GREENLAND MINEX News

GREENLAND MINERAL EXPLORATION NEWSLETTER

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Exploration commitments for 2000 reduced by 50%

One year renewal of temporary measure

We reported on changes in mineral exploration licence conditions last year in the June issue of Greenland MINEX News. In an attempt to alleviate the effect of depressed metal prices and reduced exploration activities, exploration commitments for mineral licences in Greenland were reduced by 50%. It was also stated then that the effect of the measure would be reviewed before the end of 1999 in anticipation of possible renewal for 2000.

The Bureau of Minerals and Petroleum (BMP) has now reviewed the measure. Although the decline in exploration activities seems to have levelled out, exploration companies – particularly juniors – are still faced with serious financing problems, and the authorities find it appropriate to extend the measure to 2000. Exploration commitments for mineral licences in 2000 are therefore reduced by 50%.

At the same time, the BMP announces that the measure will not be renewed for 2001, at which time exploration commitments for mineral licences will return to the 'normal' level, viz. the level indicated in 'Standard Terms for Exploration Licences for Minerals (excluding hydrocarbons) in Greenland'.

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Commercial exploration round-up: 2000 update

New gold exploration target in North-West Greenland
Nalunaq gold, South Greenland: in production within two years?
Platinova – Rio Tinto lead-zinc deposits in North Greenland
Diamonds still in focus in West Greenland

Exciting new gold target

During *Kane Basin 1999* – a multidisciplinary geoscientific project in northern Greenland – the Geological Survey of Denmark and Greenland (GEUS) outlined a new gold exploration target in the Palaeoproterozoic shield of Inglefield Land, North-West Greenland (location map, page 3). Out of the 120 mineralised rock samples from the whole of Inglefield Land (7000 km^2), 14 returned more than 0.2 ppm Au with a maximum of 12.5 ppm Au. These 14 samples stem from six localities, with different rock types and all with sulphide mineralisation. Gold is typically associated with copper. The six localities are distributed along a 70 x 4 km north-east striking belt that coincides with an conspicuous aeromagnetic lineament of unknown significance but interpreted to be a deep-seated structure. This constitutes an interesting exploration target from a region where at present, no exploration licenses are in force. A preliminary report on the so-called 'North Inglefield Land gold belt' has been issued (cited below).

Gold indications in northern Inglefield Land, North-West Greenland: a preliminary report from project Kane Basin 1999. Danmarks og Grønlands Geologiske Undersøgelse Rapport 2000/9, 14 pp.
By B. Thomassen, P.R. Dawes, T.R. Iannelli & F. Pirajno. Available from the Survey. Price: 140 Danish kroner.

Nalunaq gold

In 1999 Nalunaq I/S continued investigations of its gold prospect in the Palaeoproterozoic Ketilidian orogen of South Greenland (see MINEX no. 15, November 1998; location map, page 3). Nalunaq I/S is equally owned by the Greenlandic company NunaMinerals A/S and Canadian Crew Development Corporation: the merger involving Crew and Norwegian Mindex ASA is noted on page 4 of this newsletter.

The summer's programme was based on a positive pre-feasibility study by the Canadian consultants MRDI in March and a positive review by Strathcona Minerals in June. The programme focused on upgrading and expanding the identified resource of 425,000 ounces gold by surface sampling and 2500 m of diamond drilling. The drill programme indicates that mineralisation continues in the so-called "Target Block" beyond the existing 300 m adit and that high-grade mineralisation exists in the recently-discovered "Southern Block". Outcrop sampling from the Main Vein shows consistent medium- and high-grade mineralisation which includes a 123 m long section of 50.2 g/t/m in the "Upper Block".

MRDI's pre-feasibility study estimates a NPV of 39.8 million USD and an IRR of 51% for a 500 tpd operation. The calculated 27.3 g/t mill feed suggests a payback of 1.8 years of the 20 million USD capital investment. A work programme is being defined for year 2000 with a view to completing a final feasibility study and commencing production within 24 months.

