GREENLAND MINEX News

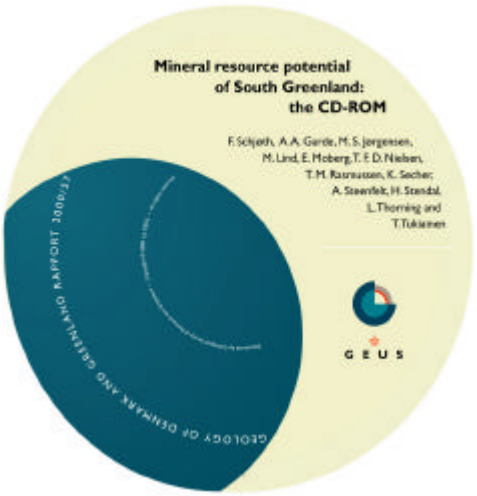
GREENLAND MINERAL EXPLORATION NEWSLETTER

Greenland MINEX News No. 19 **January 2001**

Get the key to your favourite commodities

CD-ROM released packed with data on the mineral potential of South Greenland

The hitherto most comprehensive digital compilation of earth science data from Greenland – The South Greenland CD-ROM – is now available from the Geological Survey of Denmark and Greenland (GEUS).



Many geoscientific activities were conducted during the second half of the last century in South Greenland and most of the information has been hitherto available in traditional formats, such as printed papers, reports, maps, field notes, etc. The demand for digital versions of geoscience data, preferably with

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a GIS association, is ever increasing. Based on comments from potential users, not least readers of MINEX, the consensus is that unless data exist in easily accessible digital formats, valuable information will escape notice by busy explorers.

The digital data now available are part of the final assessment of the mineral resource potential of South Greenland. The data comprise a wealth of information for exploration experts and Greenland geology users.

The CD-ROM contains an ArcView project file with accessory data and text files. Topographic, geological, geophysical, geochemical, mineral occurrence, mineral exploration and remote sensing spatial data sets are presented as maps or images. Tables give details on samples, chemical analyses, geo literature and company reports. Files in PDF format provide a geological summary and descriptions of 107 mineral occurrences.

Highlights of the CD-ROM

Topographic base map
Layers of names, geographical grid and selected geographical features are available.

Digital Elevation Model
Approximate digital elevation model calculated from positional data from aeromagnetic survey aircraft. Included as an image in TIF format.

Mosaic of Landsat TM scenes
A composite, natural look satellite image based on a mosaic of seven Landsat TM scenes in compressed format (MrSid).

Geological map (1:500 000)
A new digital geological map based on the printed 1:500 000 map with modifications reflecting the results of recent investigations.

Airborne magnetics
Total field and first vertical derivative magnetic anomaly maps based on different airborne surveys.

Airborne electromagnetics
Anomaly maps based on airborne electromagnetic surveys of selected areas in the north-western part of the region.

Airborne radiometrics
Radiometric anomaly maps based on airborne surveys.

Gravity maps
Free-air and Bouguer gravity anomaly maps based on data from a number of sources compiled in a database by The National Survey and Cadastre.

Sample locations
Sample locations of stream sediments (fine fraction), heavy mineral concentrates of stream sediments and rock samples.

Stream sediments
Gridded anomaly maps for 42 major and trace elements.

Heavy mineral concentrates of stream sediments
Positions and analytical results as tables and coloured dot plots for 16 trace elements.

Rock analyses
Positions, sample descriptions and chemical analyses of c. 3400 rock samples.

Mineral occurrences
Map of 107 mineral occurrence sites with hotlinks to descriptions in PDF format.

Mineral exploration licenses 1992–2000
Maps of position and ownership of mineral exploration licenses for each of the years 1992–2000.

List of existing maps from South Greenland
Coverage and a few basic data on published topographic and geological maps and on unpublished field maps from GEUS archives.

Bibliography
Geo-referenced bibliography of more than 2000 titles and a list of 204 released exploration company reports.

