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ON THE LAND UPLIFT IN FENNOSCANDIA

by

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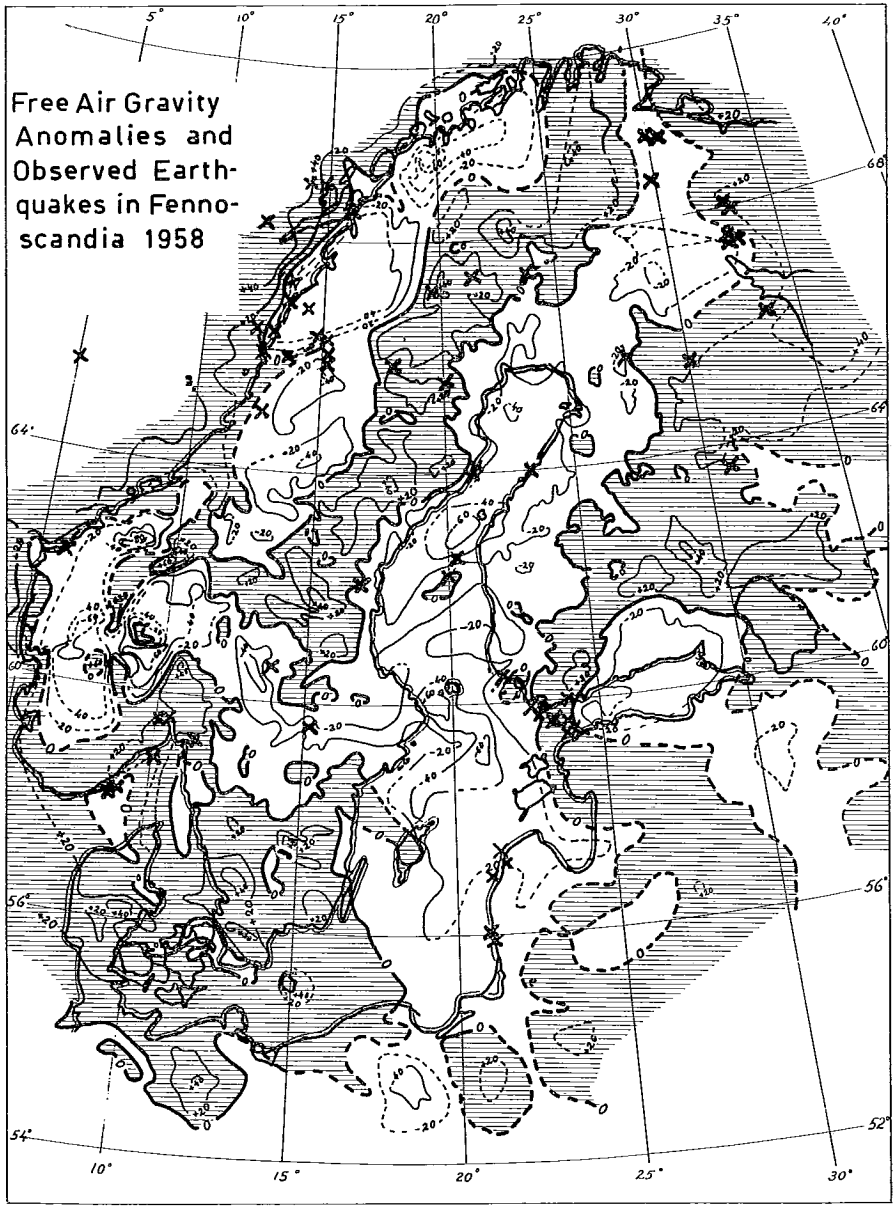
The land uplift in Fennoscandia has been investigated by many methods. The uplift along the coastlines was determined by organizing continuous tide gauge records. How the uplift happened in the interior of the country was at first explained by geological methods, by investigating the old coastlines, which nowadays are some ten metres above sea level. The tilting of the inland lakes has made it possible to determine the relative rise of the land in different parts of large lakes. Finland's recent uplift has been accurately determined by means of two precise levellings. The precise levelling in 1892—1910 was performed with great care and with a great degree of accuracy. In 1935—1956 relevelling was performed. The changing of height differences during the interval of approximately 50 years gives an accurate picture of the land uplift in this period. The post-glacial land upheaval and how much further the land will rise, have been computed on the basis of the elasticity of the rock. Though the lack of isostatic equilibrium must be reflected in the gravity anomalies, it is not possible to compute the remaining rise of the land on the basis of these alone, because the density of the rock is not even known to some tens of metres.

There have been many opinions on the mechanism of the land uplift. The different branches of science seem to hold very different views. The new seismological stations in Finland, which have been set up during the International Geophysical Year, have registered a noticeable amount of small earthquakes in this country.


Free Air Gravity Anomalies and Observed Earthquakes in Fennoscandia 1958
5°
10°
15°
20°
25°
30°
35°
40°
68°
66°
64°
60°
56°
54°
52°
10°
15°
20°
25°
30°

The majority of these quakes is obviously caused by the land uplift. As the investigation of this seems to be reaching a new phase, it would be worth while considering the effect of geodetic methods on this matter.

From the land uplift map of precise levelling it is clear that the increase in land uplift towards the centre of the uplift area is not regular. Near Lake Oulujärvi there is an area where the uplift is exceptionally great. In other areas the isobases have steep curves and the uplift gradient varies so much that it is easy to show that the differences in land uplift are many times greater than the errors in land uplift values calculated on the basis of two precise levellings.

The gravity anomaly map of the whole of North Europe clearly shows many anomaly waves from the Atlantic to East Carelia. These are not concentric rings around the centre of the uplift area, but rather belts which follow the direction of the last old rockfolds — the Scandinavian mountains. It is interesting to compare how the earthquakes coincide with places where the gravity anomaly is rapidly changing and really almost all earthquakes, the coordinates of which have been determined, are on the 0-isobase (see attached map.). Since the basis for the steep anomaly change is the profound change in the rock, the probability of an earthquake occurring in such a place is very great. This investigation is, however, in its initial stage, because the new seismological stations have only been in operation for a short time. The continuation of observations for a long period would be very desirable.

The cooperation of all branches of geophysics obviously gives the best results in the investigation of the Fennoscandian land uplift.

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