Platinova – Rio Tinto lead-zinc deposits

As we reported in June last year (MINEX no. 17), Platinova A/S has a joint venture agreement with Rio Tinto Mining and Exploration Ltd. to conduct exploration on Platinova's zinc-lead-silver Petermann Prospect in Washington Land, North Greenland (location map, page 3). During last summer, detailed prospecting was carried out in July and August. The mineralisation occurs in dolomitised Ordovician limestone and is traceable for over 15 km along a steeply-dipping fault structure. A kilometre of diamond drilling from 10 holes tested a number of geophysical and geological targets over a distance of 4.5 km along this structure. One hole intersected two massive pyrite intervals aggregating 16.8 m but no significant base metal assays were noted.

During regional prospecting at the end of the season, a new zinc-lead-barite mineralisation (Cass Prospect) was discovered 50 km to the south-west in dolomitised Cambrian limestone. The mineralised zone, comprising eight surface showings over 4 km, is apparently related to a WNW-trending regional fault. A rock-chip composite sample collected across the discovery site returned 8.9% Zn, 11.1% Pb and 95 g/t Ag over 25 m length. Time permitted only one hole to be drilled. It encountered generally sub-economic grades although there was one encouraging intersection of 8.4% Zn, 0.04% Pb and 94 g/t Ag over 1.2 m.

Diamonds in West Greenland

A few years ago, grassroot diamond exploration was being undertaken throughout the entire Archaean craton of West Greenland and had spilled over into the Palaeoproterozoic orogenic belts to the north and south. Today, exploration is focused on the two regions where micro- and macrodiamonds have been found. One region is south-west of Kangerlussuaq (Søndre Strømfjord) around 66º30'N; the other east of Maniitsoq (Sukkertoppen) around 65º30'N (location map, page 3).

Kangerlussuaq. The last issue of this newsletter (June 1999) referred to a press release from the Dia Met Minerals – Monopros joint venture and the finding of 493 microdiamonds and 5 macrodiamonds from a 558 kg sample. The material came from six localites with outcropping kimberlite dykes/sheets and linear kimberlite boulder trains. Three of these localities have been resampled and results from the processing of some 20 tonnes rock are pending. In the same general area, Aber Resources Ltd sampled kimberlite dykes and boulders on ground optioned from Platinova A/S and microdiamonds are reported in initial laboratory results.

Maniitsoq. In 1997, in the area to the east of Maniitsoq, Lexam Explorations Inc. discovered macro- and microdiamonds in a kimberlite dyke on ground optioned from Platinova A/S. Platinova had earlier found microdiamonds in boulders in ground to the east where the company continues exploration with a new partner, Aurora Diamondfields Inc. Detailed areomagnetic surveys in 1999 have outlined several targets that are planned to be checked this year.

Spot news around and about Greenland

Merger, drill cores, review of activities, publications, domestic mineral hunt .....

Mindex–Crew merger

The Norwegian company Mindex ASA – one of the two joint venture partners behind the Greenland Nalunaq Gold Project – and the Canadian company Crew Development Corporation merged in December 1999. One of Crew Development Corporation's objectives is to advance the Nalunaq Gold Project to production within two years (see page 2 of this newsletter).

Drill-core library transfer to Greenland

A drill-core library containing about 75 km of core from exploration and mining activities in Greenland was established in Copenhagen in 1989 at the former Geological Survey of Greenland. In 1999, this library was shipped from Copenhagen to Kangerlussuaq (Søndre Strømfjord airport; location map, page 3), where a new facility is being established by BMP. The core library will be operational later this year. Prospective users of the library can obtain information on the facilities available by contacting BMP.

Review of Greenland activities

The annual review of the Survey's geoscientific activites in Greenland for 1999 should be available in the summer. Readers of MINEX wishing to get an idea of the range of Survey's activities and publications can refer to Review of Greenland activites 1998 published in 1999 as Geology of Greenland Survey Bulletin 183. The bulletin contains nine articles, followed by a list of publications in English issued in 1999 in the Survey's own series and those scientific papers on Greenland written by its staff in international outlets. The review of 84 pages is available from GEUS at 200 Danish kroner (excl.VAT).