Have a look at the GEUS Internet homepage at http://www.geus.dk/sg, where the compilation is described in more detail and where examples from the CD-ROM are demonstrated. Two printed reports have been released (see below) and a package containing the CD-ROM and the reports can be purchased. Contact GEUS by phone, fax or at malm@geus.net

The price for the package is DKK 1340, or approximately US$ 170. Customers in Denmark should add 25% Danish Value Added Tax (moms). The package is mailed free of charge around the world.

*Schjøth, F., Garde, A.A., Jørgensen, M.S., Lind, M., Moberg, E., Nielsen, T.F.D., Rasmussen, T.M., Secher, K., Steenfelt, A., Stendal, H., Thorning, L. & Tukiainen, T. 2000: Mineral resource potential of South Greenland: the CD-ROM. Danmarks og Grønlands Geologiske Undersøgelse Rapport **2000/57**, 36 pp., 1 CD-ROM included.*

*Steenfelt, A., Nielsen, T.F.D. & Stendal, H. 2000: Mineral resource potential of South Greenland: review of new digital data sets. Danmarks og Grønlands Geologiske Undersøgelse Rapport **2000/50**, 47 pp.*

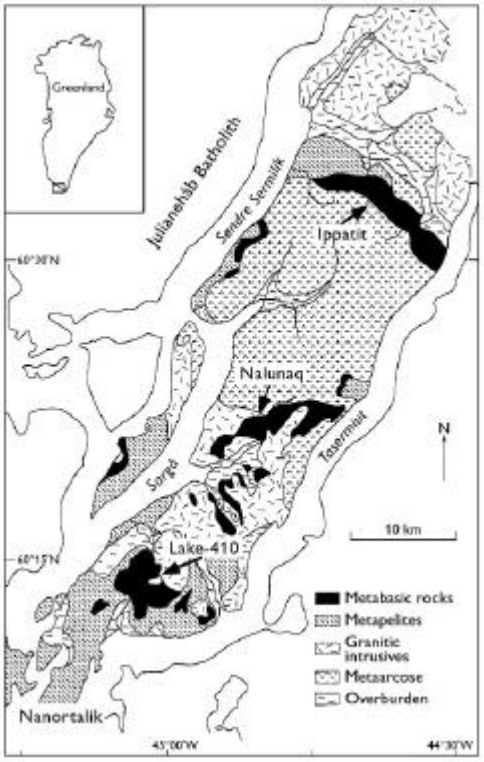
Greenland gold mine: decision expected early 2001

Crew Development Corporation seems solidly targeted at a mine at Nalunaq

The Nalunaq project is a high-grade gold deposit 40 km from the town of Nanortalik near the southern tip of Greenland. MINEX has kept an eye on the activity with reports on the exploration development from the start of the exploration (see *e.g.* MINEX News 15 and 18). Vancouver-based Crew Development Corporation acquired a 50% interest in the project by merging with Norwegian Mindex ASA in late 1999. The joint-venture Nalunaq I/S is established of which two thirds of the interest is now held by Crew, with the remaining part held by the Greenland Government owned company NunaMinerals A/S (formerly a division of NunaOil A/S). The co-operation between Crew and NunaMinerals A/S is reported to have been very constructive for the development of the project. Crew has conducted extensive underground development and bulk-sampling to provide the data for a final feasibility study and subsequent financing.

According to recent press releases from Crew at the close of the season, the company has now conducted a satisfactory underground bulk sampling programme with laboratory results still pending. The test programme was aimed at a 'go' or a 'no go' decision to production late in the first quarter of 2001; this seems still to be the intention. Financially, the project has resulted in a total investment of US$ 6 million during 2000. 1800 m of underground work and 23 000 t of crushed vein material mined from 3 drifts and 15 inclined shafts (raises) within the ore structure are the visible proof of the campaign. The test run intends to verify continuity of mineable gold grades and to upgrade the known inferred resources to measured and indicated reserves. The target is a resource that can support an ore production of 500 t/day resulting in an annual production of 148 000 oz of gold. Hopes are high that the Nalunaq deposit can become an important source for gold.

Crew has gained a good understanding of the gold mineralised structure and continued exploration is anticipated in the region around the deposit. The Nalunaq I/S licence holding in the region has also been enlarged to just above 1000 sq. km during 2000.



