

SSC OPTICAL ANALOG COMPUTER

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The SSC Optical Analog Computer is an instrument designed to solve potential field equations through the use of models. It is particularly useful in handling gravity and magnetic problems.

The models are made by sketching to scale sections which represent the earth's densities. When the model is examined in the instrument, the readings simulate gravity values. These simulated gravity values may then be compared to Bouguer gravity values taken from an actual survey.

The computer can be used to simulate gravity data from geologic cross sections. These cross sections are made to scale on a transparent medium. The geologist shades the cross sections of the geologic formations with an ordinary drawing pencil. The degree of shading represents the density of the geologic formation being simulated.

After a cross section has been prepared, it is placed on the computer window and the equivalent gravity response is read on a dial in a manner similar to the operation of a gravity meter.

The computer is applicable to both two and three dimensional analysis. Graticules can be easily interchanged in three dimensional problems or to study additional parameters of a given problem. Likewise, various vertical to horizontal scale ratios may be used. Simple recalibration adapts the computer to any of the above arrangements.

The theory of the computer is based on the use of graticule charts to compute the gravitational response of a model. By the conversion of a gravity graticule to an optical graticule, the distribution of light intensity through the window of the computer corresponds to that of the vertical component of the gravitational force field for a unit density mass. Superimposed on this light field is a semi-transparent geologic cross section. The opacity of the cross section is used to represent the density of the model. The optical graticule and the geological cross section combine to control the total amount of light falling on a photo electric cell. The amount of light transmitted to the photo electric cell is proportional to the vertical component of the gravitational force field at the point of measurement. The electrical output of the photo electric cell is express in milligals. By using successive measuring points a gravitational profile is obtained. With the analog computer the following may be done:

Terrain and topographic corrections can be handled, thus assisting in the reduction of raw gravity data.

The gravity response from an assumed or real geologic section can be quickly checked.

With a pencil and eraser the cross section can be easily modified so as to obtain a new synthetic gravity profile for comparison with the field data.

The operator can reproduce the average density of any formation

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or any combination of formations in the earth's crust, to any practical scale with accuracy comparable to such measurements taken in the field.

The reasonableness of any conventional interpretation of gravity data can be quickly checked.

Comprehensive analysis of the reasonable structural probabilities attributable to gravity data can be predicted with an economy of time and effort.

The operator can easily obtain an unlimited variety of gravity solutions from realistic geologic models.