

# Greenland, Denmark and the Faeroe Islands, and the national geological survey (GEUS): 1996, a year of transition for publications

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The former Geological Survey of Greenland (Grønlands Geologiske Undersøgelse: GGU) was to have celebrated its 50th anniversary in 1996. The ministerial reorganisation and the establishment of a Ministry of Environment and Energy led directly to the merger in 1995 of GGU with its much older relative, the Geological Survey of Denmark (Danmarks Geologiske Undersøgelse: DGU). This larger institution, also with headquarters in Copenhagen, but with roots going back to the last century, had already celebrated its 100th birthday in 1988. DGU, as well as serving the sovereign country Denmark, had also a governmental mandate to serve the third country of the Kingdom of Denmark, the Faeroe Islands.

As reported in last year's *Report of Activities*, the fusion of these two well-known Danish institutions produced a new national geological survey with a staff of about 360, viz. the Geological Survey of Denmark and Greenland (Ghisler, 1996). The official name of the Survey is *Danmarks og Grønlands Geologiske Undersøgelse*; it is known increasingly within the Survey and nationally – and we hope in time internationally – by the everyday nickname GEUS, derived from the Danish name for a geological survey i.e. **Geologisk Undersøgelse**.

## Consequences for publications

Not surprisingly, the consequences of the merger of two independent organisations were wide-ranging. As far as publications were concerned, it meant the overnight pooling of editorial and technical resources and expertise that had previously formed two separate units. While both former institutions had issued the traditional range of geological survey publications (bulletins, reports and maps), each had an emphasis on publication that was differently structured to contrasting customer markets. These stemmed from the vary-

ing social, industrial and technological development of the respective lands under the jurisdiction of the two geological surveys. GGU was responsible for geological work in sparsely-populated Greenland, the largest island in the world with a population of only 56 000; while DGU, serving the much smaller area of Denmark and the Faeroe Islands (Fig. 1), had addressed the requirements generated by a highly developed technological society with a population of over five and a quarter million.

As a consequence, GGU, basing its work programmes on seasonal expeditions to Greenland manned by international personnel, had specialised in English-written publications that were directed mainly at the international community with, particularly in the last decade, emphasis on the international promotion of Greenland's mineral and hydrocarbon resource potential. In contrast, a significant proportion of DGU's production was focused on the home market and was in the form of service and data documentation reports in Danish, commensurate with DGU's strong commitments to Denmark's natural resources, environmental geology and ministerial service.

Over the years the publication range of both institutions had been restructured to meet the changing demands directed at modern geological surveys. One such demand – to facilitate the needs of industry and society in general, by ensuring quick and easy communication of data – was clearly reflected in the publication and data services available at the time of fusion in 1995. The geological publications from both GGU and DGU included, at one end of the range refereed scientific series, and at the other, open file or data reports produced in limited numbers. The quickly-produced open file-type reports were to a high degree designed to provide a wide range of raw data to specific customers, and to the mining and oil industries in general. At the time of fusion, both former surveys were in the process of assessing digitally-processed



Fig. 1. Map of the North Atlantic – Arctic region showing Denmark, the Faeroe Islands and Greenland, forming the Kingdom of Denmark, for which the Geological Survey of Denmark and Greenland (GEUS) is the governmental research and advisory institution responsible for geological work. Average sea-ice conditions from Valeur *et al.* (1996).

publication forms, and the perspectives of the new electronic technology.

The inheritance by the new national geological survey of two firmly established ranges of publications, naturally necessitated a critical assessment of the nature and range of the publications to be issued by GEUS. It became obvious that some of the existing series complemented each other, but it was equally clear that other publications were candidates to be phased out or combined.

### Scope of this paper

The aim of this paper is two-fold: it outlines the result of the above-mentioned discussions concerning the Survey's geological series (with particular reference to Greenland-related publications), and, as background information and to illustrate the premises behind the reorganisation, it gives a comparative description of the three countries served by the new national geological survey, GEUS. It reports on the discontinuation of a number of well-known geological series and on the renaming of others, and it reviews the range of geoscientific publications – those in English and in conventional printed form – that will be available from 1997.

