

Gravity, Aero-Magnetism and Earthquakes in SW-Iceland

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ABSTRACT

Gravity, magnetic and earthquake data from an area in SW-Iceland containing a constructive rifting zone are processed, compared and analyzed.

After a predominant bowl-like regional trend has been removed, the residual gravity data are characterized by a negative anomaly of 6-10 milligals that follows the axis of the rifting zone. It is suggested that this anomaly is caused by Pleistocene volcanics buried in the crust and possibly a zone of partial melt at subcrustal depths. Also revealed in the analysis is a clustering of earthquakes in the South Iceland seismic zone around a positive gravity anomaly.

The magnetic signature of the rifting zone is enhanced by directional filtering of the aeromagnetic data. This processing delineates two distinct areas of crustal accretion during the Brunhes epoch, one coinciding with the presently most active part of the plate boundary, the other some 20 kilometers east of it. This is interpreted as a westward shift of the axis of maximum activity in the rifting zone during the last several hundred thousand years.

Directional filtering of the gravity and magnetic data also reveals linear anomalies trending transversely to the rifting zone, but at a 30-40° angle to the estimated direction of plate motion. It is

suggested that these cross-grain structures may be the result of magmatism related to contraction cracks developing within the cooling plates as they move away from the plate boundary.

INTRODUCTION

Gravity and airborne magnetic data from the southwest corner of Iceland have been processed and analyzed by newly developed techniques and computer software, partly as a test for these methods. Using these processing techniques, it is possible to isolate and emphasize lineaments in the data. Due to the tectonic origin of the lineaments, the available earthquake data were an ideal supplement to the gravity and magnetic data, as shown by the synergism in their joint interpretation.

The location of the test area is shown in Figure 1. The size of the area was set somewhat arbitrarily at 126x126 km², corresponding to a grid of 64x64 points. This covers most of the active volcanic zone in SW-Iceland, henceforth called the western volcanic or rifting zone, with the exclusion of the western part of the Reykjanes peninsula.

THE GRAVITY DATA

The acquisition of the gravity data under discussion was started in the late sixties. Most of it was collected in the early seventies but some dates from

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