The average grade of the deposit has been determined at 32 grams gold per tonne over 1 m width and the mill feed grade is estimated to 27.3 grams gold per tonne within an indicated and inferred resource of 440 000 t before this years programme. A characteristic feature of the Nalunaq deposit is that extremely high gold grades are encountered locally. One channel sample showed as much as 5000 grams gold per tonne in one adit. The high, but variable grade of the Nalunaq deposit remains a major challenge in the exploitation and the main reason for the extensive grade verification programme conducted in 2000 under the supervision of Canadian Strathcona Mineral Services.

New diamond finds close to Greenland

Diamondiferous kimberlite dykes in Labrador are neighbours to the Greenland kimberlite province

'The Canada – Greenland geological link in focus again' was a MINEX headline back in March 1998 (MINEX News 14) where information on new finds of Zn-Pb-Ag mineralistion in Franklinian Basin successions in North Greenland was released. Again we focus on this link and reflect on the comparison of resource potentials on either side of the Davis Strait in 1992 (MINEX News 1). That 1992 article was inspired by the fever created by the discovery of Lac de Gras kimberlite pipes in the Canadian NWT and immediately brought Greenland, – with its similar ancient craton, – into focus as another main target for diamond exploration.

Archaean – Palaeoproterozoic

During the latter half of the 1990s the rush resulted in a significant kimberlite exploration in West Greenland between the towns of Sisimiut and Nuuk. The finds of diamondiferous kimberlite and similar dykes carrying many microdiamonds and fewer macrodiamonds were the result of this intense exploration. Today, a couple of diamond exploration com-panies still hold exclusive licences, and a large amount of new knowledge has been acquired. However, whereas the search for kimberlite pipes like Lac de Gras still has not led to the expected breakthrough, the number of detected kimberlite dykes in the border

zone to the Archaean craton in West Greenland is still growing. This is also demonstrated by GEUS activities during the 2000 field season. On this background, new finds of diamondiferous dykes in the Torngat area of Labrador – situated only 600 miles from the West Greenland kimberlite province – again raises, expectations for Greenland diamond. The Torngat is designated the counterpart of the Palaeoproterozoic Nagssugtoqidian orogenic foreland in West Greenland.

From the 444 sq. km Torngat diamond property in Labrador on the east coast of Ungava Bay, the Twin Mining Corporation of Toronto announced impressive progress in late November 2000. The exploration program revealed a 50 km dyke system and an additional 242 macrodiamonds were recovered from 10 tonne samples. They are mostly gem quality, white and transparent, and indicate that the dyke system is capable of producing larger gem quality stones. Another Canadian junior company, Toronto-based Tandem Resources Ltd., has announced similar finds in nearby properties at the end of September 2000.

Lower Palaeozoic

Another comparison concerns the Lower Palaeozoic platfom deposits of Baffin Island and North Greenland. Twin Mining Corporation also came up with diamondiferous pipes in August 2000 from their Jackson Inlet property in north-western Baffin Island. This property has now yielded 154 diamonds including 13 macrodiamonds from 16 pipes so far discovered in a terrain dominated by flat-lying Ordovician and Silurian carbonates.

If the situation is transferred to Greenland in the border zone of the Franklinian Basin, this knowledge may fertilize the ground for yet another play of kimberlite exploration in North Greenland.

Twin Mining was awarded the prestigious Prospector of the Year 2000 Award by the Association des Prospecteurs du Quebéc for its discovery and exploration of the Torngat diamond field. We congratulate!

Revival of kimberlite exploration in West Greenland

More dykes located during 2000 field work in West Greenland

The former Geological Survey of Greenland (GGU) and the present Survey (GEUS) have registered information on kimberlite and related rocks from Greenland since the 1970s. Years before the intensive exploration by private companies took off during the 90s, a kimberlite dyke swarm was located in the region adjoining the fjord Kangerlussuaq (Søndre Strømfjord) in West Greenland. Recent findings of micro- and macrodiamonds in dykes of this swarm by various companies have encouraged renewed studies of the extent and character of the kimberlite province. GEUS is now undertaking kimberlite exploration and trace element analysis of indicator minerals as part of the resource assessment programme. Limited initial field work was carried out in the summer of 2000 with the aim of looking for signs of extension of the province towards the north and east.