## The general premises

### *Geography, geology and physiography*

The new national geological survey (GEUS) contrasts with many other geological surveys in that, as a governmental research and consultative body, it is responsible for three geographically *widely-separated* lands: Denmark, the Faeroe Islands and Greenland. These countries are very different in size and show striking contrasts in physical and human geography. They span a region extending over almost 30° of latitude, from the temperate climes of western Europe, across the North Atlantic to the high arctic of Greenland. In the north-west, Greenland is literally within sight of North America (Canada) and its northern coast is only 700 km from the North Pole (Fig. 1).

Geologically, the territory of the Kingdom of Denmark and its offshore areas represents opposing parts of the Eurasian and North American plates, as well as the volcanic rocks of the relatively young intervening North Atlantic Ocean. Basalts generated in the late Phanerozoic, form the Faeroe Islands (as well as Iceland, Fig. 1). Together, the three constituent lands preserve a complete geological column from the oldest Archaean rocks on Earth (in the Nuuk region of Greenland) to the

Table 1. Facts on Greenland, Denmark and the Faeroe Islands: size, landscape and population

	Total land area km <sup>2</sup>	Ice-free land km <sup>2</sup>	Highest point m	Average elevation m	Total population	Population/ capital
Greenland	2 166 086	410 449	3 693	1 788*	56 000	13 000 Nuuk
Denmark	43 069	43 069	173	30	5 215 000	1 346 000 Copenhagen
Faeroe Islands	1 399	1 399	882	300	44 000	15 000 Thorshavn

Data are taken from published sources except for the average elevation of Greenland (asterisk) that was calculated by Wolfgang Starzer (GEUS). This figure is for Greenland in its entirety including the Inland Ice, that alone has an average elevation of 2135 m. The land area of Greenland, including glaciers and local ice caps has an average elevation of 552 m (Simon Ekholm, National Survey and Cadastre, Copenhagen, personal communication 1997); the highest peak, in East Greenland, is 3693 m.

youngest Cainozoic, with the vast Inland Ice of Greenland as a vestige of the Pleistocene ice age.

With respect to physiography and climate, the three countries stand in particular contrast. Denmark is a lowland agricultural country where the most significant feature of the landscape is a thick mantle of glacial deposits. It has a mild maritime climate and only in occasional severe winters does the southern Baltic Sea freeze. The Faeroe Islands, comprising a group of small rugged islands between Norway and Iceland, have an average elevation well above the highest point in Denmark (Table 1); only 6% of the land is cultivated. Their climate is generally cold and stormy but the harbours rarely freeze because of the warming influence of the North Atlantic Drift (an influence clearly seen in Fig. 1). The contrast in physical conditions is completed by Greenland, that has about 75% of its area covered by the central Inland Ice that reaches an elevation of 3300 m. This ice sheet is flanked by a coastal mountainous fringe, with local ice caps dissected by glaciers and extensive fjord systems, and in which the highest peak is 3693 m (in East Greenland). Ice-choked seas surround the island for much of the year and only part of the south-western coast is navigable for ordinary shipping all year round (Fig. 1). With a span of 24 degrees of latitude (or 2675 km), there are marked climatic differences from south to north; only locally in the south-west is there any form of land cultivation.

### *Human geography and environmental geology*

The contrasts in geographical location and physical conditions noted above determine that the three constituent

lands of the Kingdom of Denmark are also quite different as regards human geography and environmental geology. Thus Greenland, with a total area almost equal to that of western Europe and an ice-free area larger than Germany, has a population only slightly larger than the Faeroe Islands (Table 1). All but one of the 18 islands making up the Faeroes are inhabited, with the population spread over 90 towns and villages; in contrast, Greenland's population is concentrated in about 70 towns and villages scattered along the south-west and west coasts between latitudes 60° and 74°N, a stretch of more than 1500 km. There are also isolated settlements in the north-west (Qaanaaq/Thule), east (Illoqqortoormiit/-Scoresbysund) and south-east (Tasiilaq/Ammassilik). The overall contrast in population density is completed by Denmark with a population of over 5 million, including a capital city of over a million inhabitants, in a total land area of only 43 000 km<sup>2</sup> (Table 1).

