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Interpretation of shallow seismic profiles over the continental shelf in West Greenland between latitudes 64° and 69°30′N

E. F. K. Zarudzki

The work included the study of parts of the data obtained during the survey cruise WESTMAR 78, described in a preliminary report (Brett & Zarudzki, 1979). The data consist of 10 741 km seismic reflection profiles obtained with sparker, sub-bottom, airgun and boomer systems; 8474 km of bathymetric profiles, 3894 km of sidescan sonar profiles and 8545 km of magnetic profiles. The study objectives in the area and its subdivision were established at an early stage.

Figure 18 is based on the new computer plot of the WESTMAR 78 tracks (SATNAV fixes at 15 min intervals) produced by C. P. Brett. The GGU seismic coverage in the study area C was widely spaced; this necessitated filling in of the gaps by shallow seismic data obtained from other sources (Denham, 1974) and newly released industrial seismic profiles (Henderson, 1978). The latter were used mainly to assess the degree of the influence of deeper structure on the surface morphology.

The area C has four distinct physiographic subdivisions: Disko Bugt, Disko Banke, Egedesminde Dyb and Store Hellefiskebanke (North).

Disko Bugt, the easternmost subdivision is characterised by broad, shallow, flat-bottomed basins thinly clad by Quaternary deposits. The basins are traversed by numerous narrow, steep-flanked ridges of harder, possibly intrusive rock trending NE–SW and E–W. Offshore, between Jakobshavn and Christianshåb the ridges form effective sediment dams.

Further to the west the broad basins deepen and are transformed into a system of glacial valleys breaching and by-passing the NNW–SSE oriented Precambrian gneiss arch lying between Egedesminde and Godhavn across the way of glaciation. The system appears to have resulted from westward moving ice exploring major tectonic and jointing trends NNE–SSW and NNW–SSE. The spectacular 90 km long and nearly 1 km deep valley collects the glacial valleys from the east and forms a physiographic boundary between the Disko Bugt and Disko Banke. The topography of the whole of Disko Bugt reflects the response of hard rocks of various characteristics and tectonic history to the intense erosion at the sole of a more than 60 km wide glacier. Except for the easternmost part there is very little sedimentation.

The *Disko Banke* (DN, in fig. 18) extends from a 500 m high Tertiary basalt escarpment (Clarke, 1975) westward almost to the shelf-break. To the north and south it is limited by