Skaergaard drill cores to Copenhagen

The exploration drilling for precious metal deposits in the classical Skaergaard intrusion of East Greenland in 1989 and 1990 resulted in more than 15 km of core. Individual cores are about 1 km long with a recovery of 100%. The material from the central, upper part of the magmatic sequence is of exceptional scientific value. In August 2000, in an operation organised by GEUS and the Danish Lithosphere Centre (DLC), about 16 tons of core will be transported from Skaergaard to Copenhagen, where it will be housed in the Geological Museum and made available for scientific, as well as commercial study. During the summer GEUS and DLC will conduct a joint field operation from a base east of the Skaergaard intrusion.

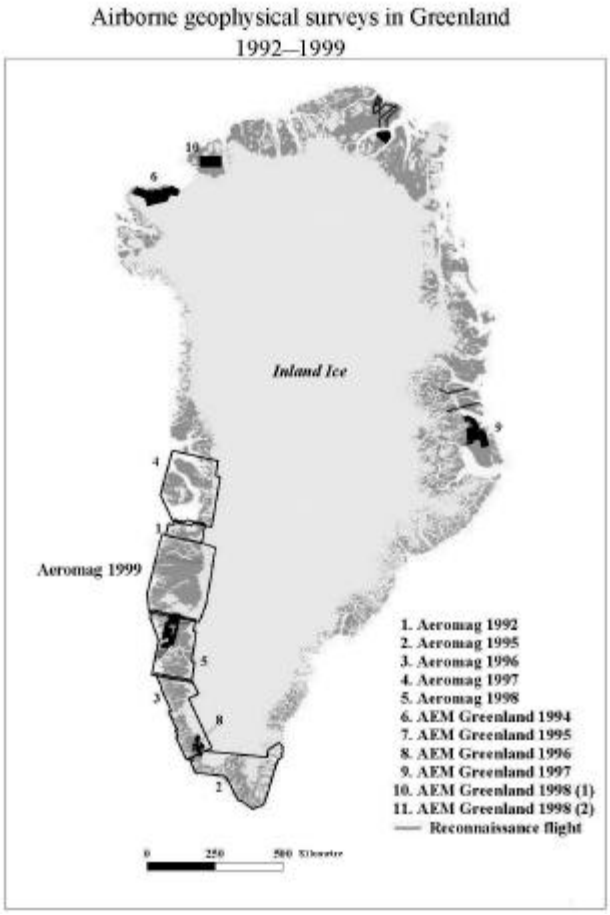
Ujarassiorit: the Greenland mineral hunt

Prize-winners for the 1999 domestic mineral hunt programme, *Ujarassiorit*, have been announced (see MINEX no. 16, March 1999 for description of the hunt). 1st prize: sulphide-bearing vein quartz with 7.9 ppm gold, north-east of Tasiilaq, South-East Greenland; 2nd prizes: massive chalcopyrite north-east of Siorapaluk, North-West Greenland, and granite with disseminated pyrite and 1.5 ppm gold, near Attu, West Greenland (location map, page 3). Prizes in Danish kroner are: 1st prize, 25 000; 2nd prizes, 15 000 each; in addition three prizes of 5000 are awarded for silver-rich, zinc-rich and gold-rich samples. Detailed information on the 1999 samples will be available on the BMP homepage in the near future.

Airborne geophysical survey in 1999: Project Aeromag 1999

Closure of an important gap in West Greenland coverage
High-resolution data: investment for the future

Aeromagnetic work funded by the Government of Greenland was carried out in summer 1999 in southern West Greenland – *Aeromag 1999*. The region chosen, between Maniitsoq and Kangaatsiaq (65º40´N and 68º20´N), covers the Palaeoproterozoic Nagssugtoqidian orogen and to the south the Archaean craton. The *Aeromag 1999* survey, totalling 141,000 line km of high-resolution data, fills a large gap in the aeromagnetic coverage of West Greenland between the regions surveyed in 1992 and 1998 (see map). Sander Geophysics Ltd., Ottawa was contractor for the project which is managed by GEUS.



Release of data

The 1999 data will be released on 1 March 2000: a report and map products will be available for inspection and purchase both in Denmark and Greenland, at GEUS, Copenhagen and at BMP in Nuuk, respectively. A selection of the data will be presented at the Prospectors and Developers Association International Convention and Trade Exhibition, 5–10 March in Toronto, Canada.

