

# A marine geophysical project

## Magnetic measurements

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This is a preliminary note on a marine geophysical project the aim of which is to obtain some geophysical information about the economic zone of the Faeroe Islands. The project is organized by Jóannes Rasmussen (Geological Survey of Denmark and Føroya Jarðfrøðisavn), but ships have been made available by the Faeroese government and the collection and processing of the data is conducted by the author in collaboration with the laboratory of geophysics at Geological Institute, University of Aarhus. Only magnetic measurements have been made until now but to decrease the ambiguity of the interpretation other methods will, hopefully, be included later.

In the summer 1976 marine magnetic measurements were carried out on board M/V Dagstjørnan and the approximate positions of the lines are shown on fig. 1. The total length of the lines is about 7000 km and along these lines the following measurements were made: the water depth was measured by echo sounding, the position was found from Decca and Loran-C observations and the total magnetic field was measured by a marine proton magnetometer (kindly lent by the Geological Survey of Greenland).

Most of the lines are along green Decca lines (North Scottish chain) and fixes were made when crossing a red line or with time intervals of 5—15 minutes. The difference between Loran-C and Decca fixes (and the absolute error (?), may reach nearly

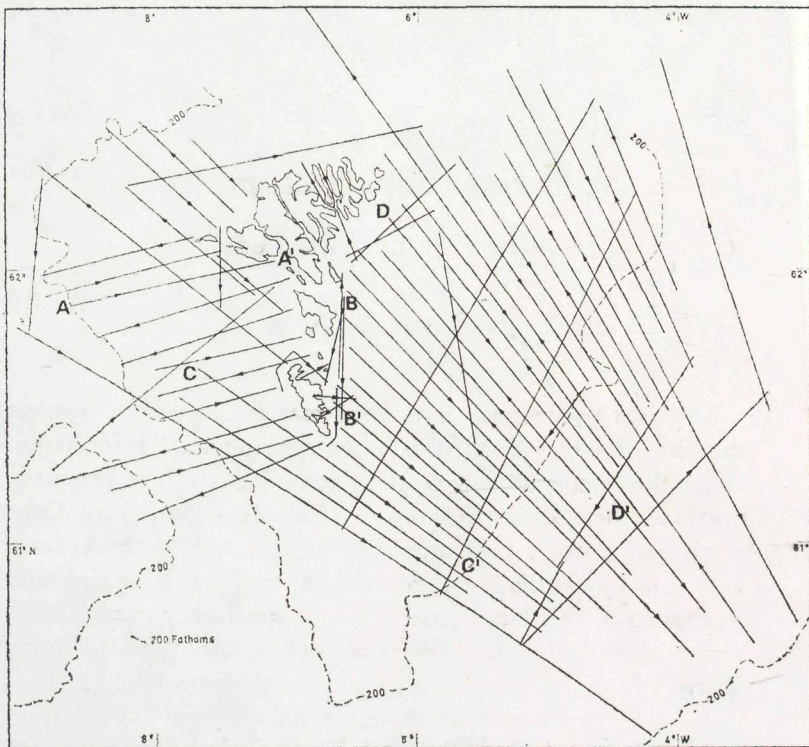


Fig. 1. A rough sketch of the lines along which the geomagnetic field was measured with *M/V Dagstjørnan* 1976. The letters AA', BB', CC' and DD' denote the lines of fig. 2 and 3.

2 km but the repeatability is much better, probably a few hundred metres except at sun rise and sun set (all measurements were made during day time because the magnetic field varies more during night time). Decca is, however, unreliable north and north west of the islands and in the sounds, and Loran-C observations are occasionally wrong by 10 units (= 10 micro second).

The magnetic field was recorded as an analog curve by a strip chart recorder. Because of the large amount of data and the highly variable magnetic field above the Faeroese basalt