Considerable offshore territory also falls within the Survey's areas of geological surveillance. While some of the limits to this territory are in dispute and have yet to be precisely defined, the economic potential of offshore territories in the North Atlantic and Arctic Oceans (Norwegian Sea, Greenland Sea, Wandel Sea, Labrador Sea, Davis Strait, Baffin Bay and Lincoln Sea) and the Baltic and North Seas (Fig. 1) are targets for investigation and economic evaluation. Exploration techniques in these areas naturally vary in accordance with the physical conditions of the seas, that vary from ice-free and navigable all year round as in the North Sea, to permanent ice cover as in the Lincoln Sea and Arctic Ocean. Where there is existing oil and gas production, as in the North Sea, monitoring of the operations on behalf of the legislature is an important task for the Survey.

The vivid contrasts in physical and human geography between Greenland, Denmark and the Faeroe Islands determine that, in terms of environmental and social geology, the countries are also very different. The practical needs of the Danish, Greenlandic and Faeroese public as regards land-use, construction of buildings and transportation facilities and environmental measures, as well as the demands for geoscientific information for exploration, exploitation and management of resources, can hardly be more varied. One illustrative example of this contrast concerns management of water resources. In Denmark, groundwater monitoring, pollution control and freshwater conservation and supply are leading social geology concerns, and, of necessity, are high priority; in Greenland, in contrast, ice and water are one of the country's foremost natural resources, with freshwater being harnessed as a power source.

### *Electronic publishing*

In addition to the general premises outlined above, the ongoing electronic communication revolution is an important factor determining the nature of future products and services available from the national geological survey. Globally, an increasing amount of geodata is being made available in digital form. Traditional geological communication in print form is being supplemented and replaced by electronic databases capable of providing on-the-spot data and compilations in a variety of forms. Some scientific journals, publishing houses and geological surveys, are already producing electronic issues. Clearly, in any reorganisation of publication strategy today, the onus is on reduction in the number of traditional printed series in readiness for the pending global utilisation of electronic scientific texts. The first GEUS electronic issue is expected to appear on the World Wide Web in 1997 and CD-ROM issues of the geological series are planned.

### **1996, a year of transition for publications**

The year 1996 was, for all intents and purposes, a period of transition characterised by the phasing out of some publication series and the introduction of GEUS issues. Thus the year was marked by the concurrent appearance of volumes in several of the established geological series, for example *Bulletin Grønlands Geologiske Undersøgelse*, *Thematic Map Series Grønlands Geologiske*

*Undersøgelse* and *Danmarks Geologiske Undersøgelse Map Series*, as well as the first numbers in the new 'open file-style' series – *Danmarks og Grønlands Geologiske Undersøgelse Rapport*. In its first year (1996) 121 numbers in the latter series were issued. However, as a consequence of the special nature of this series, only about 50% of the reports produced are available to the public (see below and Table 2).

It should be noted that the annual *Report of Activities*, from the former Geological Survey of Greenland published between 1966 and 1996, continues under the new name of *Review of Greenland Activities*. This yearly volume was previously published as part of *Rapport Grønlands Geologiske Undersøgelse*, until that series was phased out in 1995. In the transition year of 1996, the *Report of Activities* was published in the *Bulletin Grønlands Geologiske Undersøgelse* series, and formed as it happens, the last number of this series title (no. 172). Starting with the present volume – the *Review of Greenland Activities 1996* – the annual scientific review appears in GEUS format and design as a volume of *Geology of Greenland Survey Bulletin*.

The year 1996 was also transitional in terms of publication design. A delay in producing an overall design for the new GEUS geological publications dictated that the new *Rapport* series was introduced with a cover design that was phased out at the end of its first year. Clients should note that from 1997 the *Danmarks og Grønlands Geologiske Undersøgelse Rapport* series will be recognised by a cover design in the same family as the three scientific series (two bulletins and a map series; see below and Figs 2, 3).

