

# Review of Greenland activities, 1996

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Activities concerning Greenland that are undertaken by the Geological Survey of Denmark and Greenland (Danmarks og Grønlands Geologiske Undersøgelse: GEUS) were maintained at an unreduced level in 1996. Following the merger in 1995 of the former Geological Survey of Greenland (Grønlands Geologiske Undersøgelse: GGU) with the Geological Survey of Denmark (Danmarks Geologiske Undersøgelse: DGU) to form the present institute, 1996 saw the move of the great majority of former GGU staff from the University complex at Øster Voldgade to the former DGU office complex at Thoravej, in north-west Copenhagen. The former GGU geochemistry laboratories and some other facilities will remain at Øster Voldgade, together with the Danish Lithosphere Centre (DLC); the latter is a research centre funded by the Danish National Research Foundation and administratively linked to GEUS, and hosted jointly by GEUS and the Geological Institute of the University of Copenhagen. It is planned that GEUS will move to the renovated Øster Voldgade complex, which will house the new GEOCENTER, in the year 2001. This major new geological research centre will comprise GEUS, hopefully including the Danish Lithosphere Centre, together with the Geological Institute, Geological Museum and Geographical Institute of the University of Copenhagen. The final decision to establish the GEOCENTER at Øster Voldgade was made by the Danish Parliament in December 1996, with the passing of the 1997 Finance Law, as an element in Denmark's National Research Strategy. A grant of 190 million kroner has been allocated for renovation, rebuilding and relocation expenses.

As part of an agreement between the Prime Minister of Denmark and the Premier of the Greenland Home Rule Government concerning strengthening of the mineral resources sector in Greenland, two GEUS geologists were seconded to the Home Rule Minerals Office in Nuuk throughout 1996. This arrangement forms part of the strengthening of competence in Greenland in relation to both mineral and oil resources, together with

improvements in two-way communication of geological information of special relevance to the non-living resource sector.

GEUS, in co-operation with the Mineral Resources Administration for Greenland and the Minerals Office of the Home Rule Government, has continued the joint information services directed at the international oil and mining industries. This activity concentrates on the presentation of geological results and information relevant to resource prospecting on land and offshore at meetings, symposia and exhibitions, in addition to the distribution of publications, newsletters and reports. In the field of mineral resources, particular efforts have been directed at North American companies, and in respect of oil resources to companies in both North America and Europe.

GEUS has assisted the Mineral Resources Administration for Greenland in geological questions concerning the activities of companies with concessions in Greenland. Of particular interest in 1996 were the negotiations with oil companies with direct interest in the concession distribution in the offshore region of Fylla Banke (Fig. 1), and the monitoring of grønArctic's onshore drilling programme on Nuussuaq. With respect to mineral concessions on land, area calculation of the very large number of mineral licences granted in West and South-West Greenland was a significant task. The Survey has also monitored the drilling activities of Platino A/S at Citronen Fjord in North Greenland (Fig. 1), and Nunaoil A/S on Storø near Nuuk, on behalf of the Mineral Resources Administration for Greenland.

Geological, geophysical and glaciological investigations were carried out by the Survey in many parts of Greenland in 1996, by a total of 81 scientists and technical personnel, including nine from the Danish Lithosphere Centre. Nearly a third of the Survey's total staff of c. 350 has been engaged in Greenland activities. During 1996 the reorganisation of staff of the former DGU and GGU departments into new GEUS

departments, independent of geographical links to the three countries of the Kingdom of Denmark, was completed. This has strengthened and broadened the expertise which can be applied to Greenland projects, especially in the oil and gas sector.

The new statutes governing GEUS include the stipulation that the Greenland Home Rule Government and the Faeroese Government can each delegate one member to the Board of Governors, and thus have direct influence on setting priorities for the institution's varied projects.

## Geological mapping

Systematic regional geological mapping for the 1:500 000 series has continued with completion of the compilation of the Dove Bugt map sheet (no. 10) in northern East Greenland (Fig. 1), and compilation of the map sheet covering eastern North Greenland (Lambert Land, sheet 9), together with accompanying laboratory studies of rock collections from the area. In South Greenland the 1:100 000 Søndre Sermilik map sheet (60 V.3 N) was printed, and field work on the adjacent map sheet to the east (Lindenow Fjord, 60 Ø.1 N) was completed. (For an overview of the geological map sheets published by the Survey, see the index maps accompanying the final article in this volume on *Publications on Greenland by the Survey, 1996*). A project in co-operation with the Minerals Office in Nuuk to produce digitised versions of the existing 1:500 000 geological map sheets, was initiated in 1996, and in co-operation with Kort- og Matrikelstyrelsen (National Survey and Cadastre) preparations are underway to produce digitised 1:250 000 topographic maps.

Several Survey staff have participated in DLC research activities on the evolution of the North Atlantic, notably in the studies of Tertiary volcanic activity on the Blossville Kyst area of East Greenland (Fig. 1). Contributions have also been made to DLC studies of the Precambrian crystalline terrain between Søndre Strømfjord and Disko Bugt in West Greenland.

## Mineral resource investigations

As part of the continuing emphasis on promotion for the exploration of Greenland's natural resources, airborne geophysical surveys were flown over large areas of South-West and West Greenland. One survey was financed jointly by the governments of Denmark and Greenland, another was financed entirely by the



Fig. 1. Greenland map showing the Inland Ice; locations shown include those mentioned in the article.

Government of Greenland. The surveys were managed by GEUS, and carried out by international geophysical contractors. A fixed-wing magnetic survey was flown over the land areas between Ivittuut and Nuuk, and a more detailed electromagnetic and magnetic survey using a specially equipped helicopter was made over selected areas of particular interest to the north and west of Ivittuut. The data acquired are included in geoscientific databases at GEUS for public use.

Field work in South-East Greenland included ore geological and geochemical investigations, and marked the closing phase of a major project to evaluate the mineral potential of southern Greenland. The work led to the finding of a significant new gold mineralisation on the south side of Kangerluluk fjord (Fig. 1).

Studies of ore mineralising processes carried out in central and eastern North Greenland formed part of a

multidisciplinary research project focusing on the economic potential of major sedimentary basins in these areas; this project is financially supported by the Danish Research Councils Polar Research Programme. Logistic support was provided by the Danish Polar Center.

As a result of the field work in Inglefield Land in North-West Greenland in 1995, supported by the Government of Greenland, which was a follow-up to an airborne geophysical survey in 1994, the Survey has released a set of 51 thematic maps which depict the geography, geology, geophysics and geochemistry of the area. These thematic maps, issued with a descriptive text, are designed to suit the requirements of the mineral prospecting industry.

## **Petroleum geology**

More than 10 years of intensive geophysical investigations in Davis Strait, offshore West Greenland, were crowned in 1996 by the granting of a concession to a consortium of oil companies, led by Statoil, covering the Fylla Banke area, south-west of Nuuk (Fig. 1). The Survey has contributed to this result with the collection and interpretation of many thousand kilometres of seismic data, the evaluation of the geological framework and the oil and gas potential, and the communication of the economic implications of this work to the oil and gas industry.

The onshore portion of the Nuussuaq Basin in the Nuussuaq – Svartenhuk Halvø area has been the subject of detailed field studies directed at evaluating the hydrocarbon prospects. Both sedimentary and volcanic rocks are in focus following the discoveries of widespread oil seeps. Rock cores from drilling by both the Survey and the commercial company grønArctic Energy Inc. have been the subject of detailed laboratory analysis. In 1996, grønArctic drilled the first deep exploration well on land on the south coast of Nuussuaq, which reached the planned depth of nearly 3000 m. The Survey's investigations have been supported by special grants from the governments of Denmark and Greenland, as well as from the state's energy research programme and the Carlsberg Foundation.

## **Climate research**

North-East Greenland has been shown to be a region of high climatic variability and sensitivity, and for this

reason intensive glaciological studies are being undertaken on the floating glacier which fills the interior of Nioghalvfjærdsfjorden (Fig. 1). Investigations include measurements of mass balance, glacier movement, and melting on the underside of the floating glacier in contact with the sea. The project is financed by the European Community Environment and Climate Programme, and logistic support is provided by the Danish Polar Center.

Studies aimed at revealing environmental and climatic change since the last ice age, have begun with investigations of lake sediments near Søndre Strømfjord in West Greenland and their microfossil and pollen contents; this project is supported by the Commission for Scientific Research in Greenland. Information on climatic change is also revealed by ongoing studies of sea level variations along the coast of West Greenland. Investigations of late Quaternary sediments in Jameson Land, East Greenland, are a further contribution to international climate research projects.

## **Publications**

Nineteen-ninety-six was a transition year for Greenland publications. The Survey published the final three numbers of the GGU Bulletin series (nos 170, 171 & 172), which is to be succeeded by the new GEUS title *Geology of Greenland Survey Bulletin* which begins with volume 173 to be published in 1997. One sheet of the Geological map of Greenland 1:100 000 series (Søndre Sermilik, 60 V.3 N), and the final volume of the GGU Thematic Map Series (Inglefield Land) were issued. In the new open file-type series *Danmarks og Grønlands Geologiske Undersøgelse Rapport*, seven reports were issued in English which have relevance to Greenland. Other reports received 1996 numbering but remained confidential throughout 1996 (see, *Publications on Greenland by the Survey, 1996* that concludes this volume).

Rapport 1996/114 is a catalogue of Greenland publications and data services available from the Survey, and includes both old GGU and new GEUS issues. Two issues of *Greenland MINEX News* and one of *GHEXIS*, the Survey's international newsletters to respectively the mining and oil industries, were released in 1996. Articles published in international scientific journals and periodicals in 1996 are listed on page 112. In the Survey's popular scientific series in Danish *GEOLOGI – Nyt fra GEUS* one issue was dedicated to the theme 'Is og energi' (ice and energy).