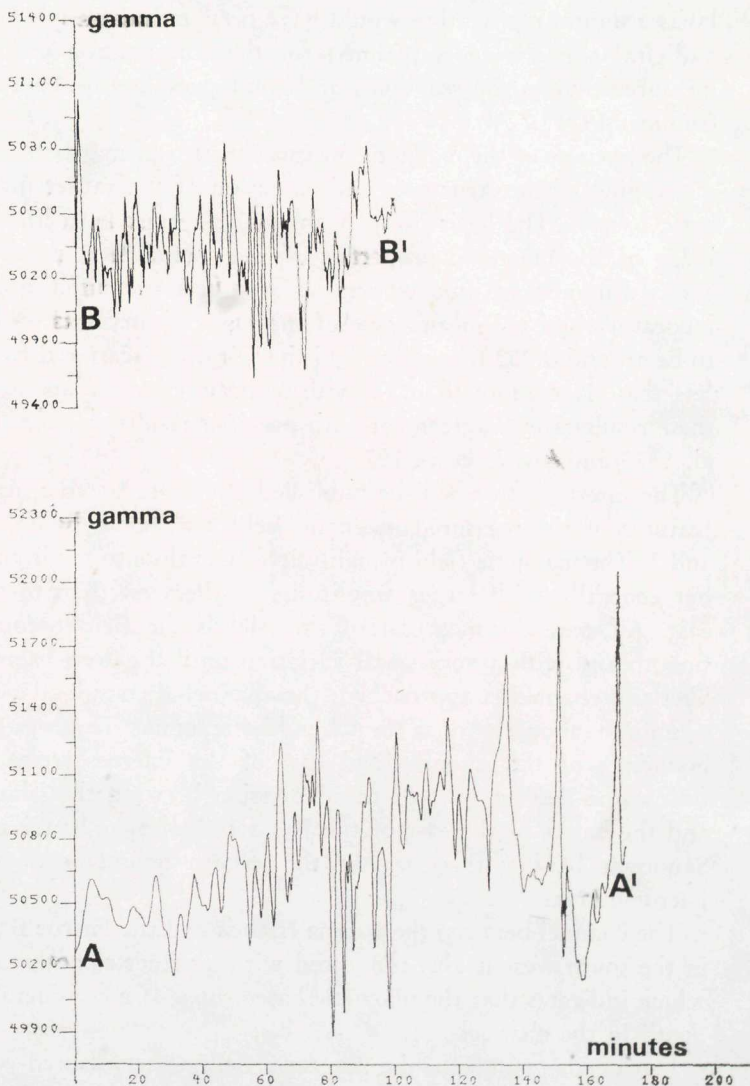


Fig. 2. Shows the uncorrected total magnetic field along the lines AA' BB', for the location see fig. 1. The speed of the ship was appr. 10 knots. (1 gamma = 100000 gauss = 1 nT).

lavas a digital registration would have been a valuable aid and a digital registration is planned for the continuation of the measurements to the sea south and south west of the Faeroes (summer 1977).

The purpose of the magnetic measurements is primarily to get a mapping of the structures and extension of the rather magnetic basalts. The basis of such an analysis must be a knowledge of the magnetic properties of the rocks. As a random choice a number of dredged erratics have been measured in the laboratory and the mean value of the susceptibility was found to be around 0.002 (cgs-units) and the Q-ratio\*) scattered from less than 1 to more than 10 with a mean value of about 4; these results are in agreement with previous results (Hansen et al. 1973 and Løvlie et al. 1975).

The interpretation will be published elsewhere but the main features of the measured magnetic field are shown by fig. 2 and 3. The magnetic field is highly irregular close to the islands but generally with larger amplitudes to the west than to the east. At some distance east of the islands the field becomes smooth and with a very small variation until the deep Faeroe-Shetland channel is approached; the channel is connected with a smooth anomaly of a few hundred gamma. The western boundary of the smooth field east of the Faeroes seems to follow the deepest part of the depression between the islands and the banks to the east of the Faeroes (Nólsoyar banki and Sandoyar banki); this may be the eastern boundary of the Faeroese lavas.

The channel between the Faeroe Islands and the Faeroe Bank in the south west is also connected with a rather smooth field which indicates that the magnetic basement is at a considerable depth in the channel.

During the campaign the magnetic field was measured continuously at Royndarstöðin in Hoyvík near Tórshavn and this co-operation is gratefully acknowledged.

\*) The Q-ratio is the ratio of the remanent (permanent) magnetization divided by the induced magnetization in the normal field of the Earth (here 50 000 gamma = 0.5 gauss = 50 000 nT).