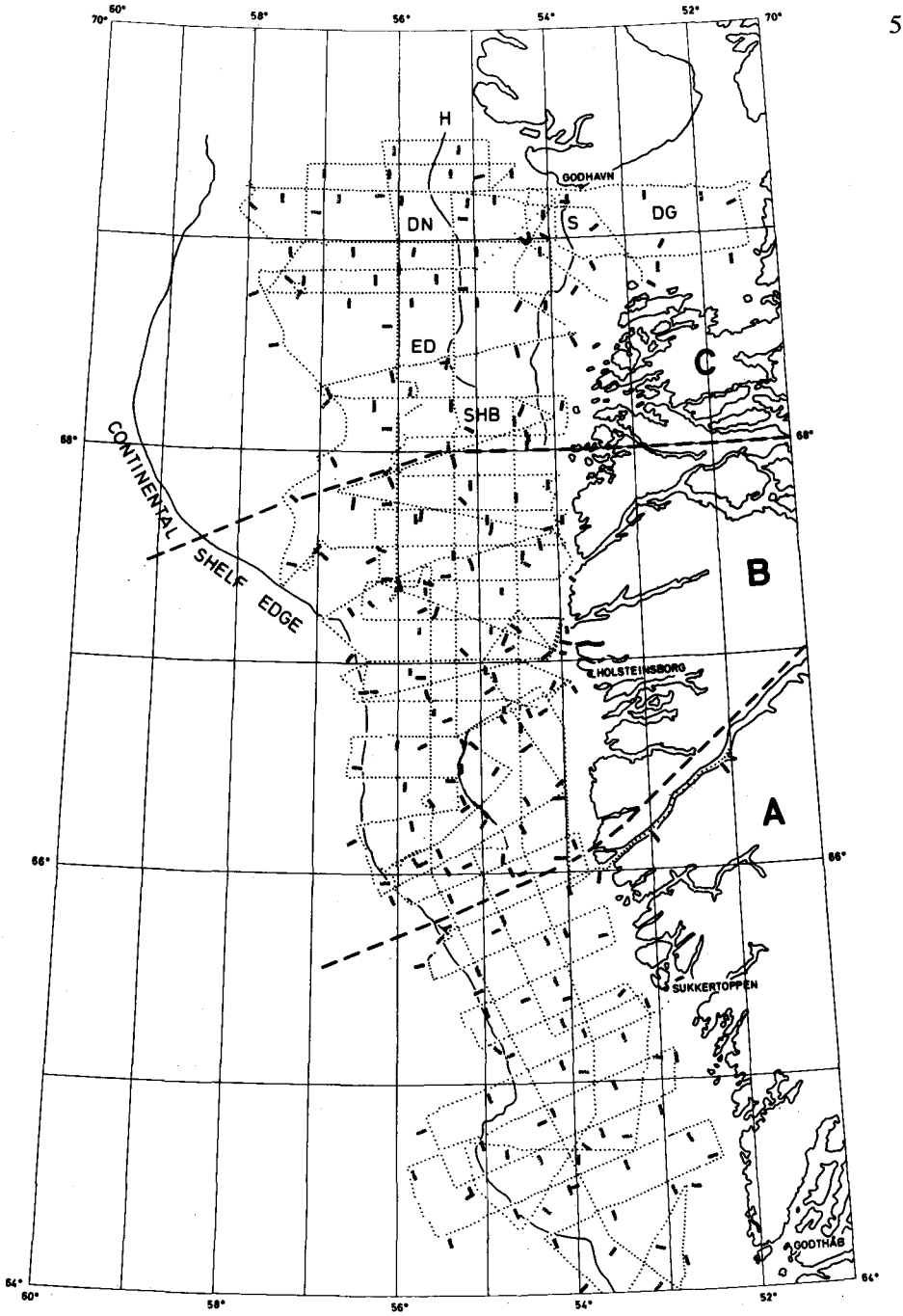

Fig. 18. WESTMAR 78 survey area. The track of the ship is marked by dots with fixed positions at 15 minute intervals. The elongated black marks beside the tracks are the computer numbers of the fixed positions. The continental shelf is marked at the 200 to 300 m bathymetric contour. The Tertiary basalt escarpment (S) and the hinge line (H) in the Tertiary basalts are marked with dashed lines. Egedesminde Dyb (ED), Store Hellefiskebanke (SHB), Disko Banke (DN) and Disko Bugt (DG).

the tectonically-controlled ice exits: the Godhavn Rende and the Egedesminde Dyb. The escarpment (S, in fig. 18) faces east and forms a bathymetric sill over 170 km long. This, almost continuously outcropping basalt front, joins the Disko volcanic pile to the shallow buried, thick basalt flows of north Hellefiskebanke (G. Henderson *et al.*, in press).

The surface morphology of the eastern half of Disko Banke is strongly controlled by the underlying plateau basalts. Regionally, the basalts dip approximately 1° westward. They tend to form characteristic 5–50 m high terraced scarps facing east. Their joints and cracks were vigorously explored by moving ice. The top of the basalts also shows numerous undulations not necessarily reflecting the structure of the underlying Precambrian gneisses. The basalts are almost bare of Quaternary sediments. Whenever Holocene muds are present they are intensely scoured by drifting icebergs.

In the western, larger part of Disko Banke the effect of the immediately underlying structure gradually disappears as the westward-dipping basalts are overlain by a Tertiary sediment wedge which thickens towards the north-west. The dip of the basalts increases abruptly (from less than one degree to over three degrees) along a distinct hinge line (H, in fig. 18) which was traced for 120 km. The Tertiary wedge is mantled with 2 to 30 m thick Quaternary soft sediments. The latter are heavily ice scoured over the bank and its flanks to a water depth of 340 m (Brett & Zarudzki, 1979). Numerous frontal moraine ridge chains trending N–S and up to 20 m high occur between the western edge of Disko Banke and the shelf-break.

The *Egedesminde Dyb* (ED, in fig. 18) is a glacial valley 250 km long and over 0.5 km deep. This is confirmed by its morphology, i.e. the traverse and longitudinal profiles, the presence of rocky thresholds, the flank, bottom and frontal moraines. It is tectonically controlled by two major faults, one running along its northern flank and another across its eastern entrance (and following north-west along the basalt escarpment S, in fig. 18), and also by the presence of a prominent basement high (Henderson *et al.*, in press) on its southern flank. It may have been the site of a Tertiary (?) river valley enlarged by a Quaternary piedmont-type glacier (Henderson, 1975). The well-preserved flank moraines, found at gradually lower elevations in the valley, testify to a recent withdrawal of the ice.

North of 68°N the *Store Hellefiskebanke* (SHB, in fig. 18) appears to have been also tectonically controlled in its Tertiary depositional history by a shallow-buried basement high mentioned above, identified to the south in deep seismic records (Henderson *et al.*, in press; Risum, personal communication). Steeply prograding sequences (perhaps Tertiary basalts) flanking it to the north and west were truncated by ice erosion where they outcropped at the bottom of Egedesminde Dyb.

The detailed report on area C is in preparation.

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Distribution of radioactive mineralisation in central West Greenland

Karsten Secher

An airborne radiometric survey 1975–76 (Secher, 1976, 1977) showed several anomalies in the area between Egedesminde and Færingehavn. The follow-up field programme from 1977–79 comprised detailed geological and radiometric mapping, as well as sampling of soil, stream water and stream sediments (Watt, 1977).

Field operations were carried out from the GGU field station at Søndre Strømfjord Airbase, using one helicopter for two to four field parties, each summer. Two GGU cutters were utilised during a part of each season.

There is little previous knowledge of radioactive mineralisation in the area; Bøggild (1953) mentions only a few scattered localities of allanite, and Noe-Nygaard (1958) gives a brief description of allanite-bearing material from the areas east of Sukkertoppen and south of Godthåbsfjord. In the area near Godthåb, allanite has long been known as a rather common accessory in pegmatitic phases of the country rocks (Boucot, 1949). Information in the records of the Geological Museum of Copenhagen mentions monazite showings in the Godthåb and Sukkertoppen districts.

The Phanerozoic carbonatite complex, Qaqarssuk near Sukkertoppen is known to represent an area of locally elevated radioactivity (Secher, 1977), and uraniferous pyrochlore is noted by Gothenborg & Pedersen (1975). U and Th mineralisations from the Sarfartôq carbonatite complex near Søndre Strømfjord are mentioned in preliminary reports by Secher & Larsen (in press).

Classification of mineralisation

Several new observations on radioactive mineralisation were made, and a preliminary classification of them has been made. They can be separated into two main groups: disseminated and vein mineralisation, which can be further divided into subgroups, according to the combination of the characteristic radioactive minerals and the host rock.

Radioactive mineralisations of the disseminated type include: