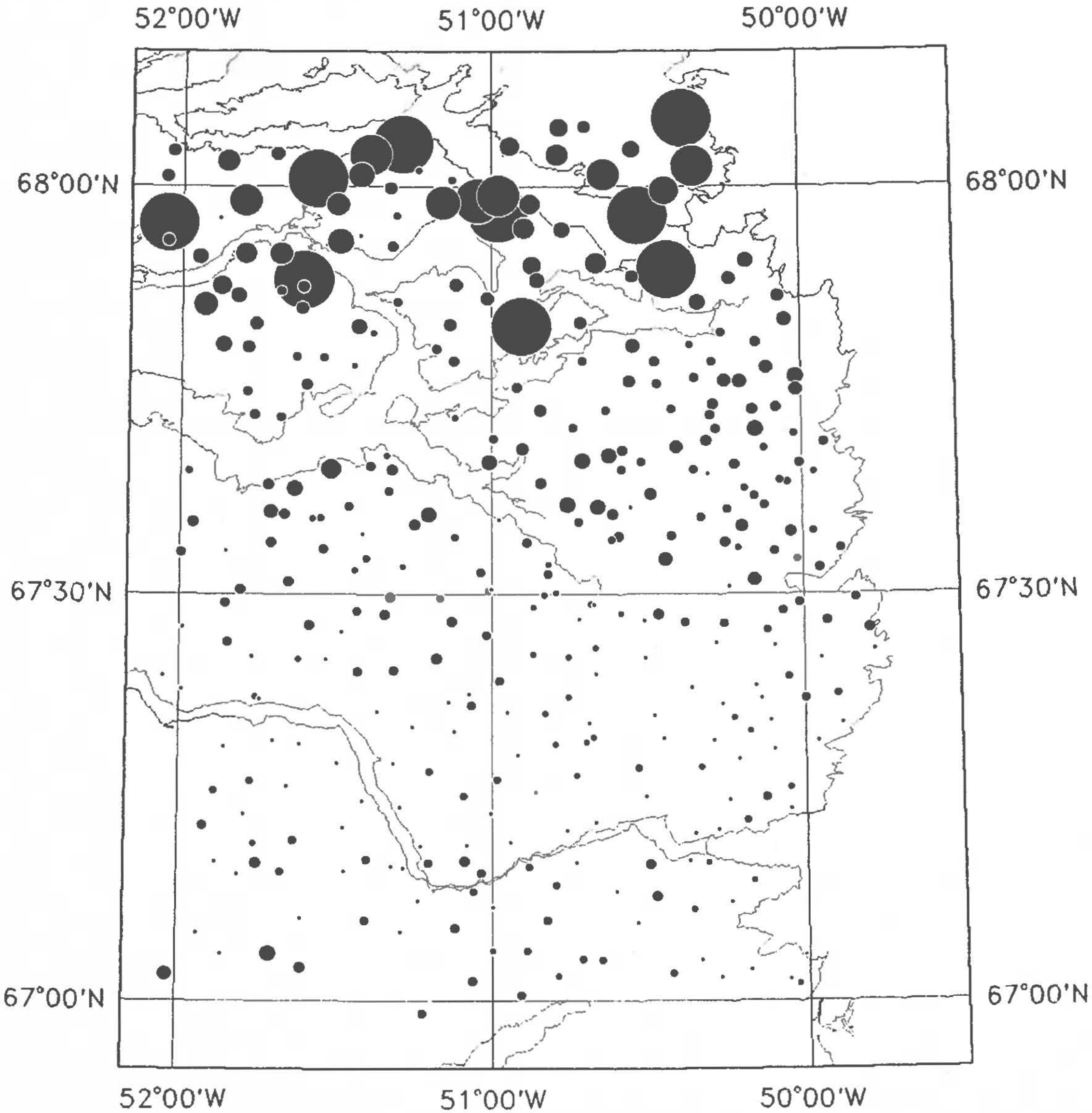
50 km

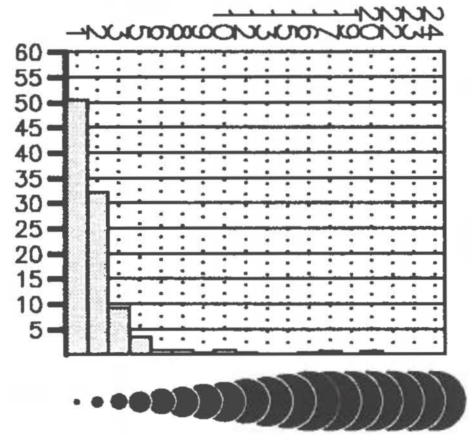
Fig. 24

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: U in stream sediment

GGU




U ppm

**Instrumental Neutron Activation Analysis**

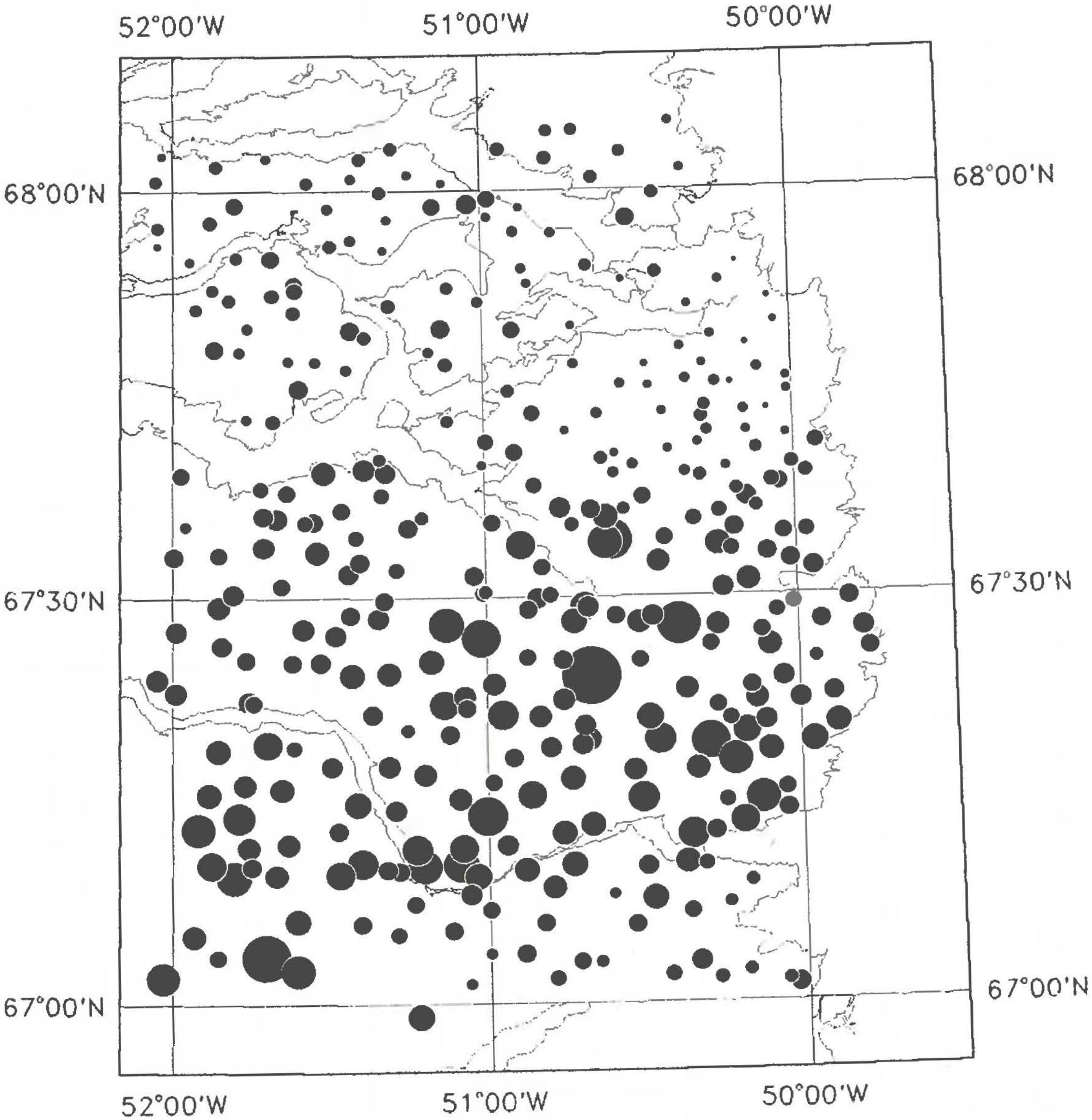
| | |
|---|---|
| Number of samples: | 350 |
| Min. value: | 0 |
| Max. value: | 47 |
| Mean: | 2 |
| Median: | 1 |
| Variance: | 24 |
| Std. Dev.: | 5 |

