COMMUNICATIONS OF THE
DUBLIN INSTITUTE FOR ADVANCED STUDIES
Series D, Geophysical Bulletin No. 38

GRAVITY ANOMALY MAP
1: 126 720 Scale
Sheet 13
MEATH

by

THOMAS MURPHY

DUBLIN
THE DUBLIN INSTITUTE FOR ADVANCED STUDIES
1989
Price £6.00

COMMUNICATIONS OF THE

DUBLIN INSTITUTE FOR ADVANCED STUDIES

Series D, Geophysical Bulletin No. 38

GRAVITY ANOMALY MAP

1: 126 720 Scale

Sheet 13

MEATH

by

THOMAS MURPHY

DUBLIN

THE DUBLIN INSTITUTE FOR ADVANCED STUDIES

1989

Price £6.00

GRAVITY ANOMALY MAP MEATH

The area covered is that of sheet 13 of the Ordnance Survey "half inch series", the scale being 1: 126 720.

The values are BOUGUER anomaly values based on the International Gravity Formula 1980, the height being reduced to Mean Sea Level using a density of 2 670 kg/m^3.

The measurements, carried out with WORDEN gravimeters are based on a value of 981 374.9 mGal for the DUNSINK base station (Bulletin No. 14) derived from the International Gravity Standardisation Net 1971 through connection with bases in England.

The stations are almost always taken on roads or tracks which have been levelled by the Ordnance Survey. The height above Mean Sea Level is in general accurate to within ±0.5 m, unless near Bench Marks when the accuracy is ±0.05 m. The percentage of stations close to bench marks varies from being as high as 80% in some areas falling to a low of 5% in others, the latter due mainly to destruction when roads and farm holdings are improved.

The station density is approximately one station to 2.5 km^2.

The position of each station, rounded to 10 m in National Grid Coordinates, is obtained from the large scale maps (1: 10 560) by the process given in Bulletin 39. Because of various uncertainties known to exist in the adjustment of these nineteenth century maps the latitude can only be obtained with reasonable accuracy to one second of arc on the International Spheroid.

Terrain corrections were applied where necessary but no correction exceeded one mGal.

Over large parts of this sheet the "overburden" consists of glacial till with a thickness up to 10 m in the northern half. In the south the underlying rock is mainly Carboniferous limestone which has an uneven surface due to weathering. The overburden can reach a thickness of 70 m and can vary rapidly. Since the till has a density as low as 2 000 kg/m^3 many readings give values up to 1.5 mGal lower than nearby ones where presumably the overburden is thinner. When contouring in such areas allowance has been made for this. Thus there is a certain amount of subjective reasoning in the contour drawing based on the knowledge of the local geology around the station positions.

Brief Description of the Anomaly Field

The mean value over the sheet is about 10 mGal with extremes of-1 and +28 mGal. There is no overall trend to the contours, the distinctly marked gradients having various directions indicating discrete bodies of quite different densities.

Kenstown Anomly

This is an outstanding anomaly of approximately -10 mGal, K in fig. 1, with a roughly circular outline centered at 297 500, 265 500 (National Grid Coordinates) near the Co. Meath village of Kentstown. This anomaly was discovered in 1952 (Murphy, 1952) and was attributed to a granitic mass with a density contrast of -80 kg/m^3. The thickness of the Carboniferous sediments in the area had been estimated as less than 1000 ft. and and assuming a simple prismatic section, the dimensions were deduced as 12.9 km across by 4.25 km thick.