A few new kimberlite and lamproite occurrences were actually located *in situ*, others were indicated by float. In some cases high concentrations of Nb in stream sediment reflected the presence of kimberlite or related dykes.

Greenland deposit of tantalum

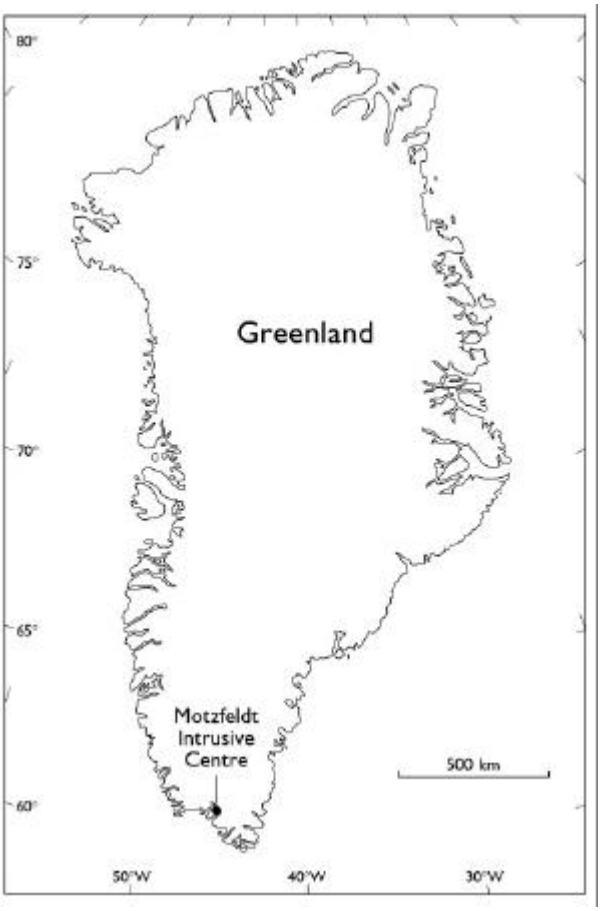
'Resource' can soon be turned into 'Reserve' of world-class size

Niobium, tantalum, zirconium and rare earth elements are important constituents of the pyrochlore accumulations found in the South-West Greenland Motzfeldt Intrusive Centre of the Igaliko Nepheline Syenite Complex. This is situated some 15 minutes helicopter flying from the international Narsarsuaq Airport. Several mineralised zones are known to carry an estimated resource of at least 50 million tonnes of ore with a tantalum pentoxide grade of about 0.03%.

Tantalum mineralisation in the Motzfeldt Centre was discovered and investigated by the Survey during the early 1980s. Early in 2000 Angus & Ross PLC was granted an Exploration Licence covering the Motzfeldt Centre, 414 sq. km.

It has recently been announced that metallurgical testing by Lakefield Research Limited indicates that the tantalum/niobium ore from the Motzfeldt Centre is amenable to flotation recovery. Dr. Robert Young, Managing Director of Angus & Ross PLC, states in a press release: "The tantalum mineralisation in Southern Greenland was not developed because the ore was considered to be metallurgically complex and the deposits were in a steep mountainous area. The test work by Lakefield Research Limited suggests that the mineral separation can be solved. Next year's field season is being planned to define tantalum-mineralised zones. We hope to show that the problems of working in such a mountainous area can also be overcome. If this can be achieved then we hope to turn this 'resource' into a 'reserve' that will be a significant part of the world's tantalum reserves."

The importance of this development was emphasised in a recent press release (19 September 2000) from Angus & Ross PLC: "Cabot Corporation, which is one of the world's main customers for tantalum concentrates has recently decided to take an initial option over one million shares of Angus & Ross at an exercise price of 10p. This interest by a major company has been welcomed by Angus & Ross' management and demonstrates how important a major consumer perceives exploration for new sources of tantalum."