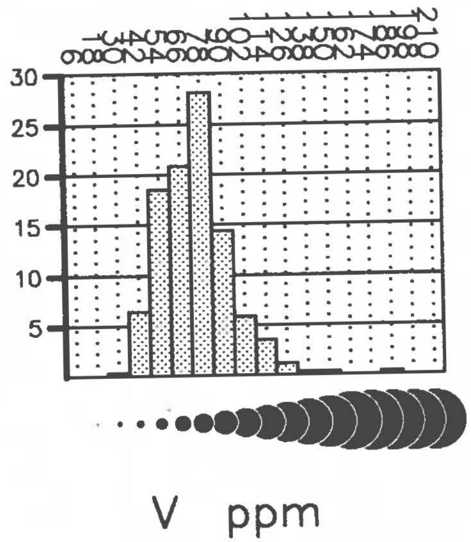
50 km

Fig. 25

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: V in stream sediment




X–ray Fluorescence Analysis

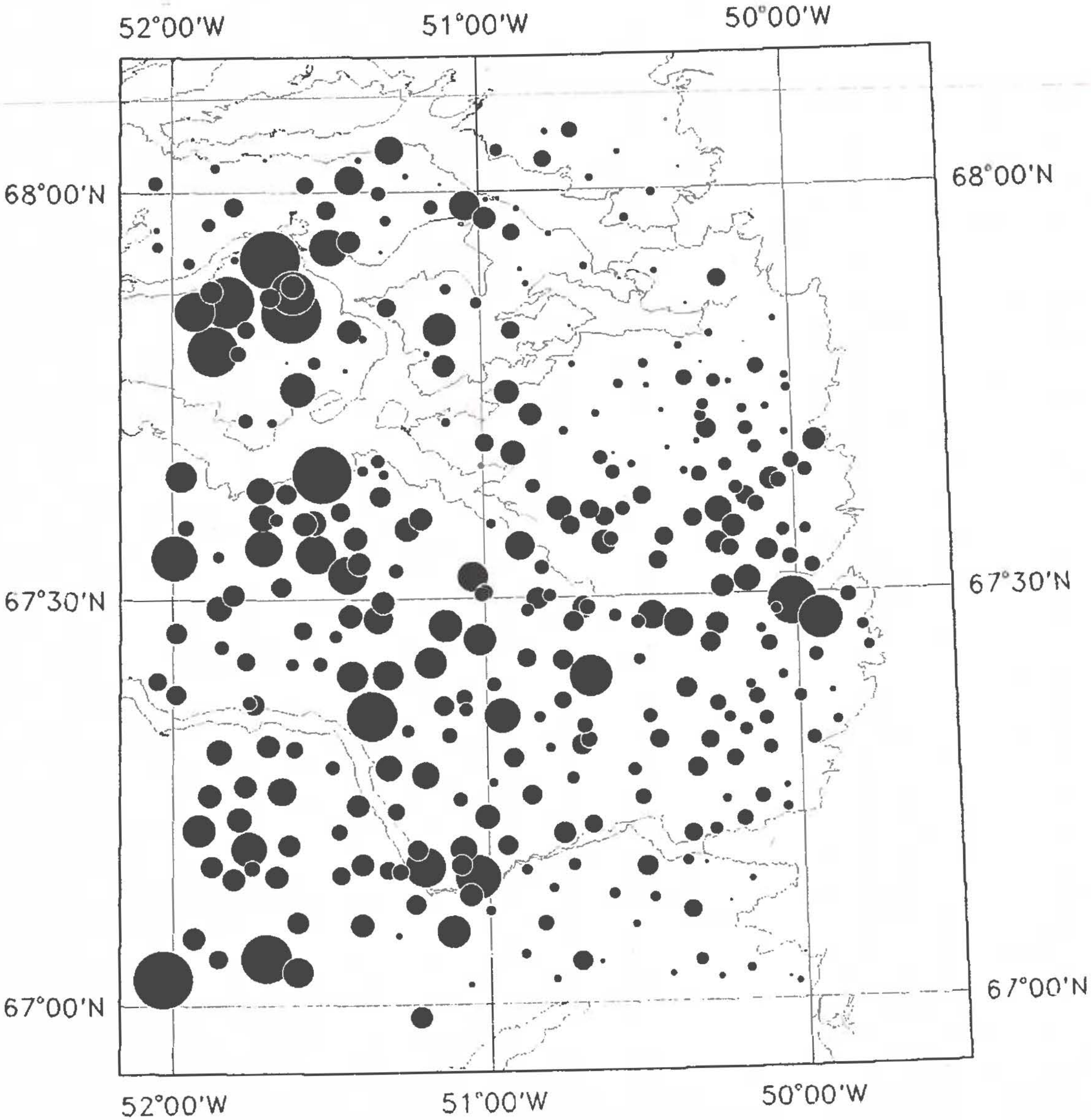
| | |
|---|---|
| Number of samples: | 341 |
| Min. value: | 32 |
| Max. value: | 189 |
| Mean: | 74 |
| Median: | 73 |
| Variance: | 398 |
| Std. Dev.: | 20 |

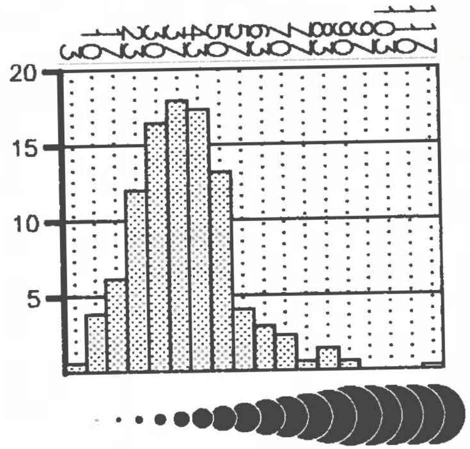
50 km

Fig. 26

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: Zn in stream sediment




Zn ppm

**X-ray Fluorescence Analysis**

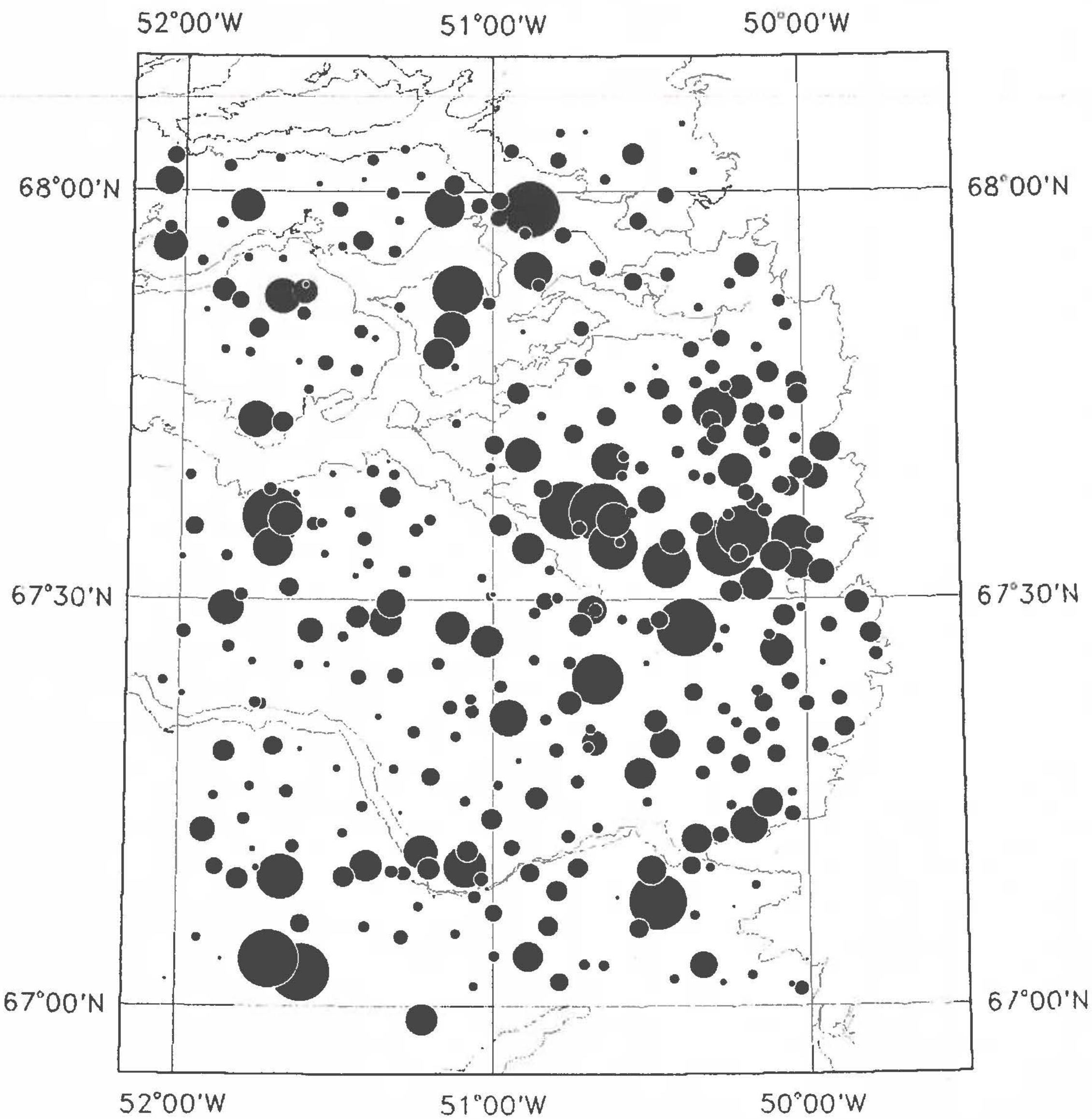
| | |
|---|---|
| Number of samples: | 341 |
| Min. value: | 6 |
| Max. value: | 185 |
| Mean: | 38 |
| Median: | 37 |
| Variance: | 311 |
| Std. Dev.: | 18 |

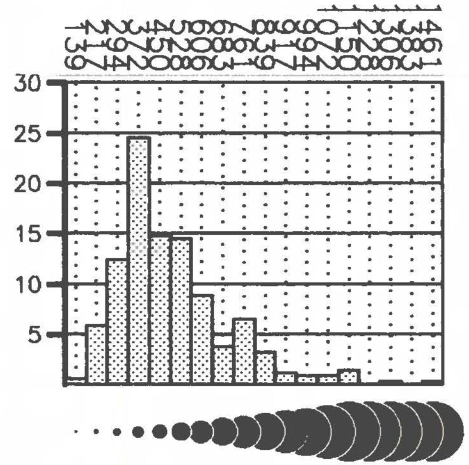
50 km

Fig. 27

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: Zr in stream sediment




Zr ppm

**X-ray Fluorescence Analysis**

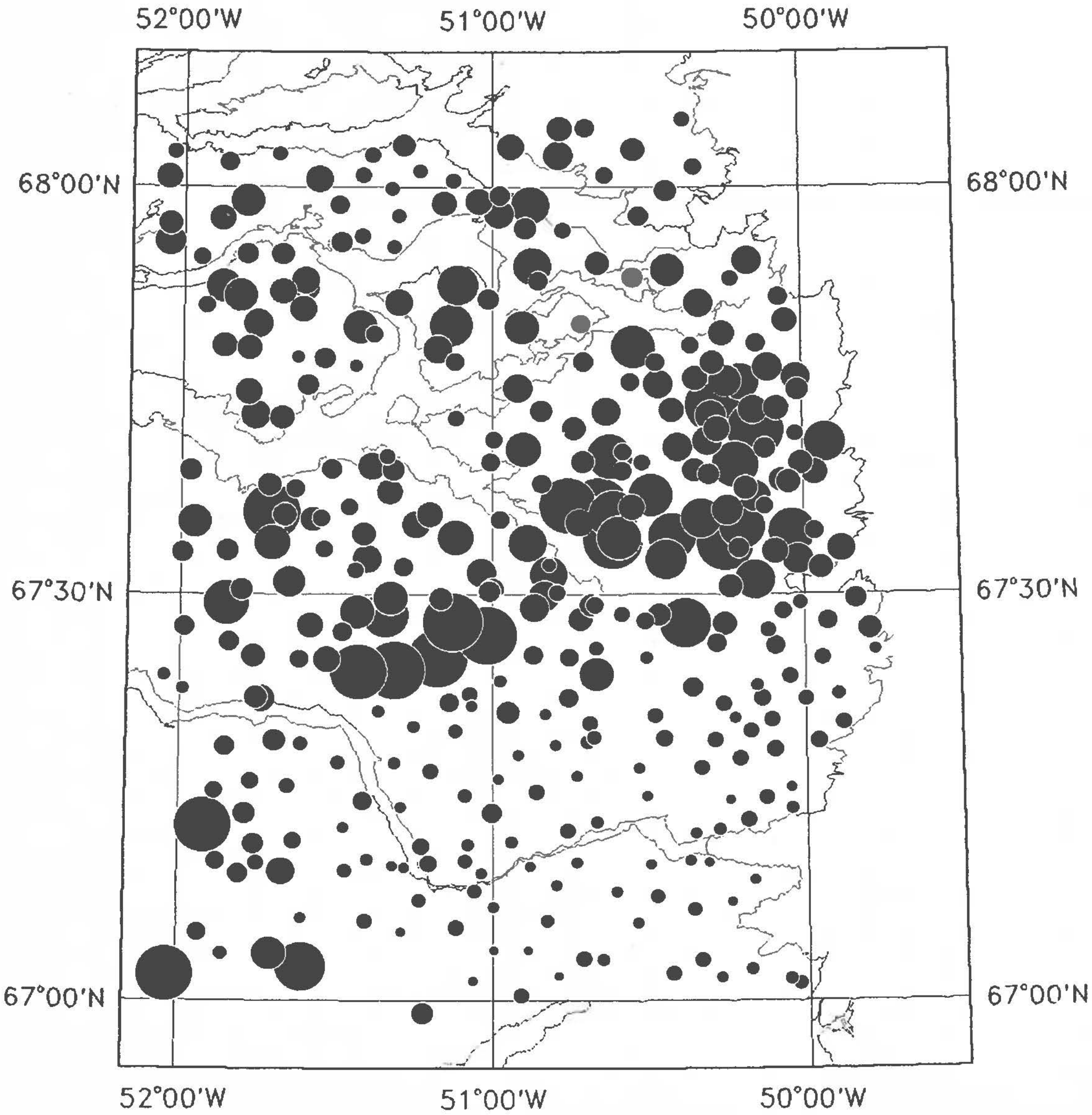
| | |
|---|---|
| Number of samples: | 341 |
| Min. value: | 139 |
| Max. value: | 1639 |
| Mean: | 501 |
| Median: | 444 |
| Variance: | 49788 |
| Std. Dev.: | 223 |