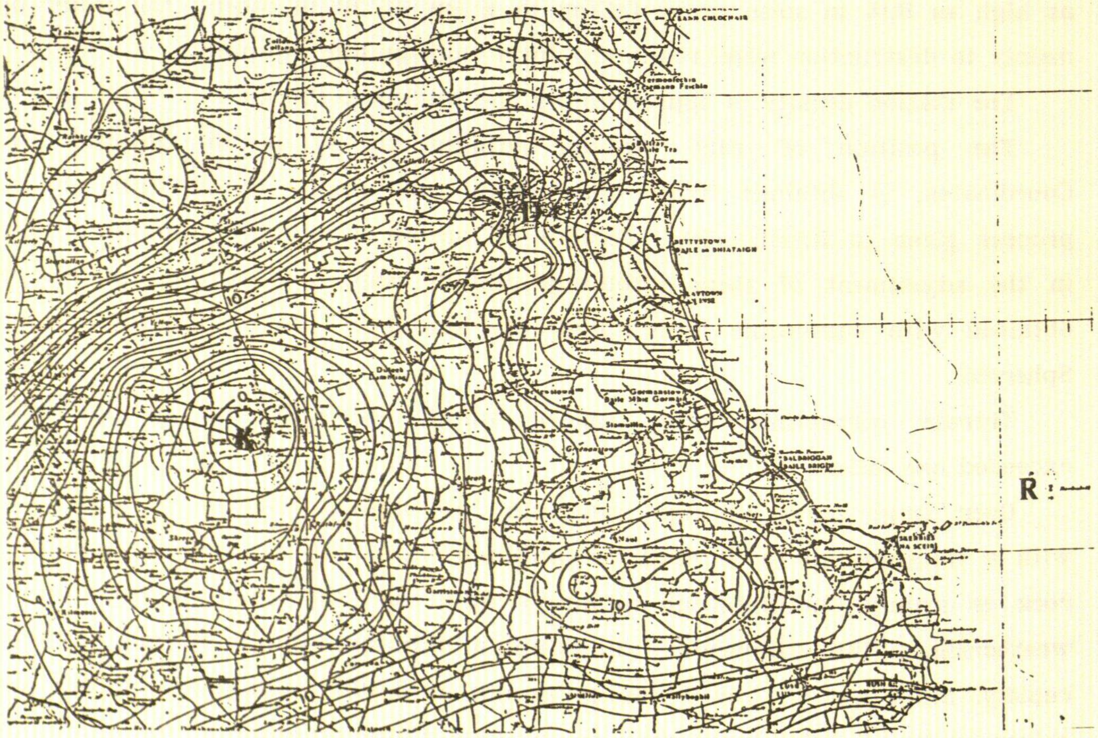


Figure 1

These results are in good agreement with a seismic study of the region (N.P. Murphy, 1987) which indicated that the Devonian and Carboniferous strata are very thin or completely absent in the area underlain by the anomalous body. With the additional information then available the body could be approximated to a sphere, density contrast -80 kg/m^3, diameter 6.88 km centred 3.89 km below the surface (N.P. Murphy, 1987). The difference in computed anomaly between a sphere and a vertical cylinder for the body would not be serious. On the east the contours take a north-south direction in agreement with the geological interpretation of F.C. Murphy (1987).

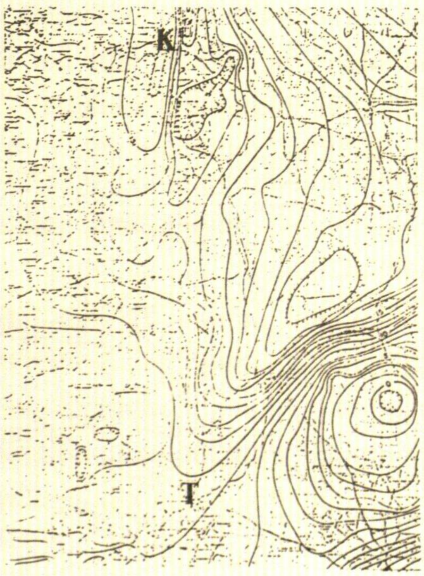
To the northeast of this anomaly there occurs a complex zone of low anomaly close to Drogheda, D in fig. 1. This was attributed to granite masses (Murphy, 1952; fig. 7) and the presence of granite dykes in the adjoining Ordovician-Silurian (F.C. Murphy, 1987) adds credence to this suggestion.

Further south, west of Skerries the closed "low" is probably caused by larger granite bodies. These have an unusual east-west orientation and readings at sea (Institute of Geological Sciences, 1976) exhibit similar anomalies on this trend. The latter trend can be traced westwards (cf. fig. 3) through Trim, T in fig. 3. Granite outcrops on Rockabill island, R in fig. 1.

Navan

North east of Navan the positive anomaly is attributed to the dense Ordovician volcanics which outcrop there. From Navan to Slane there is a steep gradient reflecting the contrast in densities between the volcanics and the body, presumed granite, which give rise to the Kentstown anomaly as well as the lighter Carboniferous strata of unknown thickness. The contours to the

Figure 2



southwest indicate the dense rocks continuing a further 9 km before terminating abruptly against the north south trending feature mentioned later.

Kingscourt Graben

At the top margin of the sheet a marked north-south anomaly of about -6 mGal is produced by the half graben filled with Carboniferous and Permo-Triassic strata (Young, 1976) K in fig. 2. Although the principal contribution to the anomaly is the contrast between the Silurian and the Namurian strata there is a crustal effect shown by the north-south trend stretching as far south as Trim, T in fig. 2, which must be taken into account. The limit lies on the east west trend already referred to.

Rochfortbridge Anomaly

At the southwest corner of the sheet a linear negative anomaly of about 5 mGal is seen, R in fig. 3. This is part of much longer, deeper anomaly named after the nearby village of Rochfortbridge (located 3 km WSW off the southwest corner of the sheet (Murphy; 1962). It has a rather abrupt north-west termination at 262 500 252 500 on the east west trend referred to above. The original suggestion that it results from solution cavities in the limestone which have collapsed and now filled with light sediments is still valid, the linearity being brought about by large faults. If cavities, their dimensions would be of the order of a hundred metres, hence their origin cannot be explained by simple solutioning in their present position with respect to mean sea level. The presence of volcanics at nearby (5 km) Croghan could be a factor. The source of this is still not solved and its explanation requires the application of other geophysical methods.

Figure 3

Chert Formation

At the western extremity of the sheet part of a large area of low anomaly is present, C in fig. 3. This is most probably the result of the extensive area of Chert limestones.

This anomaly and the preceding one will be dealt with in more detail when the adjoining sheets are published.

