A Note on some Geo-Electrical Measurements

at Tjørnuvík, Streymoy

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Abstract

In July 1967 nine electrical soundings were measured at Tjørnuvík, Streymoy, the Faroe Islands. The main purpose was to determine the thickness of the sedimentary layers, which overlay the basalt. The measurements show that the sediment cover mainly consists of three layers (Fig. 5). The average thickness of the sediment cover is found to be about 4 m, the maximum thickness being about 7 m. The thickness of the layers decrease generally towards the east. Presumably, the surface of the basalt has a moderate relief and everywhere the surface seems to be above present sea-level. (Fig. 6).

Introduction

In July 1967 a series of electrical resistivity measurements was carried out in the Faroe Islands by means of a highly sensitive measuring apparatus, as described in *Bentz* (1961). This article deals with measurements made at Tjørnuvík, Streymoy.

Tjørnuvík is situated at the southern end of a small fjord, which cuts into the northcoast of Streymoy. The form of the

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fjord and the steep rock walls curving south of Tjørnuvík indicate that the topographical form has been glacially modelled as a glacial cirque. In the most southern part of this glacial cirque sediment depositions have formed a small platform, the surface of which lies 5 to 10 m above present sea-level.

Because of previous archaeological findings (*Dahl* and *Rasmussen* 1956) a detailed archaeologic-geological investigation of the area around Tjørnuvík was desired. This small article can be considered as one of the preliminary works for this examination.

1. The main purpose of the geoelectrical examination has been in various places to determine the depth to the border of the sediment cover against the underlying basalt. According to usual practice the measurements were carried out in accordance with the electrical sounding method. (See for example *Sorgenfrei* 1955, *Kunetz* 1966).

2. An electrical sounding is measured by means of four electrodes placed symmetrically on a straight line in the terrain. During the measuring the uttermost electrodes are expanded while the innermost are kept steady with a short mutual distance (Schlumberger configuration Fig. 1).

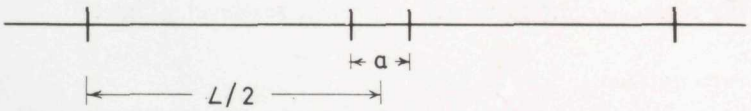

Fig. 1: The Schlumberger electrode configuration.

By measurement of an electrical sounding the apparent specific resistivity ϱa (expressed in ohm-m) of the earth is determined. The dependence between ϱa and the electrode distance (expressed by L/2 m, Fig. 1) reflects essentially the vertical variations in the underground. It is generally believed

that the measurement shows deeper layers as the electrode distance increases.

3. At Tjørnuvík nine electrical soundings were measured. Fig 2 shows their sites in the terrain.

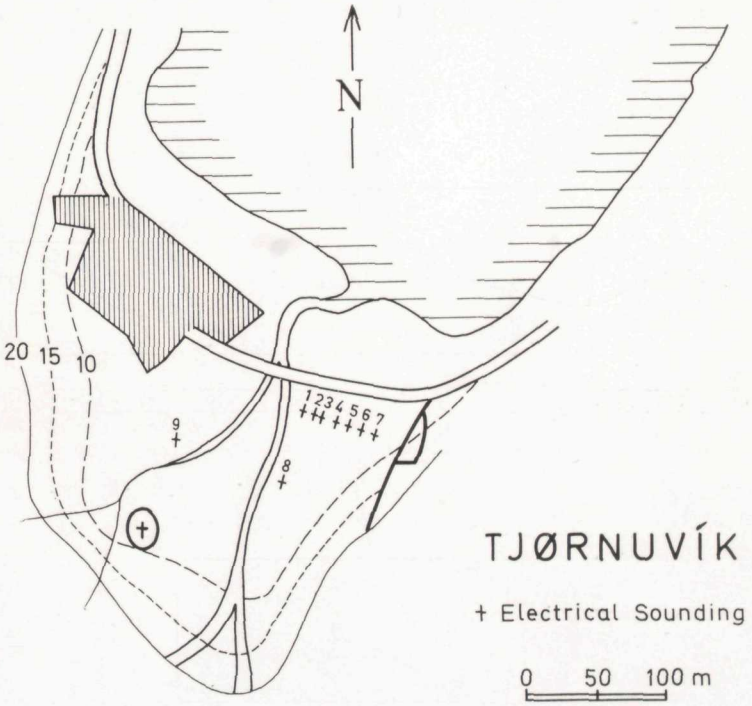

Fig. 2: Location map of Tjørnuvík electrical sounding stations.