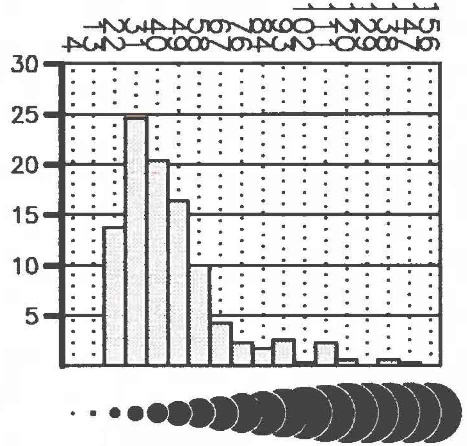
50 km

Fig. 28

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: La in stream sediment




La ppm

**Instrumental Neutron Activation Analysis**

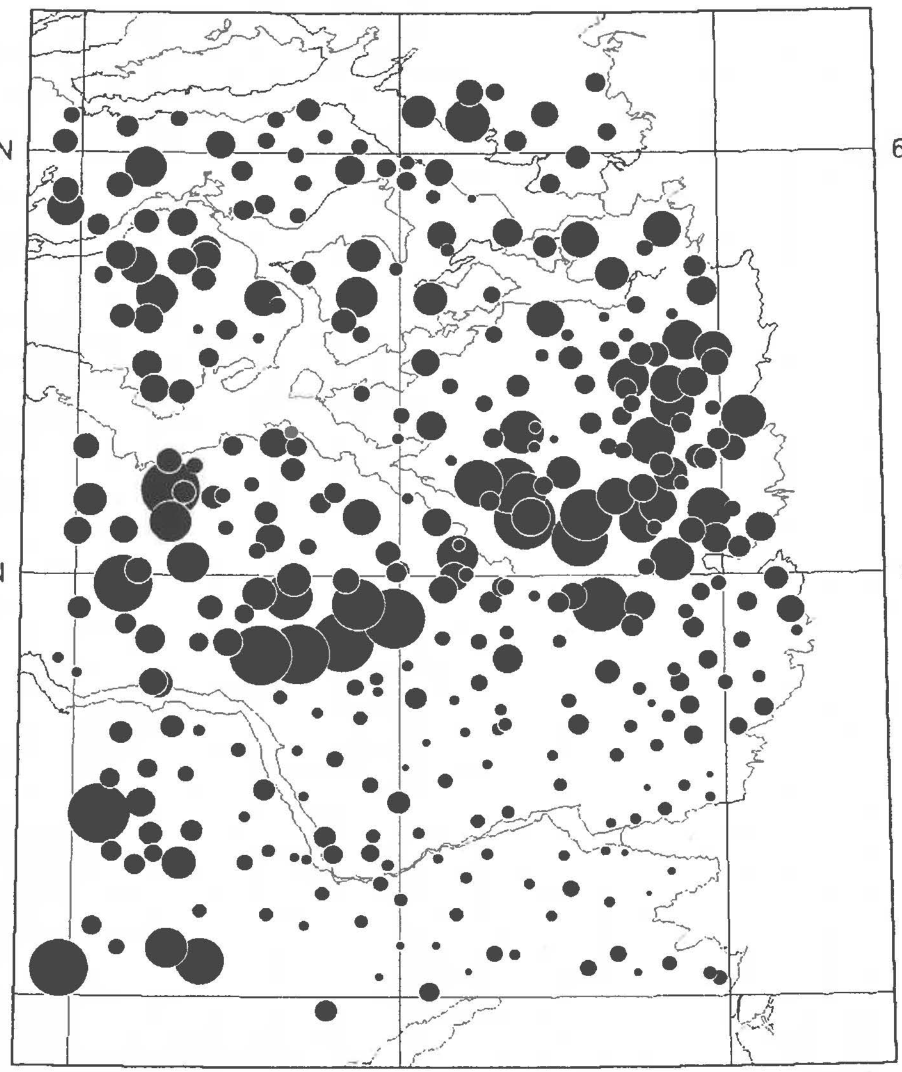
| | |
|---|---|
| Number of samples: | 350 |
| Min. value: | 19 |
| Max. value: | 170 |
| Mean: | 46 |
| Median: | 40 |
| Variance: | 524 |
| Std. Dev.: | 23 |

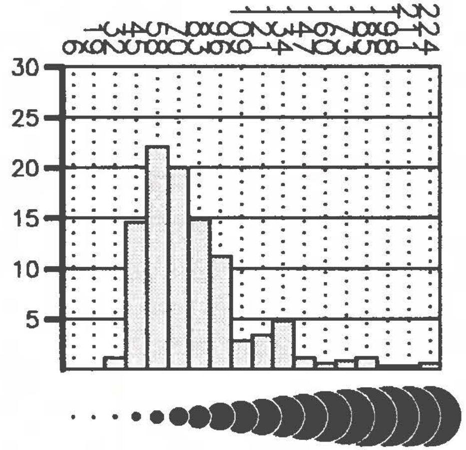
50 km

Fig. 29

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: Ce in stream sediment




Ce ppm

**Instrumental Neutron Activation Analysis**

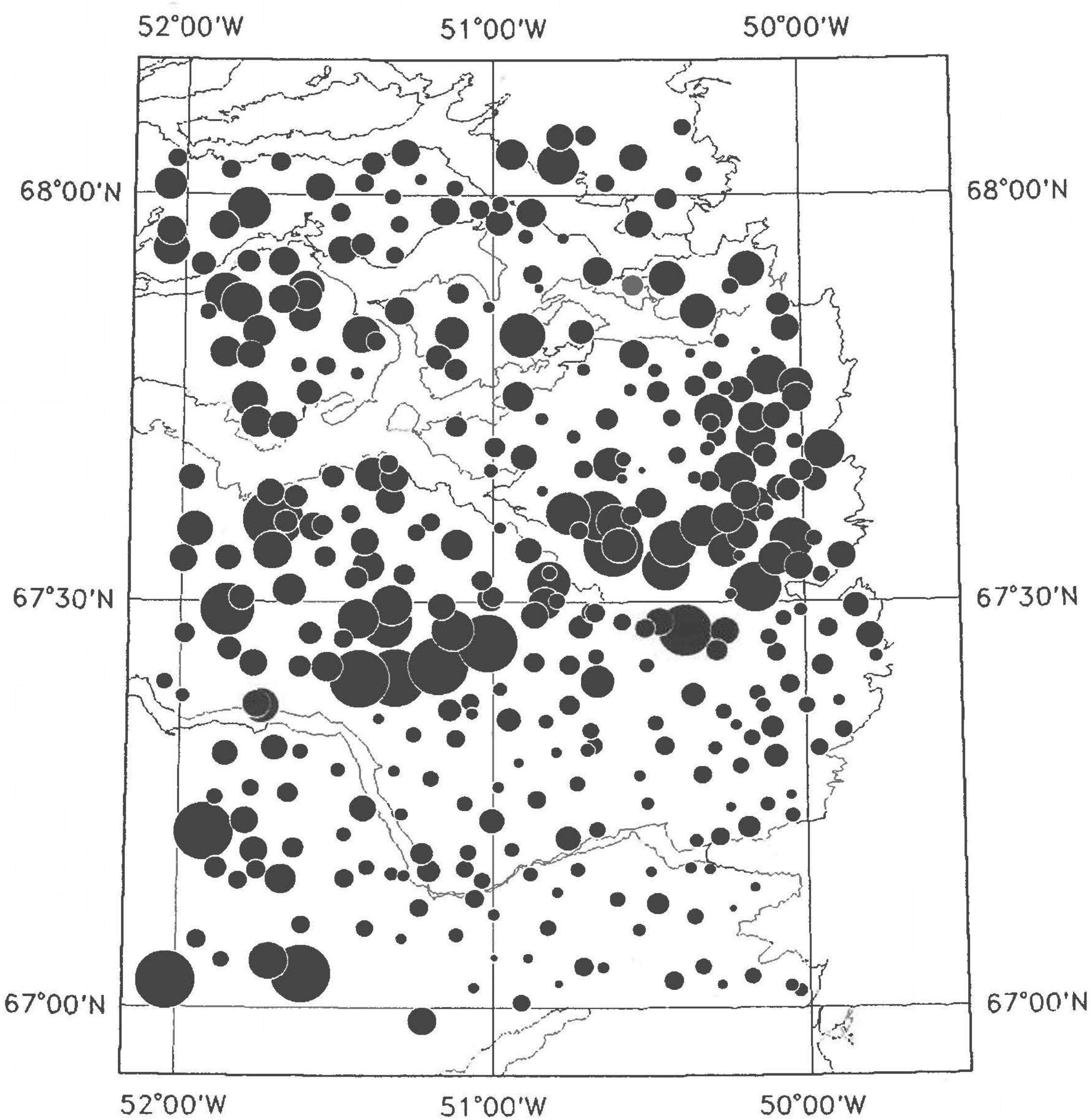
| | |
|---|---|
| Number of samples: | 350 |
| Min. value: | 34 |
| Max. value: | 250 |
| Mean: | 80 |
| Median: | 72 |
| Variance: | 1154 |
| Std. Dev.: | 34 |

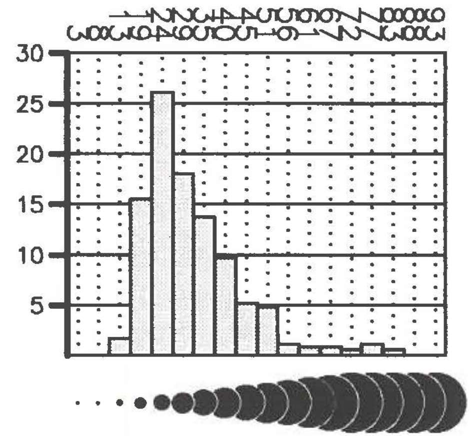
50 km

Fig. 30

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: Nd in stream sediment




Nd ppm

**Instrumental Neutron Activation Analysis**

| | |
|---|---|
| Number of samples: | 350 |
| Min. value: | 13 |
| Max. value: | 110 |
| Mean: | 32 |
| Median: | 28 |
| Variance: | 173 |
| Std. Dev.: | 13 |