Further reading:

Tukiainen, T. 1988: Niobium-tantalum mineralisation in the Motzfeldt Centre of the Igaliko Nepheline Syenite Complex, South Greenland. In: Boissonnas, J. & Omenetto, P. (eds.): Mineral deposits within the European Community, 230–246. Berlin: Springer-Verlag.

Readers are recommended to study the relevant chapters of the CD-ROM mentioned on page 1.

Box: *Market view: Tantalum*
Since the beginning of the 1990s tantalum has become increasingly important in the electronics industry because it is used extensively to make high-quality capacitors for mobile phones, computers, car electronics, video cameras, pagers and other small devices. The latest miniature mobile phones have an average of about 10 tantalum components! A side effect of the growth of demand is that traditional methods of tantalum production, as a by-product of tin slags, are being exhausted. Tantalum is now mostly produced from hard rock mines, such as Greenbushes Tin in Western Australia. There is a recognised need for the industry to produce more tantalum from existing and new mines.

Field team examines noble metal veins in East Greenland

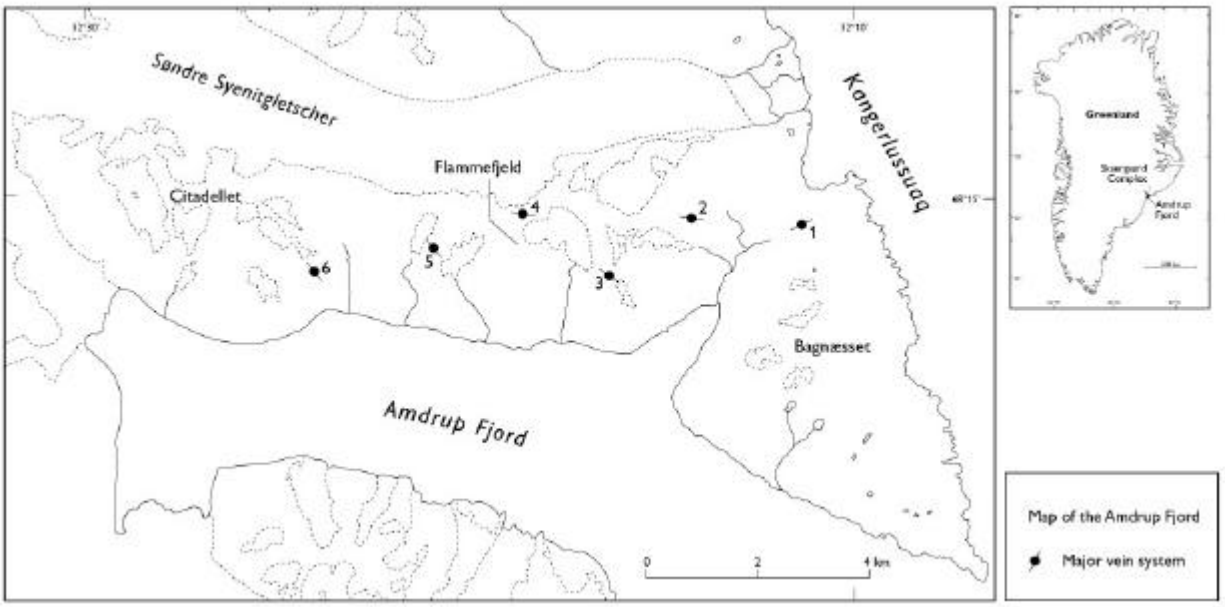
Evaluation of the Amdrup Fjord – Flammefjeld vein type occurrences

As a part of the Skaergaard field programme described later, a Survey field team examined last summer a zone of base metal veins north of Amdrup Fjord, East Greenland. The veins surround a Tertiary molybdenum-bearing subvolcanic complex hosting a breccia pipe intruded by quartz porphyries.

Previous investigations have indicated high silver and gold concentrations in the veins, which typically are developed as crustified fillings of epithermal character, often displaying vuggy and colloform structures. Quartz, calcite, rhodochrosite and fluorite are common gangue minerals. Sulphides are galena, sphalerite, pyrite, chalcopyrite and tetrahedrite-tennantite.