Figs. 3 and 4 show the results of the measurements in the form of so-called electrical sounding curves, where L/2 is abscissa and ϱa is ordinate.

4. The electrical sounding curves have been interpreted by application of theoretical curves (see for example *Schrøder* and *Henkel,* 1967). On the basis of a slightly modified Algol-programme, compiled by van *Dam* (1967) and *Argelo* (1967),

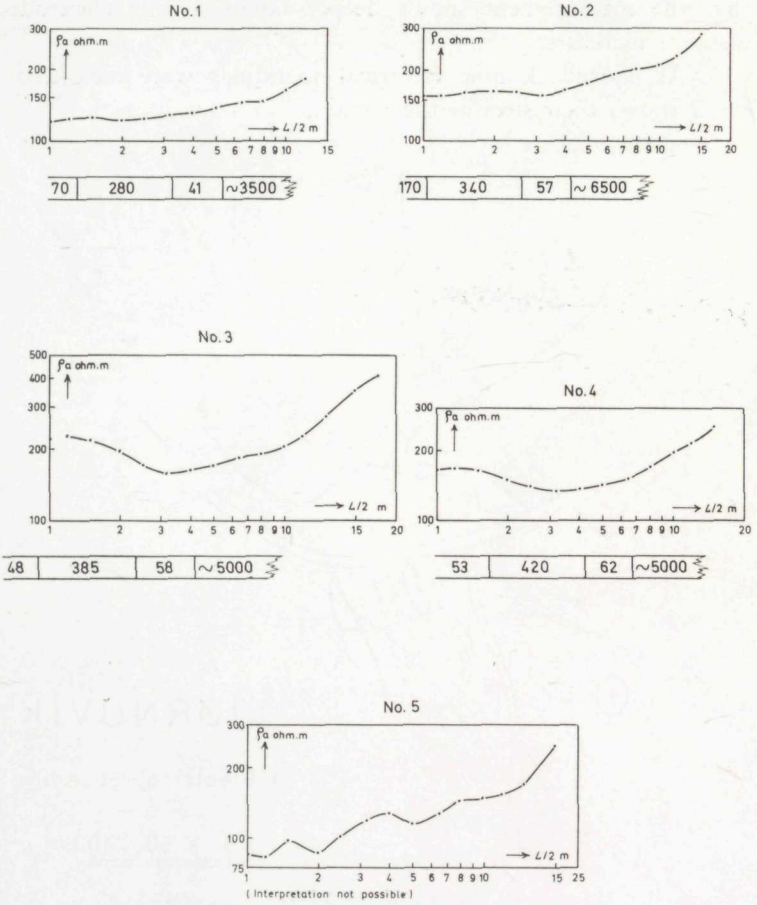

Fig. 3: Electrical sounding curves Nos. 1—5 and corresponding interpretations.

the model curve calculations were carried out on a GIER electronic computer.

On Figs. 3 and 4 a column showing the geophysical interpretation of the curves has been drawn beneath each electrical sounding curve. The depth of the interfaces is stated referring

