

Shallow core hole drilling and sampling for the investigation of organic matter rich shales in 1976, Nûgssuaq, central West Greenland

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As a continuation of the special investigations carried out in the Nûgssuaq embayment up to 1975 (Schiener, 1976), a joint field programme between GGU and the Petroleum & Organic Geochemistry Research Group (EOG) of the Nuclear Research Establishment (KFA) Jûlich, West Germany, was embarked upon in 1976. The programme was supported by a grant from the Danish Natural Science Research Council (SNF) and a contribution by KFA/EOG. It constitutes an essential part of a project within the SNF sponsored research in energy related topics (Organic Geochemistry, West Greenland).

Overall coordination of the group was handled by E. J. S. who also carried out most of the surface sampling. A drilling party of four was led by D. L.

Logistic support was provided by the GGU motor cutter *K. J. V. Steenstrup* with Andreas Viðstein as skipper and by an Agusta Bell Jet Ranger II, chartered from Greenlandair Charter A/S. The operations were conducted from the old GGU base at Marrait on Nûgssuaq.

Equipment

The drilling unit, supplied by EOG, consisted of a Winkie Drill, model GW-15 with a 10 hp Chrysler two-stroke engine. It was mounted on its watertight aluminium transport container (fig. 9), which, when filled with water, acted as a gravity anchor weighing approx. 1.5 ton. In the superficially weathered and extremely loose shales this anchoring method proved to be by far superior to mechanical anchoring by bolts or augers. The double tube core barrel was fitted with diamond bits producing cores of 32 mm in diameter.

A high pressure circulating pump Hypro, model C-5206 AF was driven by a 5 hp Briggs & Stratton four-stroke engine. To avoid freezing and blockage of the drill pipe within the permafrost when making connections, a 'Nordic' waterheater, driven by bottle-gas, was included in the circulating system.

Objectives

The immediate objectives of the programme were:

(a) to collect fresh, possibly unweathered samples from organic matter rich shales, covering the range of major stratigraphic levels and major facies of the sediments occurring in the Nûgssuaq embayment,

(b) to collect samples from within the permafrost zone,

(c) to collect consecutive samples at controlled distances from intrusive bodies.

From detailed laboratory investigations utilising organic geochemistry and reflected light microscopy on the collected material it is expected to achieve an improved understanding of

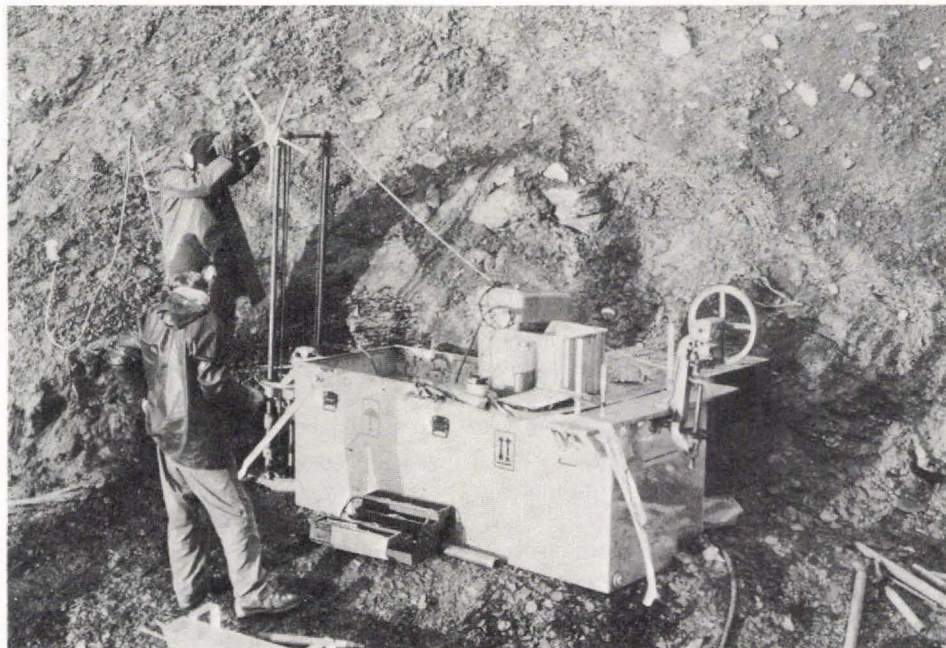


Fig. 9. Winkie Drill, mounted on its water-filled transport container, used in shallow core drilling on Nügssuaq.

the influences of the various parameters mentioned under a–c above, particularly in relation to the type and maturity of the organic matter. The laboratory work was split between the newly established laboratory for organic geochemistry (see Perregaard, this report) and EOG's laboratories. Work within GGU was to comprise extraction and analysis of C_{15+} hydrocarbons and the application of optical methods to the dispersed organic matter. EOG's investigations were to concentrate on the analysis of light hydrocarbons (C_{2-8}).

