COMPUTATION OF THE INTENSITY OF GRAVITY AT ANY SELECTED STATION

To compute the intensity of gravity at any point on the earth, account must be taken of the altitude of the point, of the effect of the attraction of all the topography upon the earth upon a unit mass at the point, and of the isostatic compensation of that topography.

This problem has been very fully and ably dealt with in Hayford and Bowie's publication*, "The Effect of Topography and Isostatic Compensation upon the Intensity of Gravity"; and the method there set forth has been followed in the reduction of the Canadian observations.

There are two other methods of reducing the value of the force of gravity from sea-level to the observing station. These are known as the "free-air" method and Bouguer's method. As stated in the *Publications of the Dominion Observatory*, Vol. II, No. 10, the free-air method takes account only of the elevation above sea-level. The station is considered as if it were suspended in the air at a height equal to the elevation. In Bouguer's method $dg = -\frac{2g^{H}}{r}(1-\frac{3\delta}{4\Delta})$, on the supposition that the station is situated on an indefinitely extended plain. Here dg is the correction to computed gravity g, at sea-level, H is the elevation above sea-level, r is the radius of the earth, δ is the density of the matter lying above sea-level and Δ is the mean density of the earth. The Bouguer method takes no account of the isostatic compensation and neglects all curvature of the sea-level surface, the topography being treated as if it were on a plain of indefinite extent. The results from applying these two methods seem to lead to the conclusion that general continental elevations are compensated for by a deficiency of density in the matter below sea-level, but that local topographical irregularities, whether elevations or depressions, are not compensated for, such irregularities being maintained by the partial rigidity of the earth's crust.

A comparison of the anomalies from the three methods of reduction will be given in the table entitled "Table of anomalies from different methods of reduction." A comparison of the anomalies by the new method of Hayford and Bowie, on the one hand, with those by the two older methods on the other hand will show the merits of the Hayford and Bowie method in comparison with the Bouguer and free-air methods.

The means of the anomalies with regard to sign from the new method, the Bouguer and the free-air method are respectively -0.001, -0.042 and -0.011

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