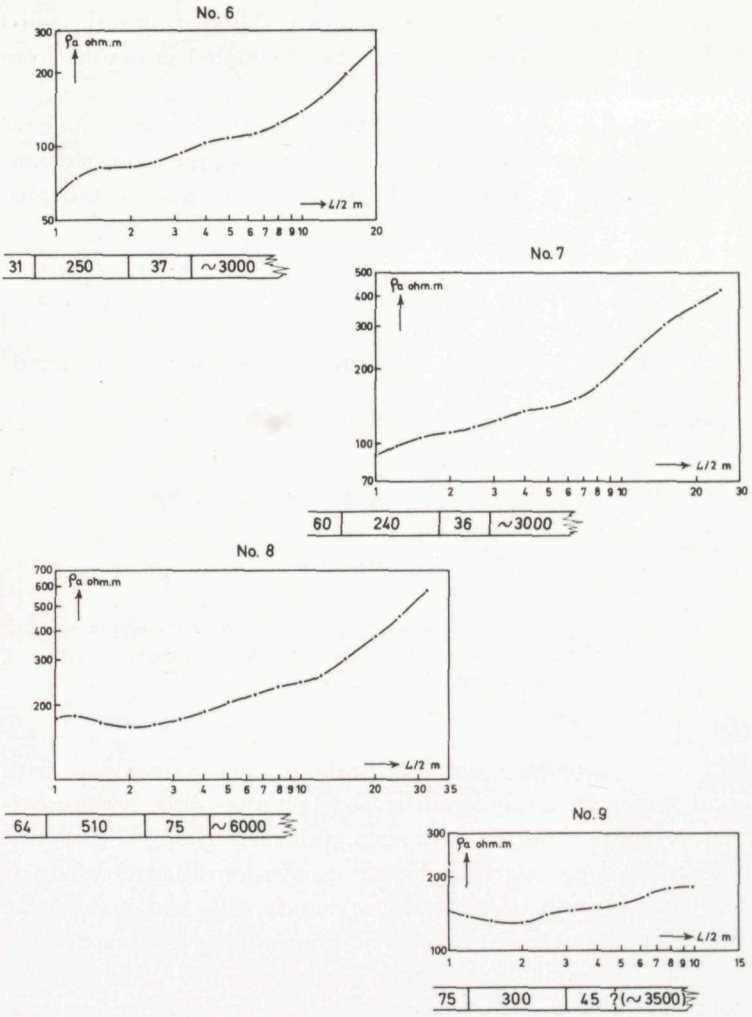

Fig. 4: Electrical sounding curves Nos. 6—9 and corresponding interpretations.

to the axis of the abscissa in the system of co-ordinates of the electrical sounding curves.

The figures in the column indicate the real specific resistivities of the layers in ohm-m. Layers situated in depths from 0-1 m have mainly been omitted.

The electrical sounding curves indicate a very uniform stratigraphy within the examined area. Thus the sequence consists primarily of four layers as stated in the generalized profile Fig. 5 A.

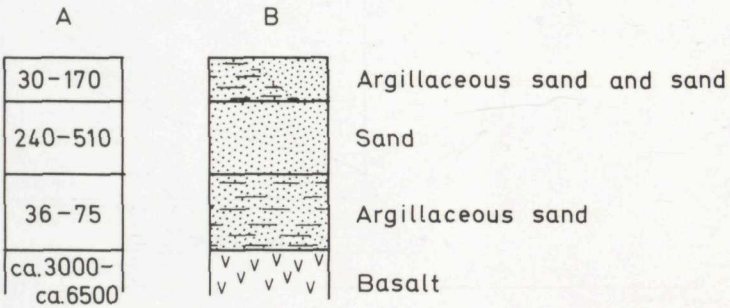

Fig. 5: A. Generalized resistivity profile. Numbers indicate the maximum and minimum resistivity values (ohm-m).
B. Generalized geological profile.

5. The geological interpretation of the geophysical data is to some extent hindered by the fact that only little information exists about the sedimentary layers. There is, however, a description of an archaeological excavation situated immidiately to the south of the road to Haldarsvík and east of the stone fence marking the eastern limit of the cultivated area around Tjørnuvík (*Dahl* and *Rasmussen*, 1956). Beneath a cover of talus the excavation revealed: 1) about 0.5 m thick layer of fairly clean sand overlying 2) clayey sand which is not cut through, but is supposed to be more than 0.5 m thick. The interface between the two layers is sharp but somewhat irregular. Towards the west the layers are cut off by a wedge consisting of talus material (Figs. 2 and 3 in *Dahl* and *Rasmussen*, 1956).

