

Coal in West Greenland

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Introduction

The project 'Coal in West Greenland' was initiated in the latter part of 1978 and is financed by the Danish Ministry of Commerce as part of a general energy research programme. The total grant for the project is 17.7 mill. D.kr. for a period of two years which provides for field work in Greenland during the summer months of 1979 and 1980. The project has, therefore, been divided into two phases. The first phase aims at detailed investigation of coal seam outcrops. The second phase aims at further surface investigation and limited shallow to deep diamond core drilling in potential areas.

Geological background

At Disko and Nûgssuaq coal deposits are widely distributed in sandy and shaly sequences from the uppermost Cretaceous and lowermost Tertiary (Henderson *et al.*, 1976). The sedimentary sequences are overlain by a thick pile of Tertiary basalts and are intruded by numerous igneous dykes and sills. Coal seams are known to be most abundant in the south central Nûgssuaq area (Schiener, 1976). Accordingly, this area was chosen for investigation (fig. 14). The total area of about 325 km² is along the south coast of Nûgssuaq from Atâ to

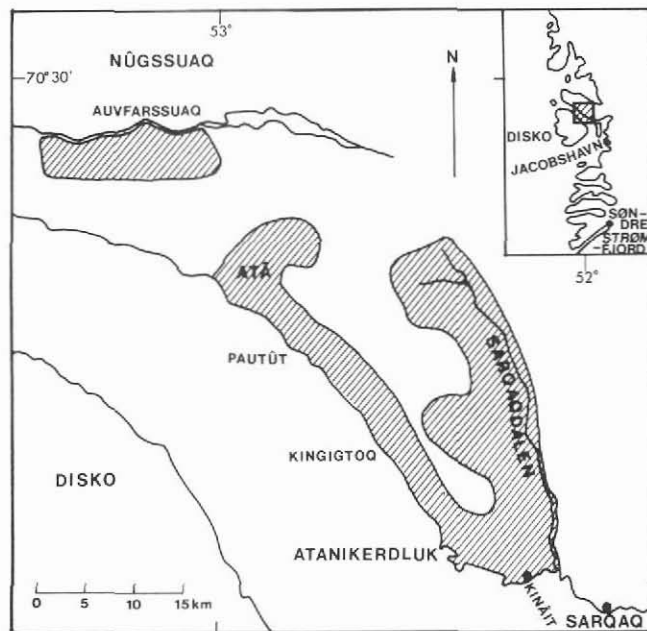


Fig. 14. Map showing the area of investigation for coal in Nûgssuaq.

Sarqaq dalen, along the western side of Sarqaq dalen and along the south side of the central part of Auvfarssuaq. The sediments are well exposed along the coast but in Sarqaq dalen the exposures are poor. Except for a few sandstone and siltstone outcrops, the area in Auvfarssuaq is devoid of sediment exposures.

Field work 1979

The basic work carried out during this field season was detailed measurement of sedimentary sequences along well exposed sections using the Jacob staff method. All coal seams/bands were noted. Coal seams more than 50 cm thick were mapped on a scale of 1:10 000 and the outcrops traced as far as possible. The topographic base maps of 1:10 000 were prepared for the project by Aerokort A/S. Coal seams more than 90 cm thick were described in great detail and 'slit samples' (samples taken perpendicular to bedding plane) were taken of the full seam thickness and roof and floor rocks wherever possible. The samples in most cases may be highly oxidized and may not reveal the precise chemical composition. Effort was however made to dig deep into the coal outcrops to get fresh samples. In many cases digging was rendered difficult because of permafrost 1 m to 2 m beneath the surface. Attempts to carry out some shallow diamond core drilling were unsuccessful for technical reasons. The coal samples collected have been submitted to Bergbau-Forschung GMBH in Essen, Germany, for evaluation of chemical, petrographic and some mechanical properties.

Preliminary observations and results

Sedimentary sequences along 61 sections ranging in thickness from 2 m to 770 m were measured and a total of 71 silt samples of coal seams were collected. A preliminary appraisal of the field data shows that from south to north in the investigation area, there is a change from sandy to more shaly facies. This facies change is accompanied by increasing thickness and greater abundance of the coal seams. Consequently, effort was concentrated in the areas of Atâ, Pautût and upper Sarqaq dalen (fig. 14). The Kingigtoq-Atanikerdluk-Kinâit area with few thin coal seams was covered with a few measured sections and the Auvfarssuaq area with no outcropping coal seams was covered with one section. The coal seams generally show variation in thickness along strike and dip directions. Thickening and thinning of partings between coal seams is also a common feature. Tracing of coal seams between sections is, however, hampered by scree-covered slopes and it is not possible to remove the scree manually to expose the coal seams. Correlation of coal seams using roof and floor rock criteria is also difficult because of the rapid change in facies. In the Atâ valley coal seams could be traced for long distances along the valley sides. It was observed here that thin seams combine down dip (N to NW) to produce thick seams. There is also a general decrease in the partings. This provides encouragement for subsurface exploration in the Auvfarssuaq area if the sediments extend northward without any major tectonic break.

Coal seams in the area investigated vary in thickness from a few centimetres to as much as 3.5 m. The seams are generally of a banded nature. The dirt bands vary from sandstone to shale in composition. Coal seams in the Atâ and Pautût areas very frequently contain coal balls/fossil wood ranging in diameter from a few centimetres to a metre and more. The

macropetrography of the seams suggests a dominance of vitrain with clarain and durain occurring in relatively minor amounts. Fusain has been observed only in a few instances. The intrusives have not greatly affected the coal seams. However, some increase in the rank of the coal is observed within a few metres from the intrusive margins.

Washouts in coal seams due to channelling and infilling have also been observed in the Atâ and Pautût areas. In most cases the dips of the sequences are shallow (less than 5°). No major structural disturbance could be observed in the exposed sequences. But there is a distinct steepening of dips in the SE Pautût area. The possibility of faults with several metres of throw cannot be ruled out in this area. In the NW Pautût area several normal faults with throws of a few metres were observed.

In upper Sarqaq dalen, outcrops of several thick seams were located and a few seams could be traced laterally for several hundred metres. There is a lateral variation in thickness of these seams but no splitting or pinching out was observed. Coal seam outcrops in outer Sarqaq dalen are few and thin.

The preliminary observations and results indicate potential areas for coal exploration in Atâ, Pautût, Auvfarssuaq and Sarqaq dalen. This conclusion is largely based on a broad two dimensional perspective and it would involve a phased subsurface exploration through drilling, supported by geophysical surveys to assess the total reserves and economics of the deposit.

Acknowledgements

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References

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Field work in central west Disko, 1979

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Field work in the summer 1979 was concentrated in the area between 69°45'N and 70°00'N from the west coast into central Disko (fig. 15). Transport facilities were provided by the GGU cutter *J. F. Johnstrup* and by a helicopter. Two field teams led by A.K.P. and F.U.-M. completed extensive field investigations which together with work reported by