Gravity Anomaly of Mariana Trough

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We have compiled extensive bathymetry and gravity data of the Mariana Trough, which were collected during previous several Japanese cruises. Free-air gravity anomaly was calculated with subtracting the normal gravity field and with corrections of the drift and of the Eotvos effect using the DGPS data. Then, we adjusted the trend of this free-air gravity anomaly to that of the free-air gravity anomaly from satellite altimetry (Sandwell and Smith, 1997) and we merged them to get better free-air gravity anomaly. Finally, Mantle Bouguer gravity Anomaly (MBA) was calculated by the method of Parker (1972), using the free air gravity anomaly and multi-narrow-beam bathymetry. We assumed that the crust is constant thickness of 6 km and that the seawater, crust, and mantle densities are 1030, 2700, and 3300 kg/m3, respectively. The MBA reveals distinct differences between regions: 1) The north of 22N shows extremely low MBA(less then -30mgal), indicating an incipient rifting. 2) The spreading axis between 22N and 21N shows relatively low MBA(approximately -20mgal), suggesting abundant magma supply. 3) The central region between 21N and 14N shows "Bull's eye" features along the axes, which are characteristic slow-spreading features. The centers of the "Bull's eye" are always located to the west of the spreading axis, suggesting asymmetry either in crustal thickness or in melt delivery from the mantle. 4) The south of 14N shows lower MBA(approximately 25mgal) than that in the central. Furthermore, we will examine the MBA in the following three points with relation to the spreading process of the back-arc basin: 1) variation of crustal thickness that reflects the amount of the melt supply at the spreading axes, 2) contribution from plate cooling, and 3) contribution from subcrustal density variation that probably reflects the pattern of mantle upwelling, temperature variations, and/or distribution of partial melt.