### **Status of the geological series**

#### *The scientific series*

The geographically widely-separated nature of the lands under GEUS' field of reference (Fig. 1) determines that the scientific results of the new survey are published in two geographically-orientated bulletin series, rather than a single series. Thus, the scientific results concerning Greenland, and relationships to North America and to the Arctic in general, are collected in one series (*Geology of Greenland Survey Bulletin*), while those pertaining to Denmark and the Faeroe Islands, and relationships to Europe and their adjoining parts of the North Atlantic region, are reported in another series (*Geology of Denmark Survey Bulletin*; Fig. 2). This model allows for a bibliographic continuation of one scien-



Fig. 2. Front cover illustrations of the three scientific series issued by the Geological Survey of Denmark and Greenland. **A**, *Geology of Greenland Survey Bulletin* **173**, 1997; **B**, *Geology of Denmark Survey Bulletin*; **C**, *Geology of Denmark and Greenland Map Series*. Format: A and B are 28 × 21 cm; C is A4 (29.7 × 21 cm). Note that B and C are mock-ups, with fictitious titles.

tific line of the two former surveys and is thus practical for our customers. The series *Geology of Greenland Survey Bulletin* continues the numbering of the former GGU *Bulletin* series, while the *Geology of Denmark Survey Bulletin* takes over the numbering of DGU *Series A* (see Table 2).

Geological maps of the national map sheet coverage of Greenland at the standard scales of 1:500 000 and 1:100 000 will continue to be produced. However, the *Descriptive text* series, issued by the former Geological Survey of Greenland to accompany these map sheets, is incorporated in the new *Geology of Denmark and Greenland Map Series* (Fig. 2). This series comprises all types of printed geoscience maps at various scales that depict the onshore and offshore parts of Greenland, Denmark and the Faeroes, accompanied by short map descriptions. Thus, Greenland maps published in this series will not be consecutively numbered. However, the Greenland maps will continue to be issued with names and numbers identifying them as maps belonging to the previously indexed 1:500 000 and 1:100 000 standard map sheet series.

Readers may ponder on the fact that, rather untraditionally, the Survey's name does not appear in the name of the three scientific series, viz. *Geology of Greenland Survey Bulletin*, *Geology of Denmark Survey Bulletin* and *Geology of Denmark and Greenland Map Series*. This, combined with the all-embracing name on which the three series are based, viz. *Geology of*

*Denmark/Greenland*, signals the intention to accept other than strictly Survey results in these series.

### *The open file-type reports*

The *Danmarks og Grønlands Geologiske Undersøgelse Rapport* series comprises unedited reports and maps in Danish and English that have a wide subject range including non-geological topics. The series presents data from all regions of the Kingdom of Denmark, as well as from other parts of the world where survey staff have worked on contract. However, unlike the GGU *Open File Series*, or other traditional open-file series, the new *Rapport* series also includes confidential material. This confidential category of reports includes those commissioned by industry and other customers, as well as service or inspection reports prepared for ministerial use.

Reports in the *Danmarks og Grønlands Geologiske Undersøgelse Rapport* series take over the very important role of communicating preliminary field information and analytical data promptly to the public. Reviews of Greenland publications, and in particular articles about the GGU *Open File Series* and *Thematic Map Series* (Schönwandt, 1993; Dawes, 1994; Ady, 1995; Sønderholm, 1996), have pointed out that this type of reporting is a key to developments in the field of economic geology in Greenland, particularly mineral and petroleum exploration. Clients should therefore note that, as a conse-





Fig. 3. Illustrations of the open file-type reports. *Danmarks og Grønlands Geologiske Undersøgelse Rapport* series started in 1996; this cover design is from 1997. The series presents data from the three countries of the Kingdom of Denmark, as well as other countries where Survey staff have worked on contract; it also contains confidential reports which are released when the period of confidentiality expires. Greenland-related reports are distinguished by an outline map. Format: A4 (29.7 × 21 cm).