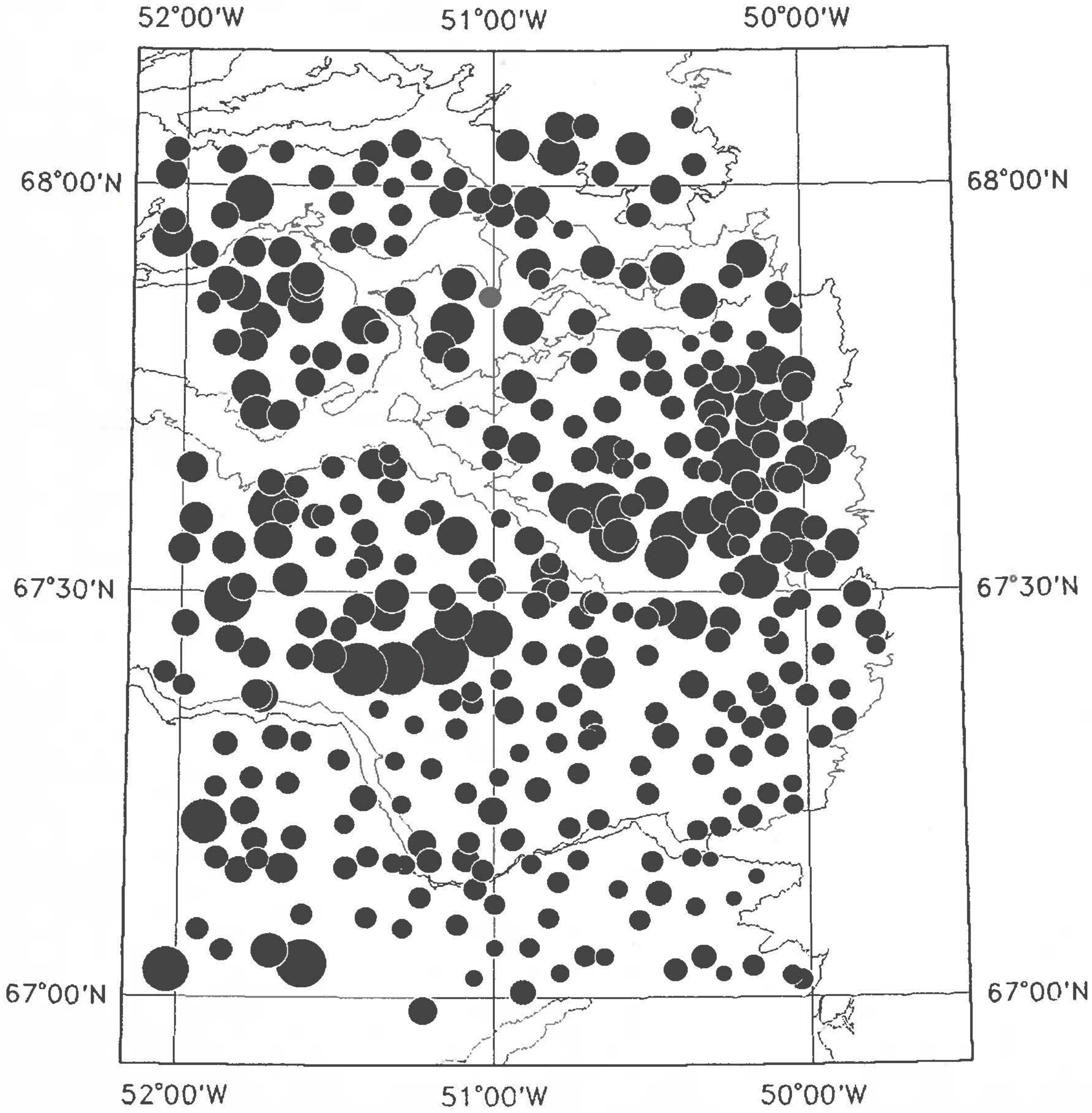
50 km

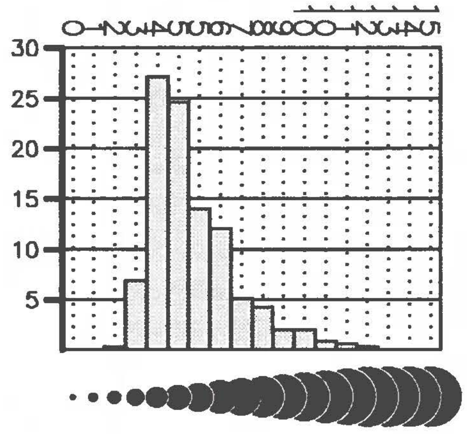
Fig. 31

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: Sm in stream sediment

GGU




Sm ppm

**Instrumental Neutron Activation Analysis**

| | |
|---|---|
| Number of samples: | 350 |
| Min. value: | 2 |
| Max. value: | 12 |
| Mean: | 5 |
| Median: | 5 |
| Variance: | 3 |
| Std. Dev.: | 2 |