Previously, five hydrothermal vein systems were known from the area. During the recent field work 30 additional veins, mostly of modest size, were found and sampled. The samples have been submitted to multi-element analysis including gold, silver and base metals.

The vein-type mineralisation encountered so far cannot be expected to yield economic base metal deposits but it holds a potential for gold and silver. This will be better understood when the analytical results from the field work become available. A final report including sample lists, analytical results and a sampling map is planned for summer 2001.



New three-year resource assessment programme in West Greenland

70 000 sq. km from Kangerlussuaq Fjord to Disko Bugt

The Department for Economic Geology at GEUS has launched a new activity concerned with *Resource evaluation from Sukkertoppen Ice Cap in the south to the Nuussuaq Peninsula in the north*. The activity is planned for the period 2000–2003. The aim is to make a regional resource assessment of the mineral potential in the region 66˚N to 70˚15´N, West Greenland, based on compilation of existing data, new field work and integrated interpretation of geological, geochemical and geophysical data. Results will be presented as digital data sets accessible for the mining industry – and the public, following largely along the same lines as the South Greenland CD-ROM reported elsewhere in this issue of MINEX News.

The region is easily accessible and previously the Survey and private companies have collected geochemical and geophysical data. From a resource assessment point of view, the main interests are, diamonds in the southern part and gold and base metals in the central and northern part. The main objectives are:

- Compilation of geology, mineral occurrences, geochemistry and geophysics
- Quality check of previously reported data
- Pin-pointing of relevant areas from an economic geological point of view
- Improving understanding of the genesis of mineral occurrences based on isotope studies
- Mapping of mineral occurrences and modelling in relation to plate-tectonic setting
- Outlining of possible metallogenetic provinces
- Correlation with Canada

The programme schedule year by year is:

2000: Compilation of existing data and limited field work
2001: Field work and analysis of sampled material
2002: Field work and analysis of sampled material
2003: Compilation of all data and documentation of results

The Aim is to invite participation from universities, other geological surveys and mining companies. Geologists from BMP will also participate in the field work. The Survey is open for discussion on various types of co-operation with other parties interested in the region.

Greenland drill-core library now operational in Kangerlussuaq

A successful move from Copenhagen to West Greenland

Until recently, a collection of approximately 80 km of selected cores from about 1100 drill holes in Greenland were stored in the archives in Copenhagen. During 2000 (MINEX News 18), the cores were transferred to the Kangerlussuaq International Airport and arranged in a renovated former garage. Kangerlussuaq is the main gateway to Greenland with daily connections to Copenhagen, weekly connections to Iceland and Canada and services and low-priced accommodation and board is available in addition to the three-star airport hotel.

As a transit location this site is ideal allowing geologists to inspect the drill-cores in connection with their field work in Greenland during stopovers. Provided prior arrangements have been made, visitors can have cores laid out for study and it is possible to obtain samples of many of the drill-cores. Access to the core library is arranged by contact to the BMP in Nuuk.

Under the standard terms for exploration licences, drill-cores and other samples must be offered to the BMP when a licence expires or is relinquished. As a general rule, all drill-cores will in future be stored at Kangerlussuaq. However, two sets of drill-core considered to have particular scientific value are stored in Copenhagen on permanent loan to the Geological Museum, University of Copenhagen. These are the recently salvaged cores from the Skaergaard intrusion in East Greenland drilled by Platinova A/S and two drill-cores from Rio Tinto's exploration of the Archaean banded iron formation at Isua, north-east of Nuuk.

Skaergaard palladium deposit

Drill cores now on display in Copenhagen and in Kangerlussuaq

The large tonnage Pd mineralisation of the Skaergaard intrusion of East Greenland (see MINEX News 18) is still of major interest, helped by the fact that Kitco prices remain high. As of 2 January 2001 the level was around 940 US$ per ounce. Vancouver-based Gryphon Metals Corporation was granted earlier this year a licence to an area of 103 sq km covering the interior of the Skaergaard intrusion. The company did not carry out field work in 2000. However, activities in the region included a joint effort with parties from GEUS and Danish Lithosphere Centre.