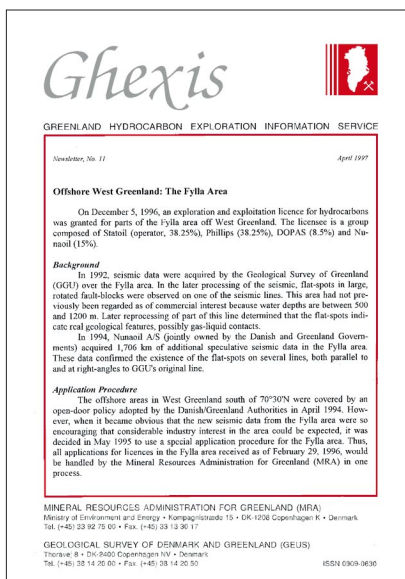
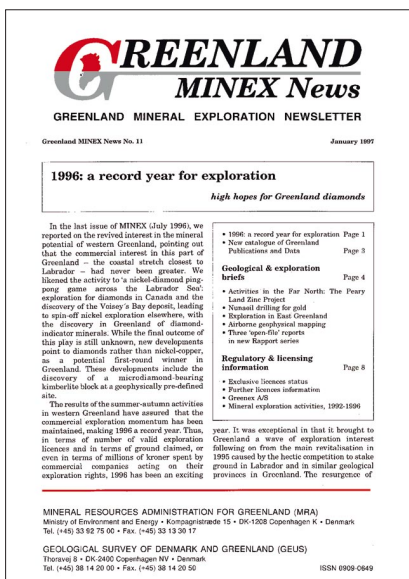


Fig. 4. Illustrations of the newsletters to industry. The newsletters *Greenland MINEX News* and *GHEXIS*, started in 1992 and 1990 respectively, are directed to the international mineral and petroleum industries respectively. The design, format and names of these publications are not affected by the Survey reorganisation: they are now issued by the Geological Survey of Denmark and Greenland (GEUS) in cooperation with the Mineral Resources Administration for Greenland. They continue to relate specifically to Greenland. Format: A4 (29.7 × 21 cm).

quence of the wide subject range and cosmopolitan nature of the series, and the classified nature of some of the material, the numbering of Greenland-related reports in the *Danmarks og Grønlands Geologiske Undersøgelse Rapport* series is not consecutive. Greenland-related reports are distinguished by a cover design including an outline map of Greenland (Fig. 3).

One important point of caution is that the new-style *Rapport* series of the Geological Survey of Denmark and Greenland should not be mistaken for the *Rapport* series of the former Geological Survey of Greenland (*Rapport Grønlands Geologiske Undersøgelse*) that was discontinued in 1995. That series, which contained refereed, short scientific articles and current research

papers, has been incorporated into the *Geology of Greenland Survey Bulletin* series (see Table 2).

### Newsletters to industry

The format and names of the newsletters *MINEX* and *GHEXIS*, designed particularly for the international mining and oil industries, have not been affected by the Survey reorganisation and they continue as before to relate specifically to Greenland (Fig. 4). However, two other series of the former Geological Survey of Greenland that are of direct relevance for industry – the *Open File Series* and the *Thematic Map Series* (started respectively in 1989 and 1990) – were discontinued

Table 2. Publication register of the six geological series available from GEUS in 1997

