Poster 11

A satellite derived Bouguer Gravity map of Southeast Asia

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The earth's surface is distorted from the ideal ellipsoidal shape by (among other things) the uneven distribution of mass beneath. Where high density rocks are present the sea is drawn in from surrounding regions to form an outward bulge. Conversely, the comparatively less dense rocks of sedimentary basins tend to give rise to sea-surface depressions. Satellites carrying accurate radar altimeters map out the sea level as they orbit the earth and as the earth rotates beneath. The height variations can be transformed to Free Air Gravity. Because the ocean surface is the primary gravity sensor, there is no loss of resolution due to upward continuation effects. Although satellite derived gravity data cannot be expected to have as high accuracy or resolution as surface measurements, ARK has remarked good correlation between surface and satellite derived gravity data sets in various regions across the world. Satellite derived gravity are because of their wide coverage and ready availability ideal as a reconnaissance tool for detecting and delineating large offshore sedimentary basins, especially in virgin exploration areas.

A processed grid of Free Air gravity derived by Haxby and his coworkers at the Lamont-Doherty Geological Observatory has been used as the basis of the study presented here. The major component of variation in Free Air Gravity maps results from water depth variations because of the large density contrast at the sea bed. This has been compensated for by applying a Bouguer correction using bathymetry data, which simulates replacing the sea water with rock of a given density. The resulting Bouguer Gravity map reflects the more subtle density variations in rocks beneath the sea bed, with for instance Bouguer Gravity lows over most sedimentary basins. It is on these Bouguer Gravity maps that interpretation has been conducted of the major crustal structure for the S.E. Asian region.

The resolution of the satellite data used is about 30 kilometers, varying slightly across the area according to the track density. Accuracy is more difficult to quantify because of oceanographic effects caused by wind, tide and currents, but is probably about 5 milligals. There is also a general degradation of the data close to land, which raises questions of the validity of some parts of the map.

This display presents the satellite derived Bouguer Gravity map of S.E. Asia, together with an interpretation of the major features seen on it, and with maps of selected regions within S.E. Asia showing the resolution that the method is capable of.

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