Twenty tons or 6 km of representative drill core material from the Skaergaard intrusion and its precious metal mineralisation were packed and shipped. Mineralisation intersects will be stored in the Bureau of Minerals and Petroleum (BMP) core library at Kangerlussuaq in West Greenland and research core material will be housed at the Geological Museum in Copenhagen. The research core in Copenhagen will form the basis for a new international research programme presented at the American Geophysical Union meeting in San Fransisco, December 2000.

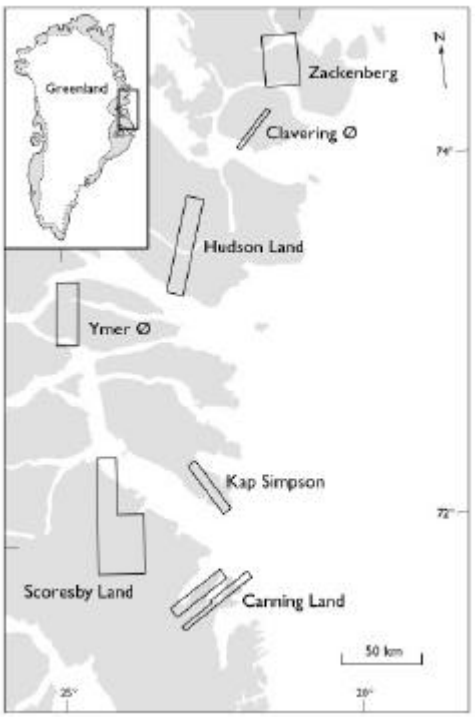
Core in storage in Canada from previous drilling activity by Platinova in the area will also be returned to the core library in Kangerlussuaq together with grab sample profiles from the mineralisation.

A new look at Greenland mineral deposits

– Airborne hyperspectral mapping launched in East Greenland

The project HyperGreen 2000 financed by BMP (MINEX News 18) carried out airborne surveys using the HyMap imaging spectrometer in seven localities in central East Greenland. The HyMap scanner, which has 126 bands across the reflective solar wavelength region of 0.45–2.5 nm with contiguous spectral coverage (except in the atmospheric water vapour bands) and bandwidths between 15–20 nm, has been successfully used for mineral exploration in a wide range of environments in the world.

The original plan of the HyperGreen project was to cover selected areas in West Greenland but the weather conditions by the time the airborne system was available in Greenland did not allow the equipment to be ferried to the west coast. The alternative targets in central East Greenland were



defined on the spot by consultation with the BMP.
The main objective of the HyperGreen project is to assess the applicability of this advanced technique in mineral exploration. The radiometrically calibrated radiance data delivered by the contractor will be subjected to geo coding, atmospheric correction and statistical treatment to produce mineral maps for exploration and related studies. Limited field follow-up activity will be carried out in 2001.

'This is GREENLAND 2000–2001'

A wide range of practical information about Greenland also on the web

The volume for 2000–2001 of the official Greenland reference series 'This is GREENLAND' was issued in the autumn of 2000, published by the Government of Greenland and the Royal Danish Ministry of Foreign Affairs. It offers an updated and extended introduction to Greenland, its society and business community.
"It is my earnest hope that it will promote closer relations between Greenland and the international business community", says Jonathan Motzfeldt, Premier, Government of Greenland, in the foreword of the book.
The book is obtainable in hard copy from the BMP. As an new service, the entire text is also accessible on the web:

http://www.greenland.dk/startmenu.htm

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The future with Greenland MINEX News

Would you like to continue receiving our newsletter in hard copy or would you prefer the web edition?

Note: Fill in the form and be part of a lottery. A copy of the South Greenland CD-ROM will be sent to the lucky winner. Answers must reach GEUS by 1 March 2001.

Dear MINEX reader,

Would you like to continue receiving the Greenland MINEX News free of charge as hard copy or would you prefer just an e-mail message announcing a new MINEX web issue? The web issue has been online since 1997.

Hard copy: Yes/No *Web message:* Yes/No *Both hard copy and web issue:* Yes/No

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If your answer is received before 1 March 2001, you could be the lucky winner of a free copy of the South Greenland CD-ROM described on page 1 of this issue.

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