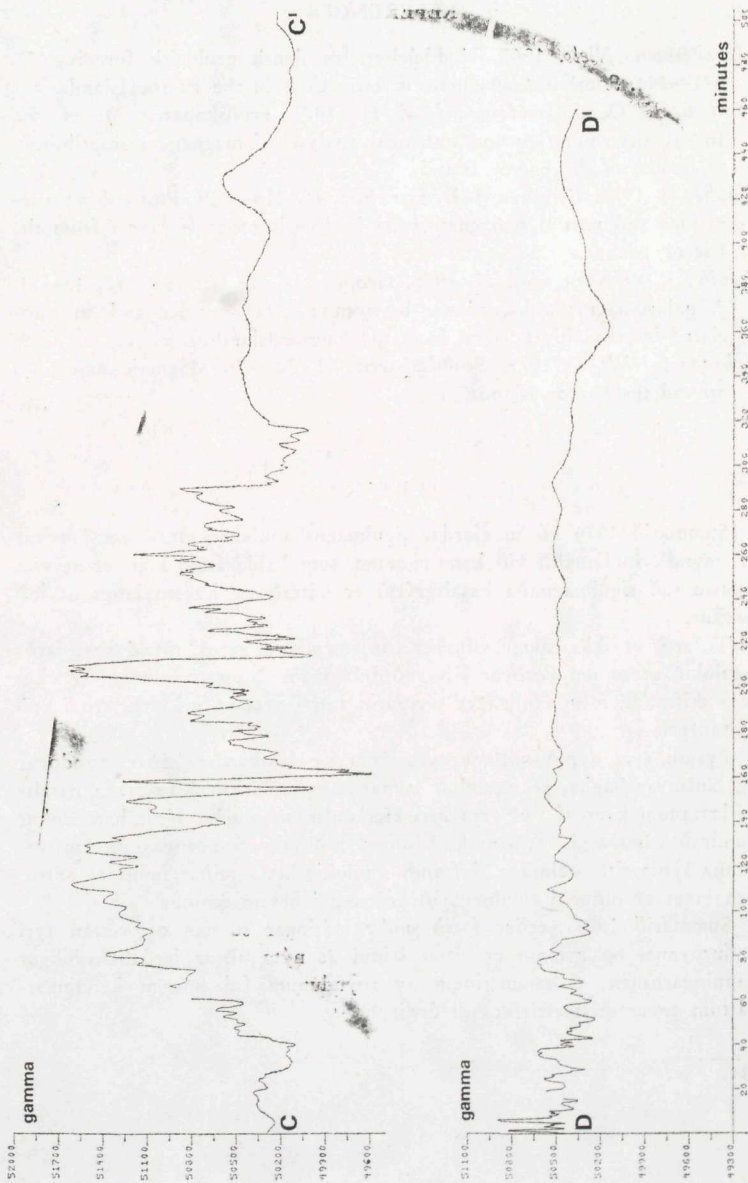


Fig. 3. Shows the total magnetic field along the lines CC' and DD'. See fig. 1 and 2.

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## ÚRTAK

Summarið 1976 vórðu gjørdar sigulmagnskanningar uttan um Føroyar (1. mynd). Endamálið við kanningunum, sum halda fram í ár, er at vita hvussu tað sigulmagnaða basaltgrýtið er háttað og hvussu langt út tað røkkur.

Tilfarið er ikki liðugt viðgjørt enn, men á 2. og 3. mynd sæst jarðsiguløkið uttan um Føroyar í høvuðsdráttunum. Næst oyggjunum er økið sera skiftandi, men vanligu er sveipurin størri vestan fyri oyggjarnar enn eystanfyri.

Eystan fyri dýpið millum oyggjarnar og bankarnar báðar, Sandoyar og Nólsoyar banka, er siguløkið javnari, eysturmarkið á føroyska basalt-háslættanum kann tí væl vera her. Hetlandsrennan sjálv sýnir bara nøkur hundrað gamma, javnt frávik. Eisini dýpið millum Føroyar og Føroya-banka sýnir eitt spakuliga skiftandi siguløki; hetta miðar ímóti at rættuliga langt er niður á sigulmagnað grótsløg í hesum rennum.

Summarið 1977 verður farið undir mátingar sunnan og vestan fyri Suðuroynna, og ætlanin er eisini seinni at nýta aðrar jarðalisfrøðiligar kanningarhættir, tí sammetingin av royndunum frá ymsum kanningarháttum gevur mest eftirfarandi úrslit.