Focus on West Greenland

The region covered by *Aeromag 1999* has been in focus in recent years, in particular with respect to diamond exploration, and in the next few years part of the Survey's onshore work will be concentrated there. Interpretation of the new geophysical data will be an important part in the effort to improve understanding of Archaean and Proterozoic evolution of the region.

High-resolution geophysical data: investment for the future

The 141,000 line km flown during *Aeromag 1999* represent a 46% increase in state-funded high-resolution aeromagnetic data from Greenland; a total of 445,000 line km is now available. In addition to the regional magnetic surveys, 75,000 line km of detailed multiparameter (EM, magnetic and partly radiometric) data are available from *AEM Greenland 1994–1998* covering six differ-

ent regions. Access to modern high-quality geophysical data is an essential tool if exploration is to be effective: the data collected since 1992 in Greenland form an important contribution in the promotion of mineral exploration. The present coverage is far from being complete and therefore effort is being made to continue the momentum for the collection of high-resolution, magnetic and multiparameter data. Airborne geophysical field work in 2000 will concentrate on hyperspectral measurements (see *HyperGreen 2000* and *MINEO* below) while emphasis at home will be on integrated interpretations of the magnetic, AEM and other geoscientific data.

High-resolution hyperspectral image data from West and East Greenland

HyperGreen 2000 and MINEO: new airborne geophysical projects

The project *HyperGreen 2000*, financed by the Government of Greenland, has been devised to make use of aircraft capacity that will be available this summer as part of the project *MINEO* that will operate in East Greenland (see next page for introduction to *MINEO*). *HyperGreen* will utilise the airborne imaging HS system of *MINEO* to cover selected targets in West Greenland. The aircraft is equipped with the hyperspectral (HS) imaging spectrometer HyMap™ operated by Hyvista Corporation of Australia and the initial objective will be to carry out a HS survey of the Mestersvig mine area in central East Greenland (location map, page 3). The abandoned lead-zinc mine is selected as a *MINEO* arctic test site (together with test localities in Europe) to assess the application of advanced earth observation methods for monitoring and mapping the environmental impact of the past and present mining activity in Europe.

HyperGreen: objectives and targets

HyperGreen objectives are to assess and evaluate the strength and cost effectiveness of the hyperspectral imaging techniques to assist mineral exploration and geological mapping in arctic conditions. The project aims to establish reference data sets and to develop generic image processing models to facilitate the interpretation of future hyperspectral data sets.

The targets selected will cover known mineral occurrences, as well as areas with economic mineral potential such as in parts of southern West Greenland where there is current diamond exploration (see page 3 of this newsletter). Also targets with interest for hydrocarbons will be included, as well as areas with complicated geology, thereby providing the background to assess the use of hyperspectral data in solving lithological mapping problems.

The final selection of targets will be dependent on weather conditions during the flight operations that are scheduled to take place between 25 July and 10 August, 2000. The operations will be based on Constable Pynt and Kangerlussuaq (Søndre Strømfjord), respectively, in central East Greenland and southern West Greenland, respectively (location map, page 3).

Information on the web-site

Technical characteristics of the HyMap hyperspectral scanner: http://www.intspec.com

Hyvista Corporation/Hyperspectral imaging case histories: http://www.hyvista.com

MINEO Project: http://www.brgm.fr/Mineo

MINEO

MINEO (Monitoring the environmental impact of mining activities in Europe using advanced earth observation techniques) is carried out by consortium made up of members of the EuroGeoSurveys Remote Sensing Topic Network (ERSTN), the Joint Research Centre / Satellite Applications Institute (JRC/SAI, Ispra, Italy), environmental research organisations and mining companies. The project is financially supported by the European Community under the fifth (EC) Framework Programme creating a user-friendly information society (IST).

HyMap™ is registered trade mark of Integrated Spectronics Pty Ltd., Australia.

Palladium potential of Skaergaard: economically viable?