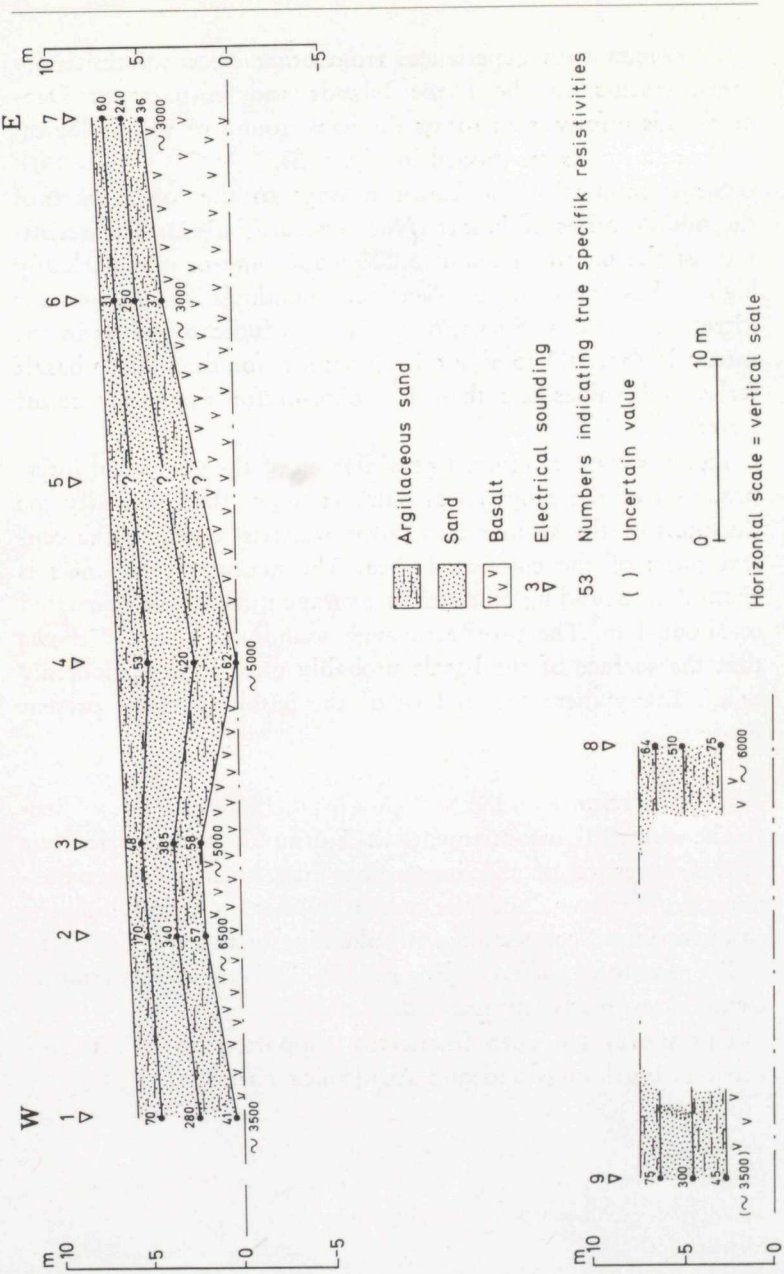

Fig. 6: Geological interpretation of the geophysical data.

Combined with experiences from other electrical resistivity measurements on the Faroe Islands and in parts of Denmark this information forms the background of the geological interpretation as mentioned in Fig. 5 B.

Stratigraphically the basalt belongs to the lower part of the middle series of basalt (*Noe-Nygaard,* 1962). The resistivity of the basalt of about 3,000-6,500 ohm-m is remarkably high. Thus very deep electrical soundings in Saxundalur (Streymoy) and at Sørvágsvatn (Vágar) indicate values in the interval from 500 to about 1500 ohm-m for the middle basalt series and values less than 100 ohm-m for the lower basalt series.

Fig. 6 gives a completed presentation of the geological interpretation of the geophysical data. It shows that generally the thickness of the sedimentary cover increases towards the central parts of the cultivated area. The maximum thickness is about 7 m (Sounding No. 4). The average thickness is calculated to about 4 m. The profile through soundings Nos. 1-7 shows that the surface of the basalt probably must have a moderate relief. Everywhere the surface of the basalt is above present sea-level.

Acknowledgement

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ÚRTAK

Í juli 1967 vóru gjørdar níggju ravmagnsskantingar í Tjørnuvík. Høvuðsendamálið var at máta tjúktina á fláunum oman á føstu helluni. Mátingarnar sýna, at fláirnar omaná eru í trimum (5. mynd). Miðaltjúktin á teimum tilsamans er umleið 4 m, í mesta lagi umleið 7 m. Tjúktin minkar yvirhøvur eystureftir. Ætlandi er hellan ikki heilt sløtt, og allastaðni tykist hon at liggja oman fyri sjóvarmálan.

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