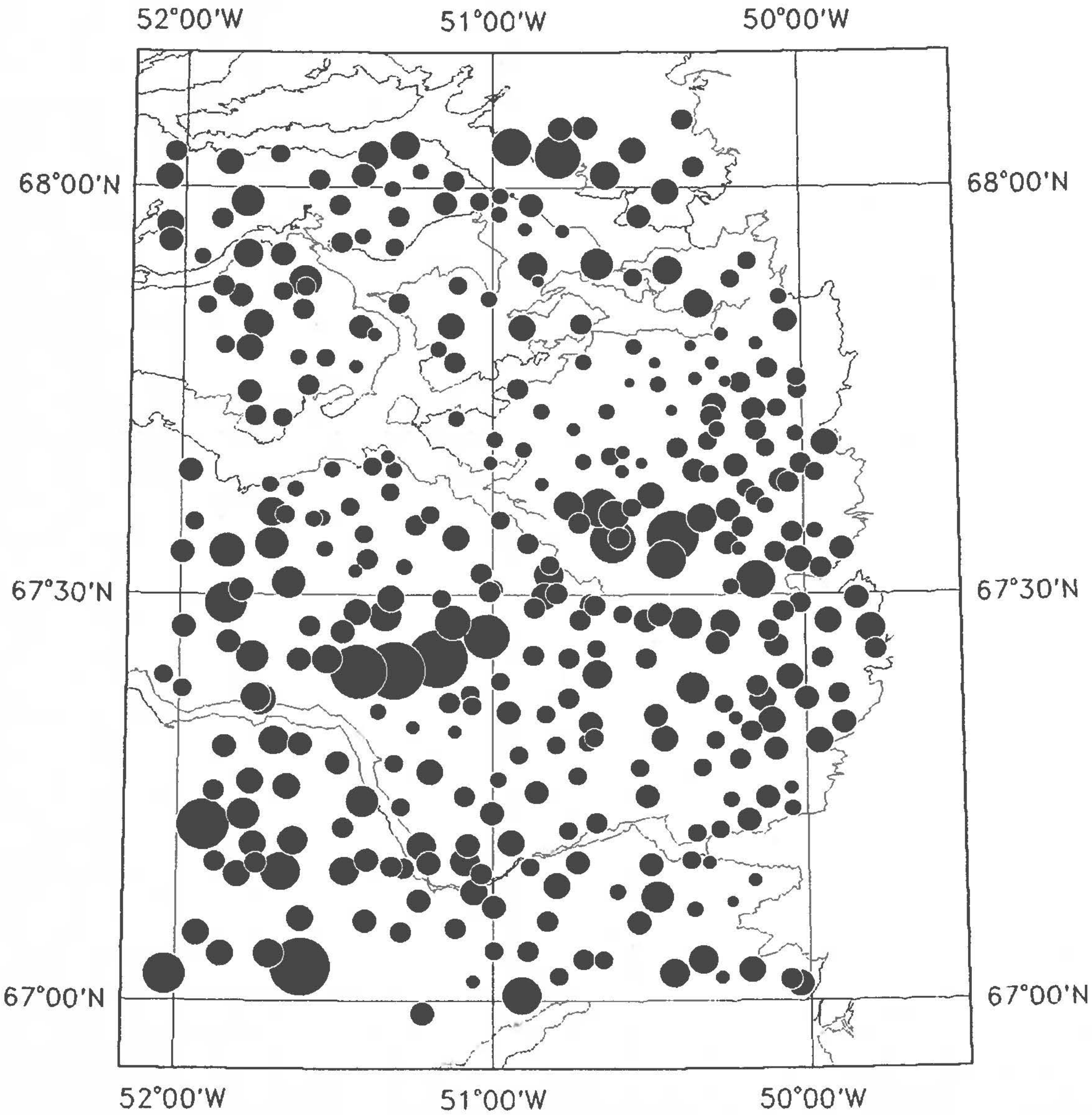
50 km

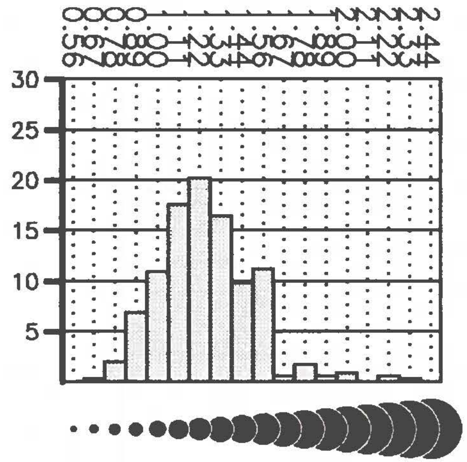
Fig. 32

Grønlands Geologiske Undersøgelse

GGU

# GEOCHEMICAL MAP: Eu in stream sediment




Eu ppm

**Instrumental Neutron Activation Analysis**

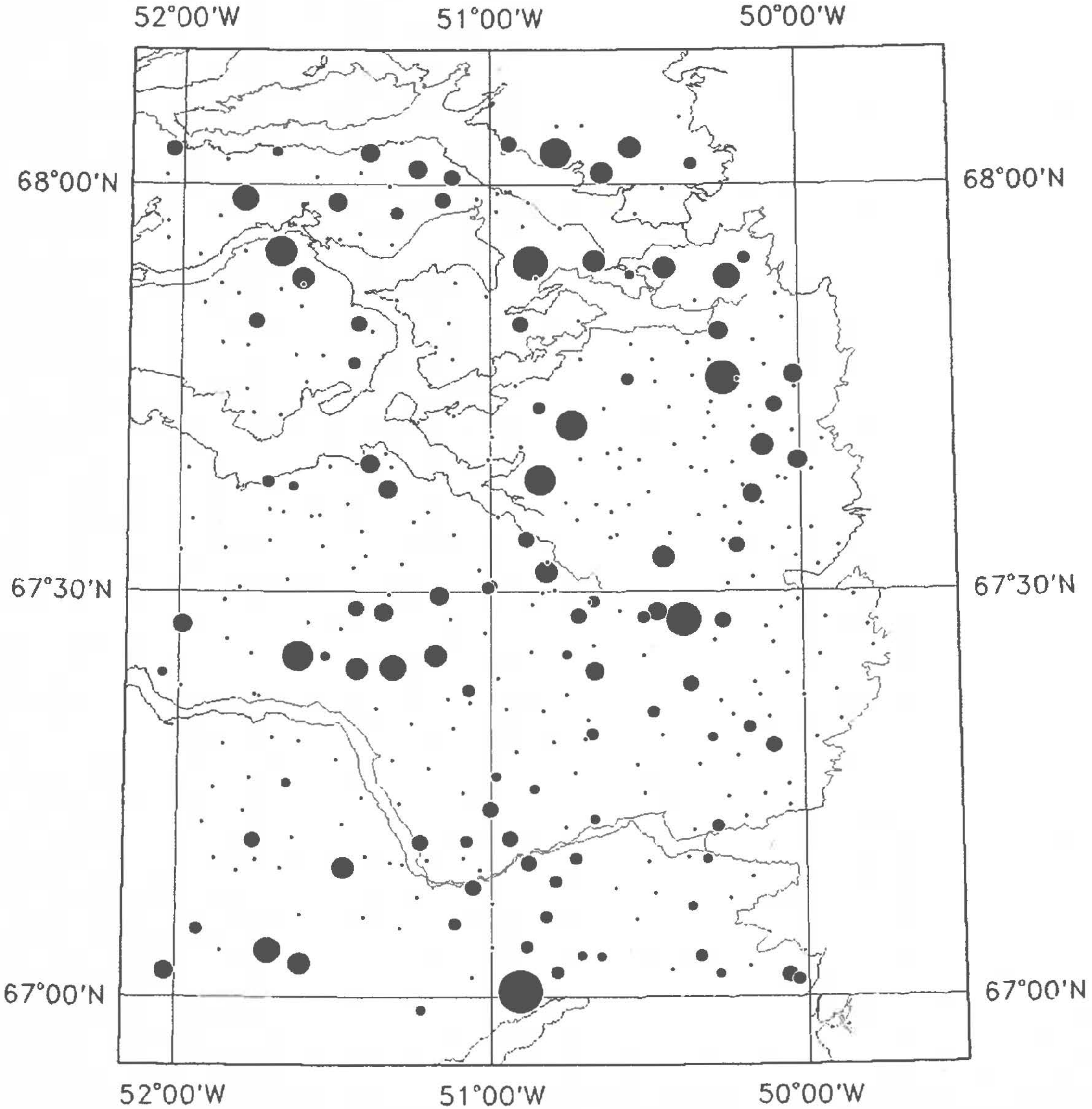
| | |
|---|---|
| Number of samples: | 350 |
| Min. value: | 0.70 |
| Max. value: | 2.80 |
| Mean: | 1.25 |
| Median: | 1.20 |
| Variance: | 0.08 |
| Std. Dev.: | 0.28 |

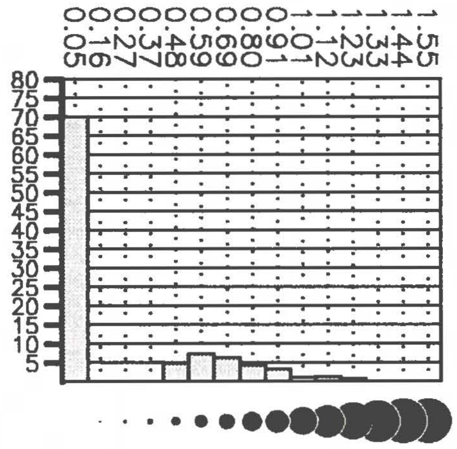
50 km

Fig. 33

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: Tb in stream sediment




Tb ppm

**Instrumental Neutron Activation Analysis**

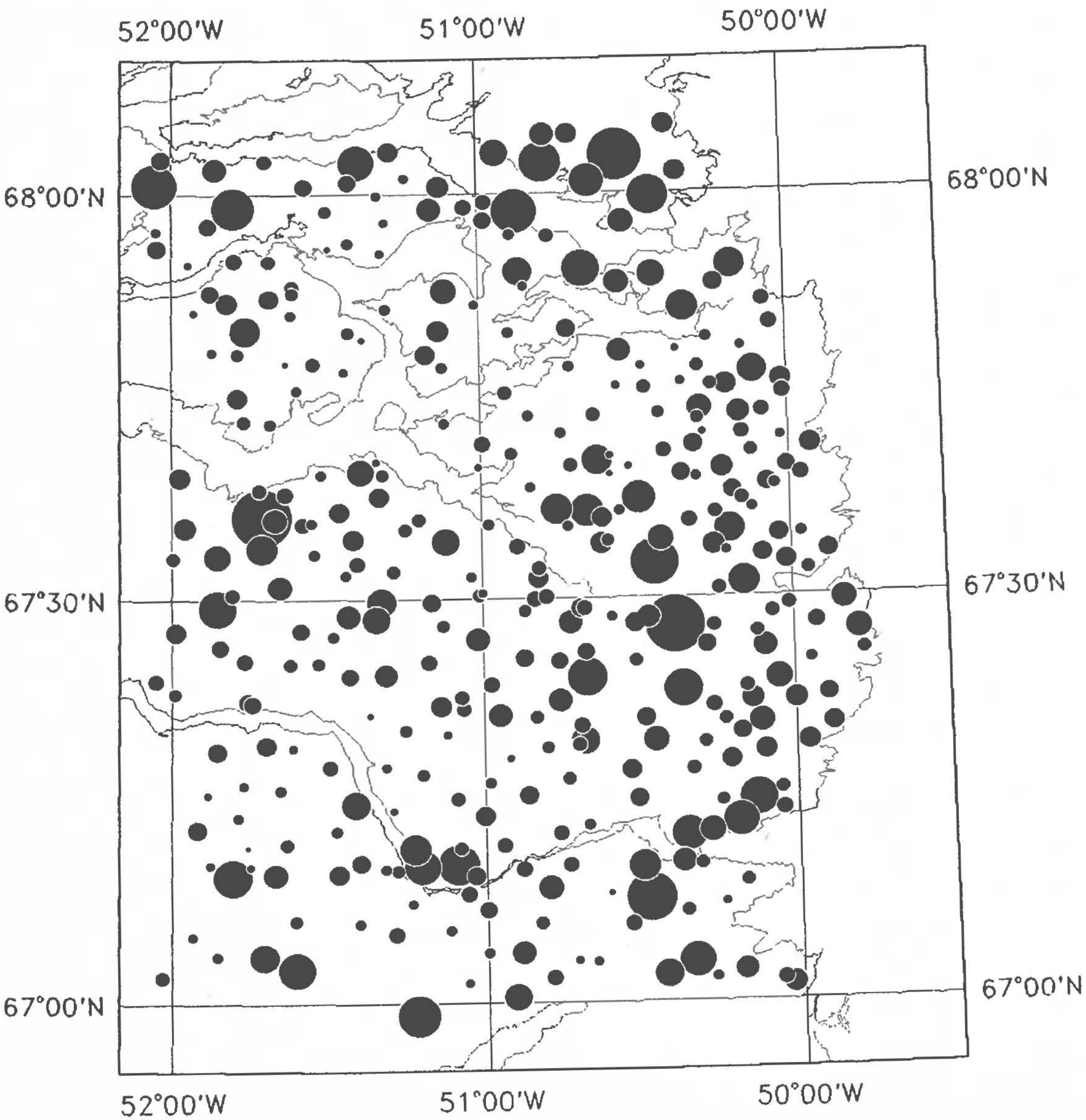
| | |
|---|---|
| Number of samples: | 350 |
| Min. value: | 0.00 |
| Max. value: | 2.30 |
| Mean: | 0.22 |
| Median: | 0.00 |
| Variance: | 0.13 |
| Std. Dev.: | 0.36 |

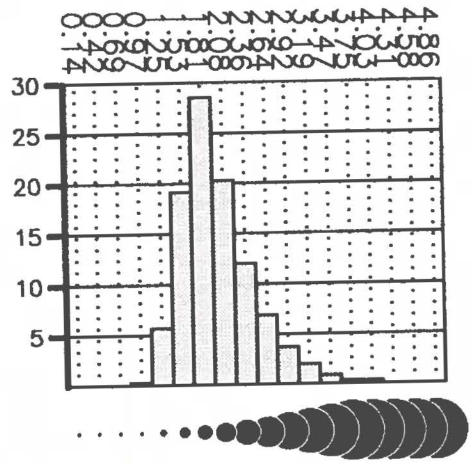
50 km

Fig. 34

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: Yb in stream sediment




Yb ppm

**Instrumental Neutron Activation Analysis**

| | |
|---|---|
| Number of samples: | 350 |
| Min. value: | 1.05 |
| Max. value: | 3.93 |
| Mean: | 1.99 |
| Median: | 1.90 |
| Variance: | 0.23 |
| Std. Dev.: | 0.47 |