Drilling

Suitable drill sites were difficult to find since three conditions had to be satisfied by the sites' position: fresh outcrop, sufficient water for circulation and safe access for the slinging helicopter.

Six sites were drilled (fig. 10) with varying success in core recovery (Table 1). The originally planned two drill sites on Itsako had to be curtailed owing to adverse weather conditions.

Sampling

Seventy-nine core samples were canned immediately upon recovery for light hydrocarbon analysis. The remaining material (108 samples) was packed in non-contaminating plastic

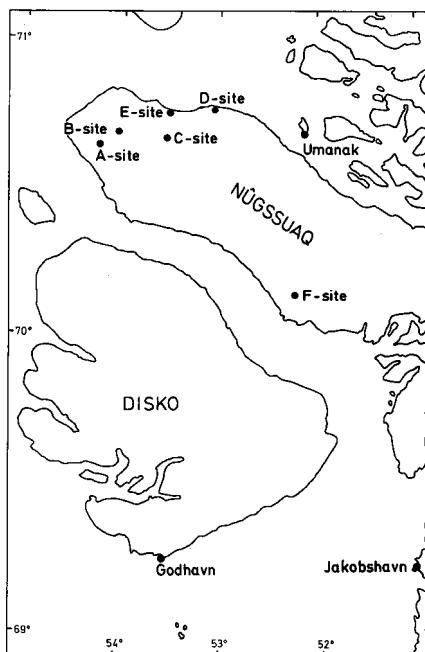


Fig. 10. Core hole drill sites on Nûgssuaq, central West Greenland.

bags for other investigations of the organic matter content. More than 200 surface samples were collected on Nûgssuaq and Itsako (south-east Svartenhuk), predominantly from the vicinity of intrusive bodies and from within known areas with elevated maturation values.

The planned sampling of gas and/or water emanating from 'mud volcanoes' and lakes (Henderson, 1969) proved, with one exception, to be unsuccessful owing to absence of production. In the Kûgânguaq valley, north-east Disko, water, strongly smelling of H_2S was sampled. Here, as in two more cases in the Auvfarssuaq valley of Nûgssuaq it was observed that the mounds had ice-cores. They should more appropriately be called pingos (Müller, 1959).

Summary

A large part of the collected material has already been analysed. Preliminary results substantiate earlier indications of restricted areas with increased heat flow and elevated

Table 1. Details of the six shallow drill core sites from Nûgssuaq

	A site	B site	C site	D site	E site	F site
	Ukalersalik	Itivdle	Tunorssuaq	Ikorfat	Niaqorssuaq	Naujat
Depth	12.70 m	6.90 m	4.40 m	18.20 m	8.40 m	8.60 m
Core recovery	10.95 m	2.10 m	0.90 m	16.40 m	4.75 m	4.55 m
Time	16 hrs	17 hrs	9 hrs	13 hrs	11 hrs	10 hrs

palaeotemperatures against the background of immaturity for most of the region. The combination of optical and organic geochemical methods will provide useful parameters pertaining to the characterisation and classification of potential source rocks.

References

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Development in petroleum exploration offshore West Greenland during 1977

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Four wells were drilled offshore West Greenland during the summer and early autumn of 1977, these bringing to five the total number of wells drilled so far in this region (Table 2). Three of the wells were situated in water depths of 104 to 163 m on the continental shelf while the fourth, Ikermiut 1, was drilled in 447 m of water on the continental slope (fig. 11). All four wells were dry holes, and were plugged and abandoned immediately after completion of the drilling, all installations being cut off below the sea floor.

GGU staff were closely involved, together with other representatives from the Ministry for Greenland, in the assessment of the drilling programmes in advance of the drilling, and GGU was represented on the ministerial group that followed the progress made in each well from day to day. GGU staff paid at least two inspection visits to each of the drilling platforms. Cuttings samples, core splits and copies of all well logs were submitted to the Ministry by the operators and are currently being worked on independently by the Survey. Numerous discussions were held throughout the year with representatives of the operating companies that were drilling or had drilled wells offshore.

Four of the groups completed a total of over 2000 km of deep-penetration seismic surveys, which brings the total amount of new seismic lines shot since April 1975 to about 15 000 km.