Name	Status	Type
<p><b>I. Scientific series</b>  <i>Geology of Greenland Survey Bulletin.</i> (New)</p>	<p>Continuation of <i>Bulletin Grønlands Geologiske Undersøgelse</i>, and incorporating <i>Rapport Grønlands Geologiske Undersøgelse</i>. Starts with no. 173.</p>	<p>Scientific, internationally-refereed articles in English on research pertaining to Greenland and the relationships to the North Atlantic and Arctic regions. Note that this volume – <i>Review of Greenland Activities</i> – is an atypical issue of this series, in that by its nature it is not subject to the international reviewing requirements otherwise applied to the series.</p>
<p><i>Geology of Denmark Survey Bulletin.</i> (New)</p>	<p>Continuation of <i>Danmarks Geologiske Undersøgelse Serie A</i>, and incorporating <i>Danmarks Geologiske Undersøgelse Serie B</i>. Starts with no. 36.</p>	<p>Scientific, internationally-refereed articles in English on research relating to Denmark and the Faeroe Islands, and the relationships to surrounding regions.</p>
<p><i>Geology of Denmark and Greenland Map Series.</i> (New)</p>	<p>Incorporates <i>Grønlands Geologiske Undersøgelse Map Descriptive text</i> series (for 1:500 000 and 1:100 000 maps of the national map sheet coverage) and <i>Danmarks Geologiske Undersøgelse Map Series</i>. Starts with no. 1.</p>	<p>All types of geoscientific maps of Greenland, Denmark and the Faeroe Islands, including offshore areas; issued with short refereed descriptive texts.</p>
<p><b>2. Open file-type reports</b>  <i>Danmarks og Grønlands Geologiske Undersøgelse Rapport.</i> (New)</p>	<p>Incorporates <i>Open File Series Grønlands Geologiske Undersøgelse</i>, some aspects of <i>Thematic Map Series Grønlands Geologiske Undersøgelse</i> and internal and service GGU reports, including field and express reports, inspection reports and special reports to industry; and <i>Danmarks Geologiske Undersøgelse Serie C and D</i>, and DGU's <i>Service reports</i> and <i>Data-documentation reports</i>. Started in 1996; consecutive numbering within each year. In 1996, reports 1996/1 to 1996/121 were issued, of which 68 were classified; of the 121 reports, 20 deal with Greenland-related topics.</p>	<p>Cosmopolitan, multi-disciplinary, unedited reports in English or Danish, produced in limited numbers. The series includes confidential (classified) reports, some of which are released when confidentiality expires.</p>
<p><b>3. Newsletters to industry</b>  <i>Greenland MINEX News</i></p>	<p>Unchanged since its start in 1992. Continuous numbering: most recent issue is no. 12 from July, 1997. Available free on request.</p>	<p>The name <i>Greenland MINEX News</i> is derived from <b>Greenland Mineral Exploration</b> Newsletter. It brings up-to-date geological and regulatory information on Greenland to the international exploration and mining industry. The newsletter is published by GEUS jointly with the Mineral Resources Administration for Greenland.</p>
<p>GHEXIS</p>	<p>Unchanged since its start in 1990. Continuous numbering: most recent issue is no. 11 from April, 1997. Unnumbered information packages are also issued under the GHEXIS name and design. Available free on request.</p>	<p>The name <i>GHEXIS</i> is an acronym for <b>Greenland Hydrocarbon Exploration Information Service</b>. It brings up-to-date geological and regulatory information on Greenland to the international oil and gas industry. The newsletter is published by GEUS in co-operation with the Mineral Resources Administration for Greenland.</p>

as identifiable series in respectively 1995 and 1996. The type of information that characterised these two series is now released in the new open file-type series, viz. *Danmarks og Grønlands Geologiske Undersøgelse Rapport* (Fig. 3), while some thematic map data will in future be released in CD-ROM issues that have yet to be formalised.

## Publication register

The geological series issued by Danmarks og Grønlands Geologiske Undersøgelse (Geological Survey of Denmark and Greenland – GEUS) from 1997 are listed in Table 2. Popular scientific series, and series entirely in Danish, are not included. To help in appreciating the reorganisation of Survey publications, and to establish the status of the new series issued by GEUS, the names of the relevant, but now discontinued, GGU and DGU series are indicated. The six GEUS series are illustrated in Figures 2, 3 and 4.

## Final comments: Greenland publications and data

The reorganisation of Survey publications, stimulated by the institutional fusion in 1995, has led to a reduction in the number of geological series relating to Greenland, from seven to five. Two of these, *Geology of Denmark and Greenland Map Series* and the new *Danmarks og Grønlands Geologiske Undersøgelse Rapport* series contain, as outlined above, material pertaining to all parts of the Kingdom of Denmark. Only one scientific series – *Geology of Greenland Survey Bulletin* – and the newsletters *Greenland MINEX News* and *GHEXIS* deal specifically with Greenland.

A 'Catalogue of Greenland publications and data' published in the *Danmarks og Grønlands Geologiske Undersøgelse Rapport* series gives full coverage of the discontinued GGU series (publications that naturally can

still be obtained from GEUS) and introduces the new GEUS series (Dawes *et al.*, 1996). The catalogue also reviews available map and graphic services other than the traditional geoscientific series, for example, topographic, bathymetric and satellite maps of Greenland, and it provides a data directory that outlines the diversity of data and services that are available from the new national geological survey, GEUS. This 'Catalogue of Greenland publications and data' can be obtained free of charge on request.

Finally, it should be emphasized that GEUS is committed to supplying the same range of geological services pertaining to Greenland, as those managed by its predecessor, GGU. Information about Greenland publications and services can be obtained from the GEUS headquarters in Denmark, as well as in Greenland at the Minerals Office of the Government of Greenland in Nuuk.

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