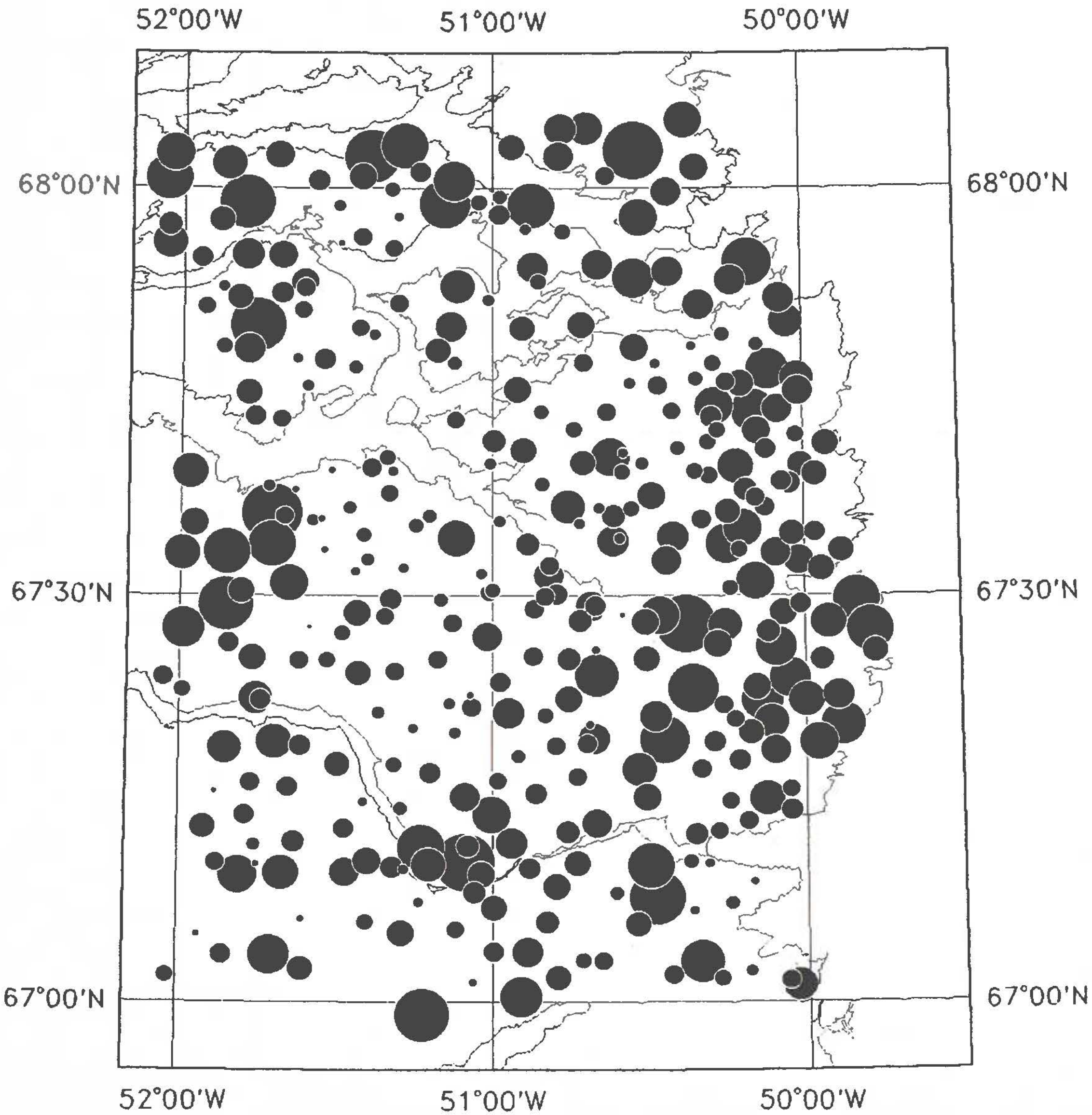
50 km

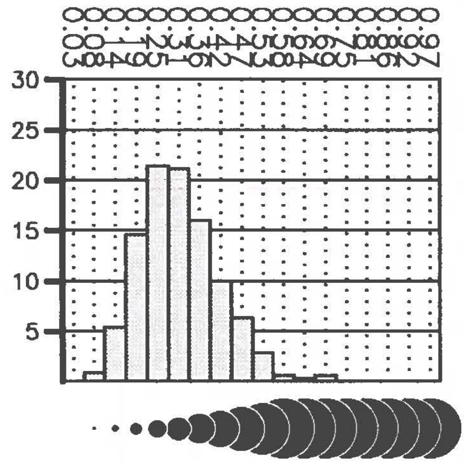
Fig. 35

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: Lu in stream sediment

GGU




Lu ppm

**Instrumental Neutron Activation Analysis**

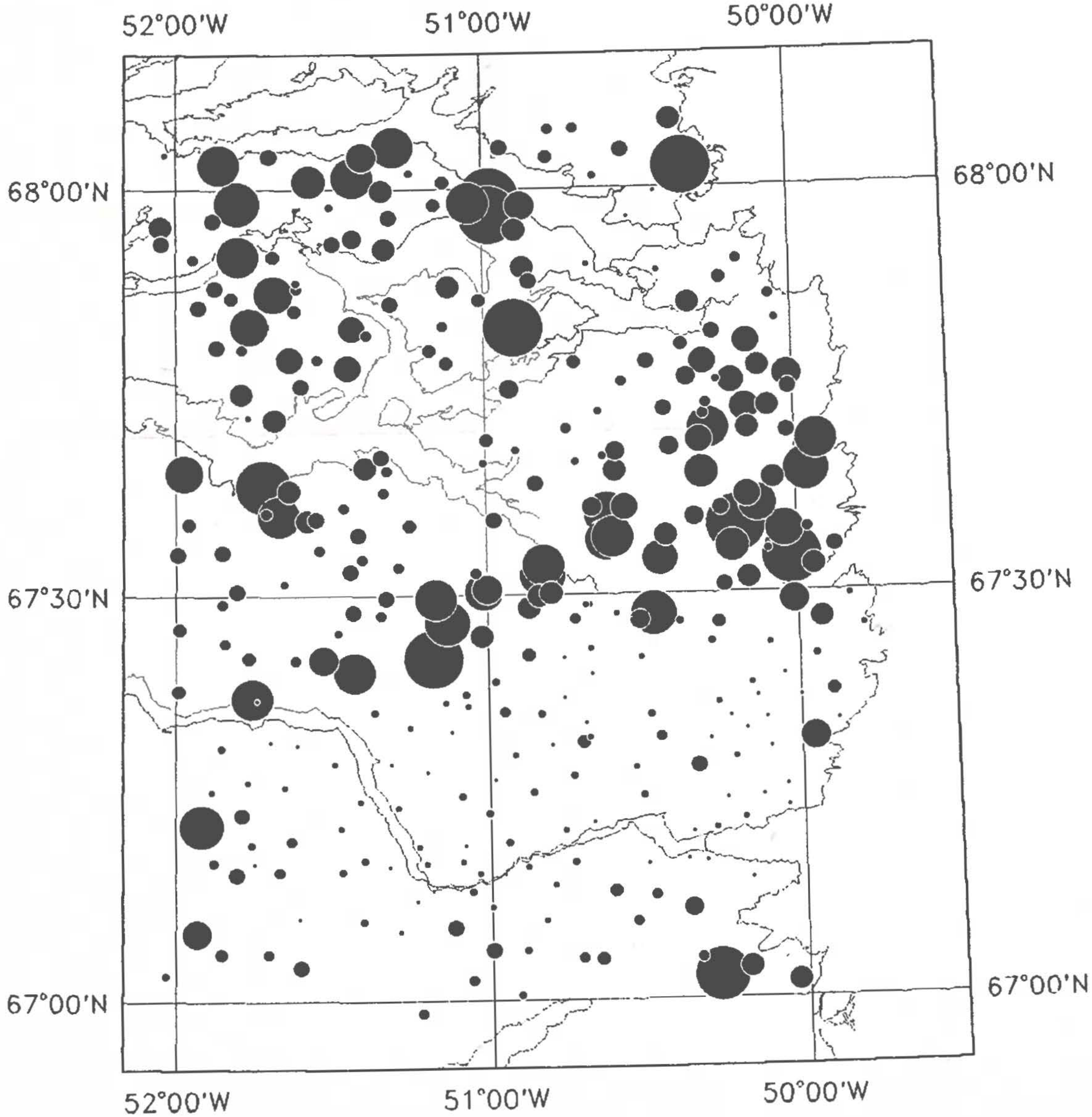
| | |
|---|---|
| Number of samples: | 350 |
| Min. value: | 0.10 |
| Max. value: | 0.71 |
| Mean: | 0.31 |
| Median: | 0.29 |
| Variance: | 0.01 |
| Std. Dev.: | 0.10 |

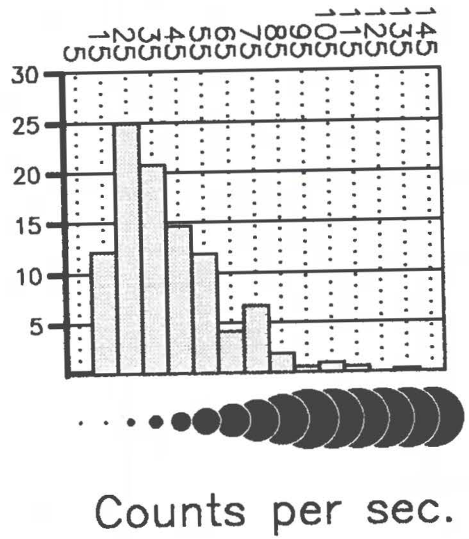
50 km

Fig. 36

Grønlands Geologiske Undersøgelse

# GAMMA–RADIATION MAP: Total radiation




**Scintillometry**

| | |
|---|---|
| Number of samples: | 314 |
| Min. value: | 8 |
| Max. value: | 170 |
| Mean: | 38 |
| Median: | 33 |
| Variance: | 479 |
| Std. Dev.: | 22 |