Increase in demand brings the classical intrusion in focus again

Since 1986 the Skaergaard intrusion at 68°N in East Greenland (location map, page 3) has been known to host a major low-grade precious metal deposit dominated by palladium and gold. Renewed interest in the mineralisation is stimulated by the increasing demand for palladium and the fact that more than two-thirds of the palladium on the world's market is supplied by a single producer. The exploration licence on the Skaergaard intrusion was held by Platinova A/S from 1986 to 1999.

Systematic chip sampling and drilling between 1987 to 1990 covered the main part of the intrusion at about 500 m intervals. By analysis of existing exploration data, combined with modelling of the intrusion's structure and mineralisation and mass-balance calculations, a re-evaluation of the palladium potential is now being made available. At present, drill-core information indicates a potential for more than 60 million tons with average palladium concentrations of between 2.5 and 3 g/t over 2 metres in a host rock with a density of 3.3–3.4. Best intersections show 5 g/t Pd over 1 metre and > 0.5 g/t over 10 metres. Flotation tests suggest a recovery of 90 % or more. Palladium and gold occur as alloys with copper.

Geochemical information from the cores portrays a stratigraphically very well-controlled, primary high-temperature mineralisation, the variations in which can be followed in great detail throughout the intrusion (more than 40 km^2). This exceptional stratigraphic control suggests the possibility for good grade control. Mass balance calculations also suggest a potential for undiscovered platinum mineralisation.

Drill cores from Skaergaard will soon be available for study in Copenhagen (see under *Spot news around and about Greenland*, page 4). A Survey report is pending: to pre-order this and for information contact GEUS.

South Greenland: old and new geoscientific data reassessed

Geological, geochemical and geophysical data available in GIS format
Comprehensive review on economic potential nearing completion

Since 1992 and the initiation of *Project SUPRASYD*, the Survey has been re-evaluating the economic potential of the Precambrian rocks of southern Greenland that form the Palaeoproterozoic Ketilidian orogeny and the Mesoproterozoic Gardar rift province. These provinces host a number of classic mineral deposits and a wealth of geological information has been gathered since the 19th century. The region has also been in focus in recent years through suggested correlation with Labrador and the regional efforts to discover equivalents of the Voisey's Bay nickel-copper-cobalt deposit. *Project SUPRASYD* was designed to transform the most relevant data to digital formats for GIS purposes, update geological, geophysical, geochemical information from the region and to develop new concepts for the architecture, development and mineral potential of the region. The project included five field seasons.

The transformation of old hard copy information to digital formats for GIS use has required critical reviews of all data including published geological, geochemical and geophysical maps and papers, data bases, satellite mosaics, plus all unpublished material in GEUS archives including internal reports, industry exploration reports, field notes and maps, theses, etc. All data have been referred to the G/250 Vector (copyright Kort & Matrikelstyrelsen, 1997) topographic base for Greenland and can now be handled by GIS systems. The re-investigation of the region has resulted in an updated geological map for GIS use.

The systematic search for mineral deposits has resulted in pin-pointing more than 100 localities with exploration interest; presently, the most interesting of these is gold mineralisation of two main types. High-temperature gold mineralisation in quartz veins – called *Nalunaq-type* after the deposit near the town of Nanortalik (see page 2 of this newsletter) – is generally hosted in tectonised and metamorphosed Ketilidian mafic volcanics. Gold can be seen with the naked eye. The second type – called *Kangerluluk-type* after Kangerluluk Fjord on the east coast (location map, page 3) – is lower temperature gold, hosted in calc-alkaline, arc-related volcanics. The gold is concentrated in zones of carbonate alteration and silicification and often related to shearing and faulting. In addition to gold, Ketilidian mafic intrusions also host base-metal and oxide mineralisation; graphite is also a common commodity in supracrustal units and was exploited early in the last century.

The magmas of the continental Gardar Rift are in general highly alkaline and enriched in 'high-technology metals', several of which have been subjected to intense exploration, for example, uranium, beryllium, zirconium and rare earth minerals in the Ilímaussaq intrusion, and niobium and tantalum in the Motzfeldt complex. The most classic of all the Gardar mineral deposits is the abandoned cryolite mine at Ivittuut which for more than a century was a world supplier of cryolite as a flux agent in aluminium production.