Small Low Anomalies

At the scale of the map it has not been possible to show all the numerous low anomalies of 2 - 3 mGal covering small areas, of the order of a square kilometre. These all occur in the limestone plains and are almost always in areas covered by glacial till. In a few cases they are known to be the result of alteration of the rock and pockets of siliceous clays have been investigated. The smaller anomalies of 1 mGal probably indicate a Karst surface beneath the till.

REFERENCES

1 Murphy, F.C , 1987. Late Caledonian granitoids and timing of deformation in the Iapetus suture zone of eastern Ireland. Geol. Mag. 124, 135-142.

2 Murphy, N.P., 1987. Upper crustal seismic structure in eastern Ireland. Ir. J. Earth Sci. 8, 211-224.

3 Murphy, T., 1952. Measurements of gravity in Ireland. Geoph. Mem. No. 2, part 3. Dub. Inst. Adv. Stud.

4 Murphy, T., 1962. Some unusual low Bouguer anomalies of small extent in central Ireland and their connection with geological structure. Geoph. Pros. 10, 258-270.

5 Murphy, T, 1987. Notes on the six inch and one inch sheets maps of Ireland: Geoph. Bull. 39. Comm. Dub. Inst. Adv. Stud. Series D.

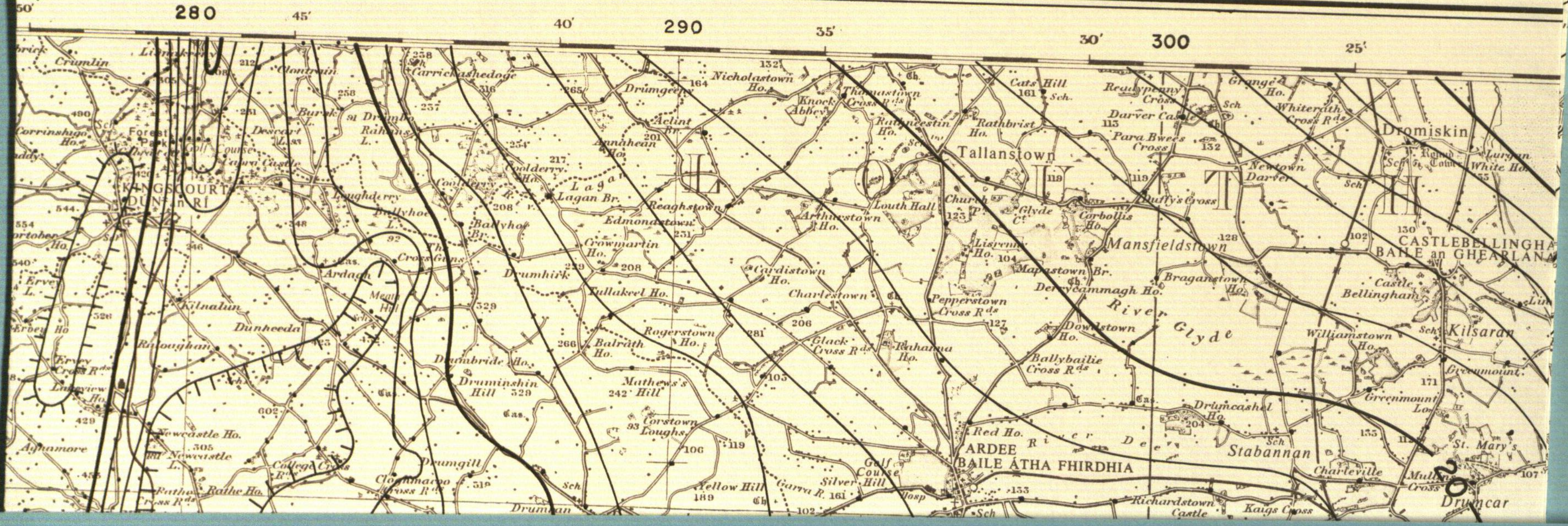
6 Young, D.G.G., 1976. A Geophysical interpretation of the structural development of the Kingscourt graben. Proc. R.I.A. 76, 43-52.

7 Institute of Geological Sciences, 1976. Bouguer gravity anomaly map; Anglesey.

November, 1989.

School of Cosmic Physics,
5, Merrion Square,
Dublin 2.

GRAVITY ANOMALY MAP MEATH



DUBLIN INSTITUTE FOR ADVANCED STUDIES
Geophysical Bulletin No. 38, THOMAS MURPHY, 1987

GRAVITY ANOMALY MAP MEATH

Bouguer Anomaly derived from:

International Gravity Standardisation Net 1971 value for DUNSINK 981 374·92 mGal

International Gravity Formula 1980 at mean sea level

Surface Density 2670 kg/m^3

Contour Interval 1 mGal

Scale of 1/2 Inch to 1 Mile :— 1:126,720

5 0 5 10 Kilometres
2 1 0 2 4 6 8 Miles

Contouring by Thomas Murphy; Drawing by Peter Murphy.

Base map reproduced by permission of the Director, Ordnance Survey, Phoenix Park, Dublin.
Published by the Dublin Institute for Advanced Studies, 10 Burlington Road, Dublin 4.