50 km

Fig. 37

Grønlands Geologiske Undersøgelse

GEOCHEMICAL MAP: Conductivity of stream water

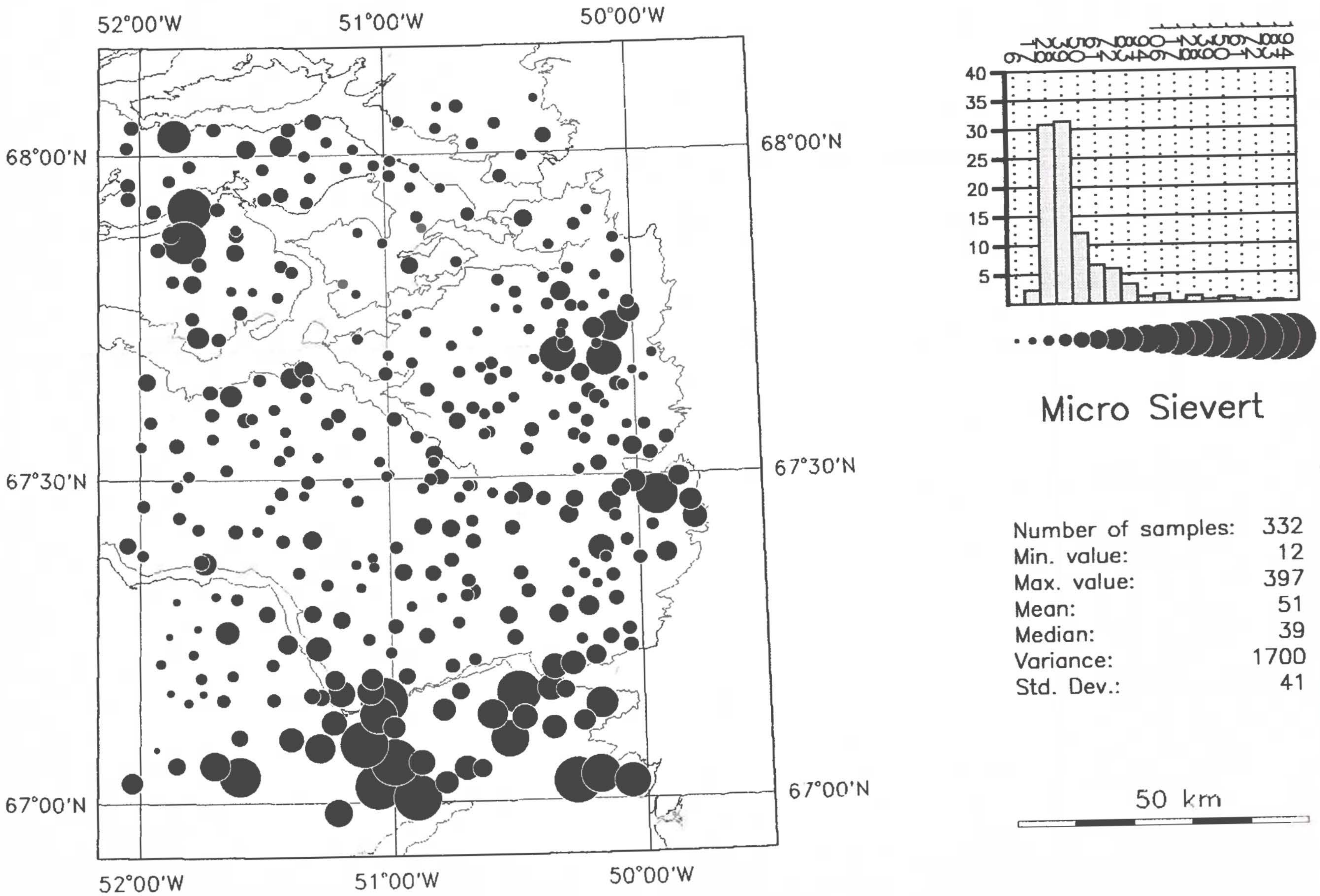
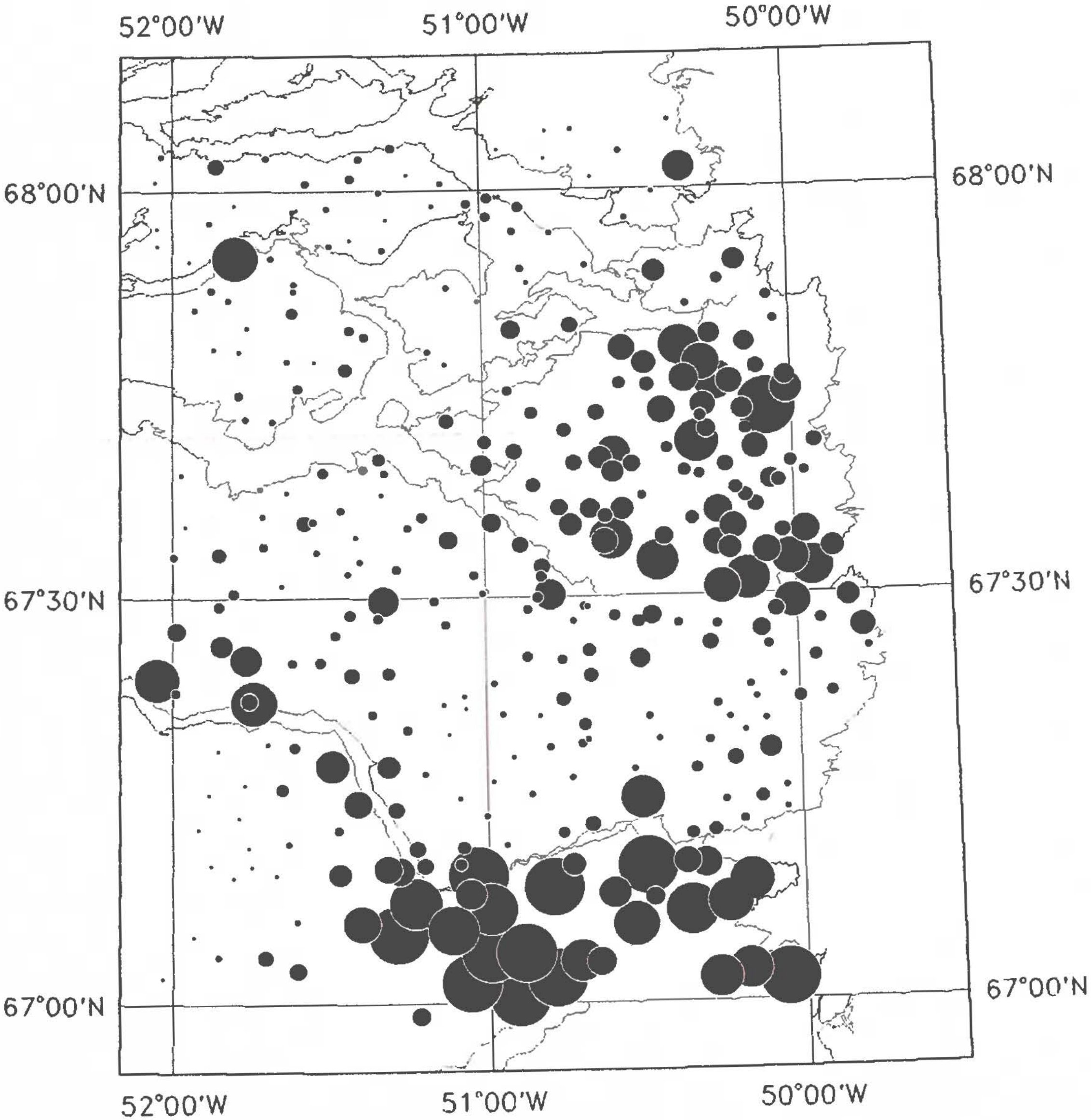
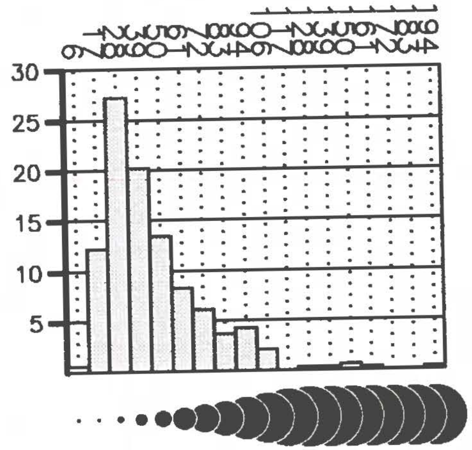



Fig. 38

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: F in stream water




F ppb

Ion sensitive electrode

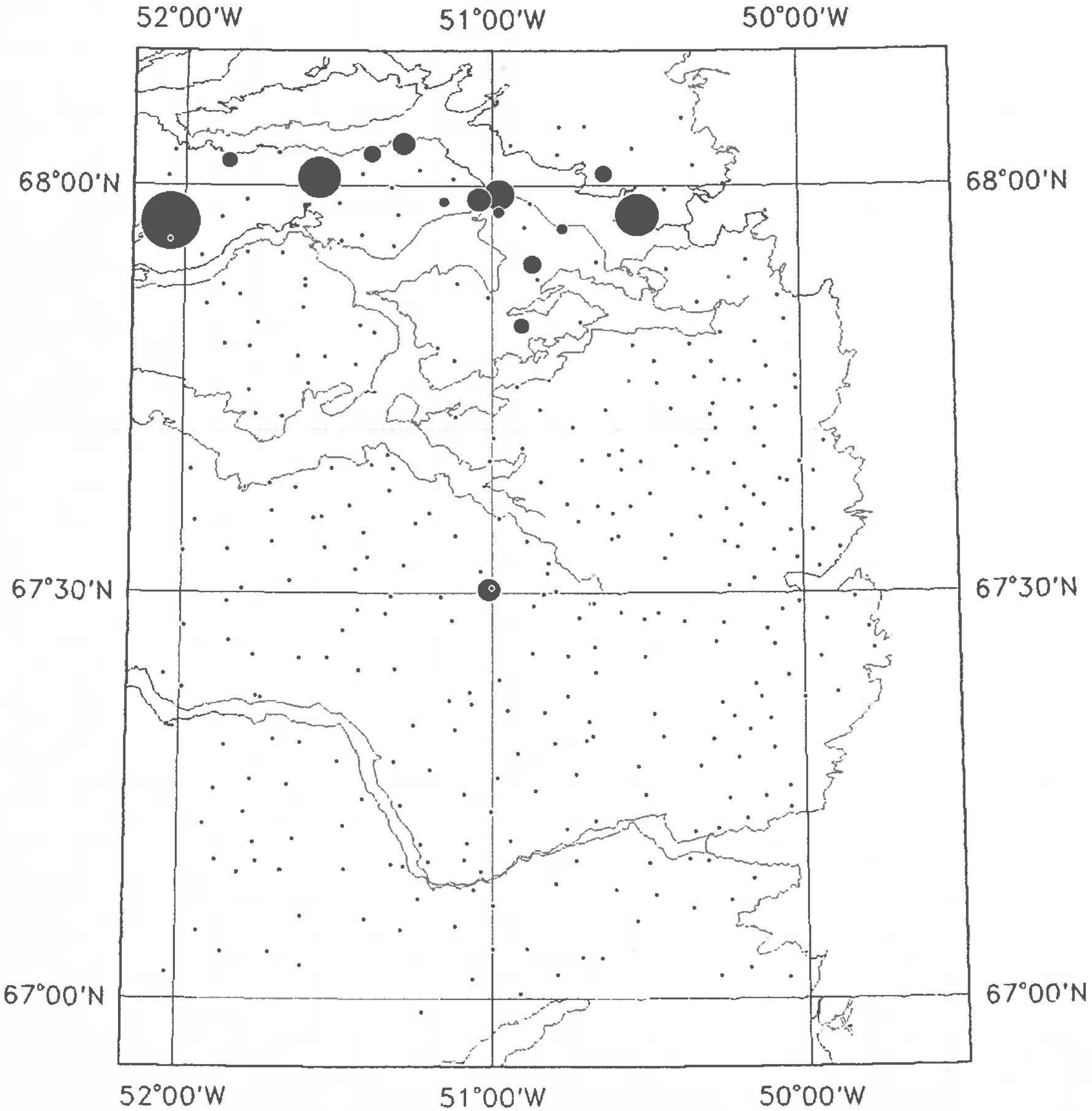
| | |
|---|---|
| Number of samples: | 332 |
| Min. value: | 10 |
| Max. value: | 380 |
| Mean: | 50 |
| Median: | 38 |
| Variance: | 1696 |
| Std. Dev.: | 41 |

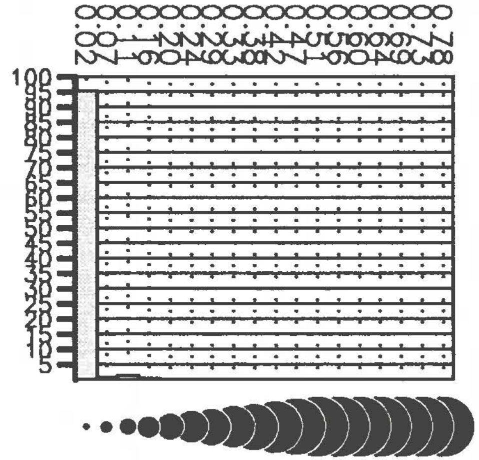
50 km

Fig. 39

Grønlands Geologiske Undersøgelse

# GEOCHEMICAL MAP: U in stream water



U ppb

Laserinduced scintillometry

| | |
|---|---|
| Number of samples: | 332 |
| Min. value: | 0.00 |
| Max. value: | 0.67 |
| Mean: | 0.01 |
| Median: | 0.00 |
| Variance: | 0.00 |
| Std. Dev.: | 0.05 |

50 km

Fig. 40

Grønlands Geologiske Undersøgelse

# LOCALITY MAP: Analysed rock samples

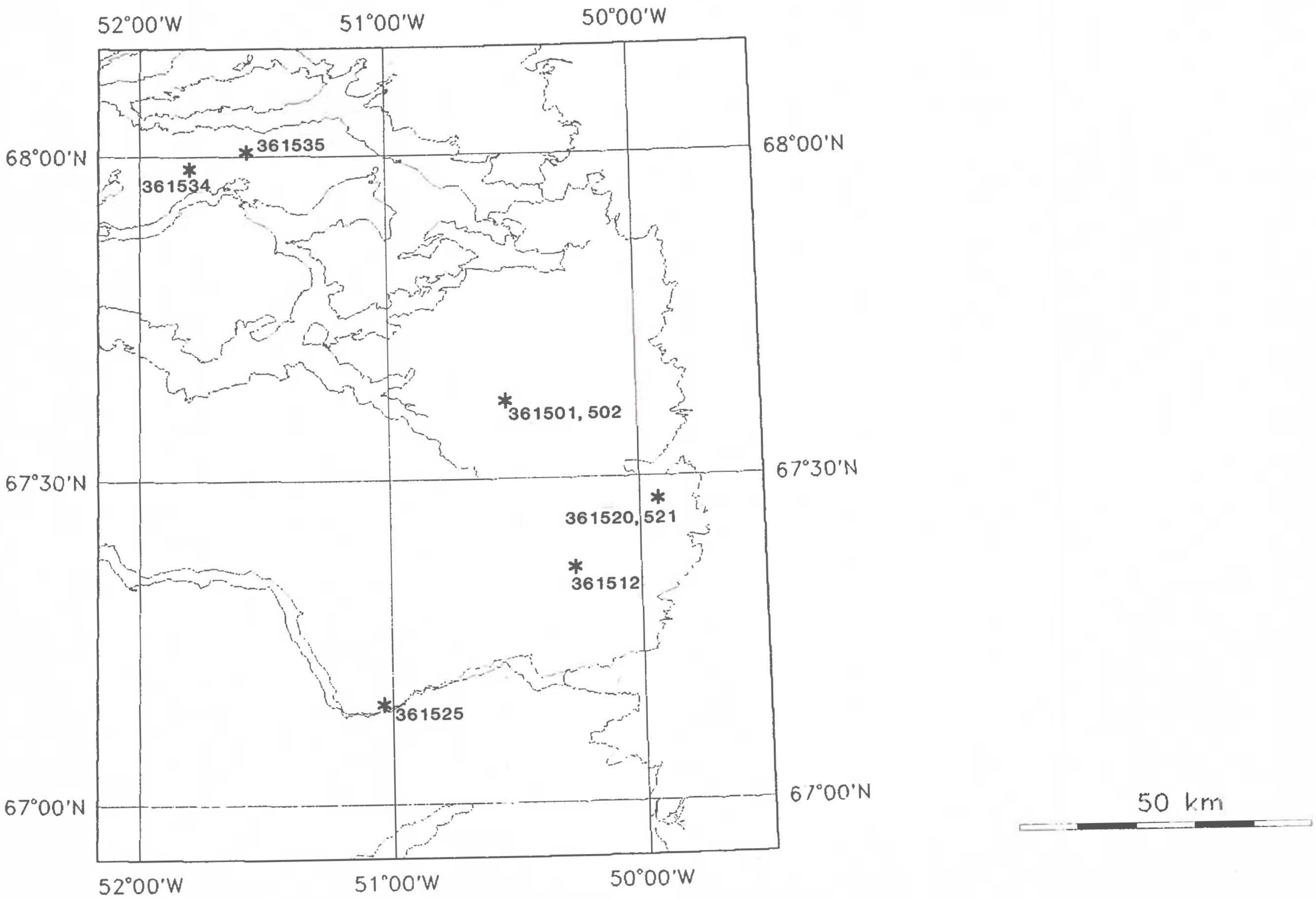



Fig. 41

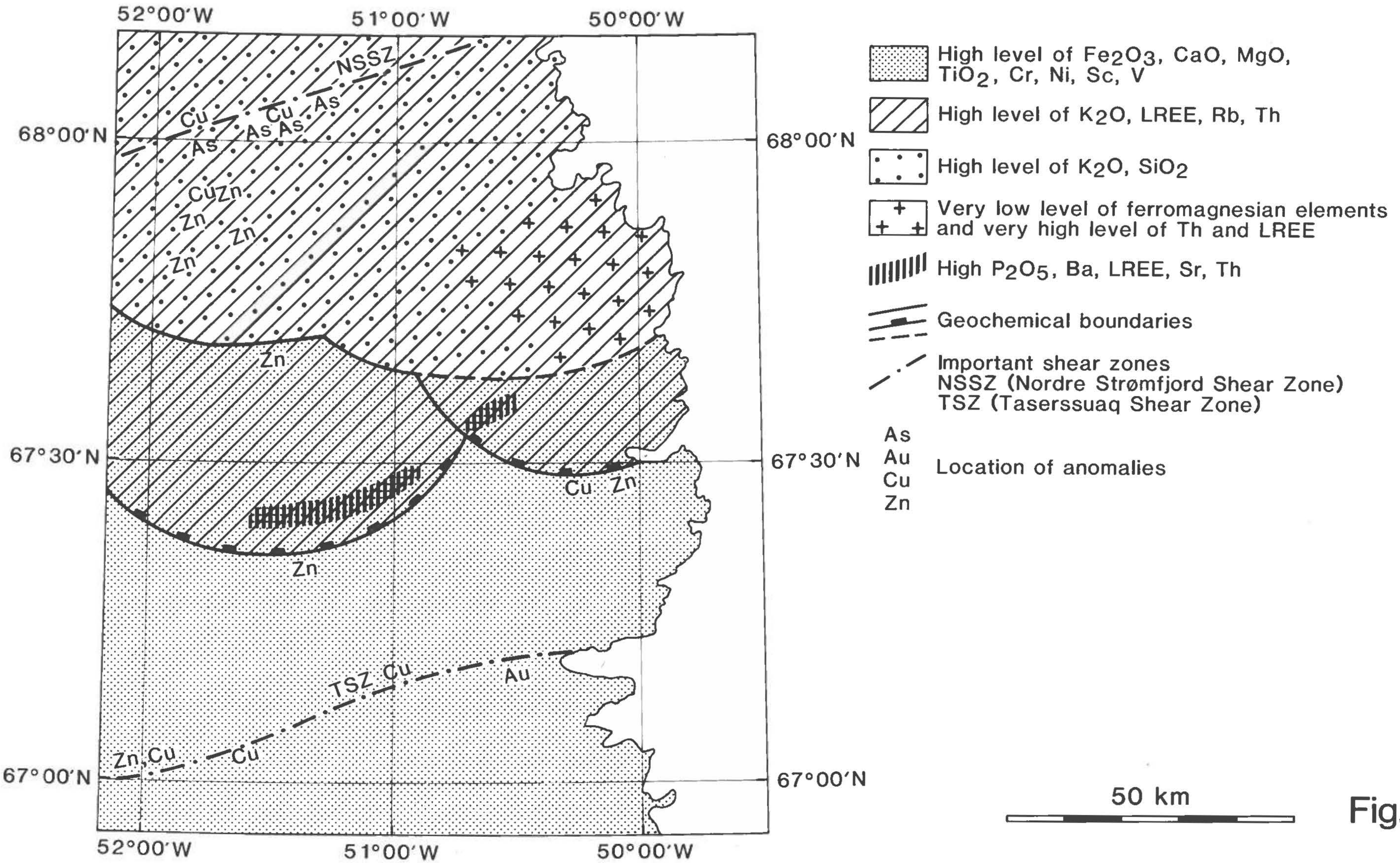
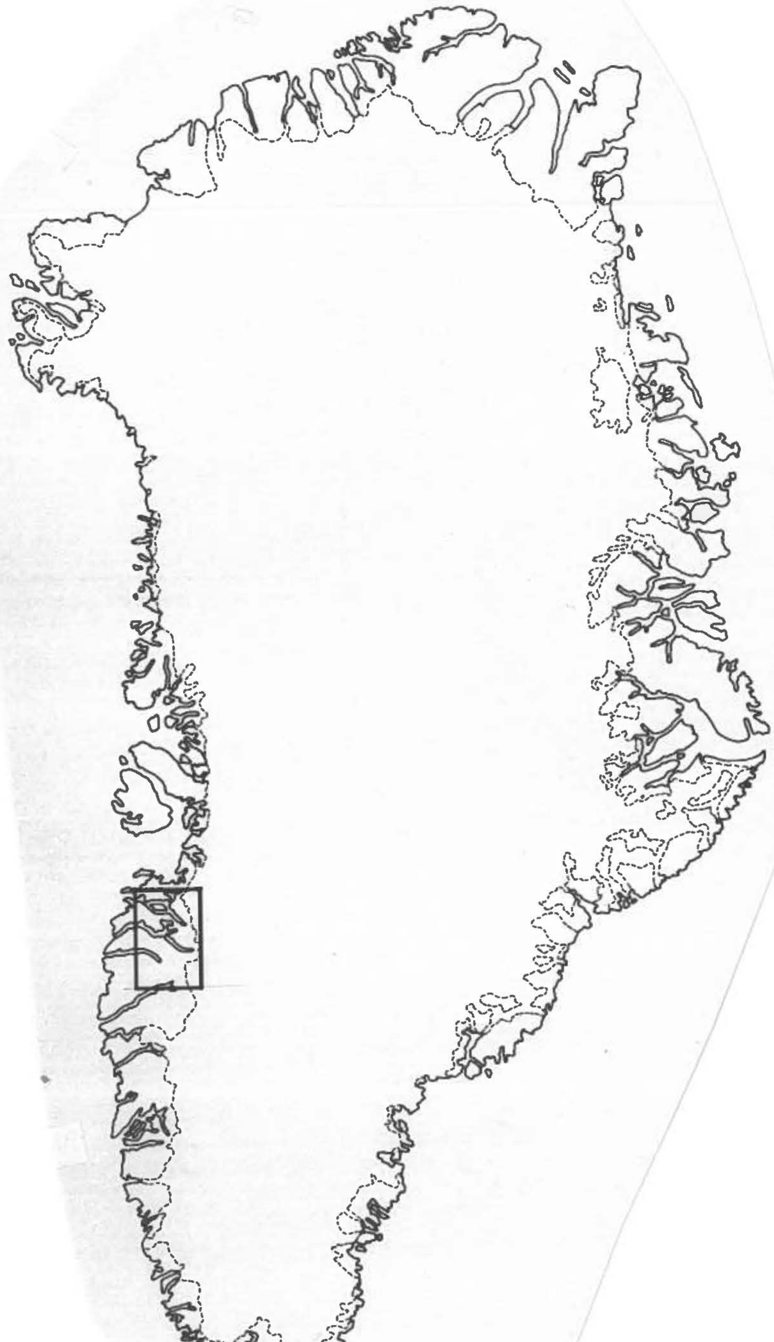

52°00'W
51°00'W
50°00'W
68°00'N
67°30'N
67°00'N
NSSZ
TSZ
Cu
As
Zn
Au
High level of $Fe_2O_3$, CaO, MgO, $TiO_2$, Cr, Ni, Sc, V
High level of $K_2O$, LREE, Rb, Th
High level of $K_2O$, $SiO_2$
Very low level of ferromagnesian elements and very high level of Th and LREE
High $P_2O_5$, Ba, LREE, Sr, Th
Geochemical boundaries
Important shear zones
NSSZ (Nordre Strømfjord Shear Zone)
TSZ (Taserssuaq Shear Zone)
As
Au
Cu
Zn
Location of anomalies
50 km

Fig. 42



ISSN 0903-7322