

A Study of accuracy estimation of satellite altimeter derived gravity anomaly around the coastal and shallow areas

Leni Sophia Heliani [1], Yoichi Fukuda [2], Kumiko Terada [3], Shuzo Takemoto [3]

[1] Earth and Planetary Sci., Kyoto Univ., [2] Geophysics, Kyoto Univ., [3] Earth and Planetary Sci., kyoto Univ

The Topex/Poseidon data has been tested to assess the capability of the data around the coastal area and shallow waters. Processing of 38 cycles of the data for the case study of Indonesian waters, the rms values of 3 to 99 cm were achieved. Where the rms values increase around the coastal area. It is due to the lack of the utilized tide model, in this case CSR 3.0. After ORI 96 and AUS 98 were applied, the rms values decreased substantially become 2 to 67 cm. The results are used as a basic of deriving gravity map and estimating the accuracy of the gravity map. Around the Indonesian islands, basing on the rms values, the accuracy of the gravity map was estimated to be about 1 - 35 mgal.

The 10 Hz sampling data of Topex/Poseidon has been tested to investigate the capability of the data around the coastal area and shallow waters. The test has been carried out in several places which have different conditions. Processing of 38 cycles of the Topex/Poseidon data for the case study of Indonesian waters, the rms values of 3 to 99 cm were achieved. Where the rms values increase around the coastal area and very high values occurred in the northwest coast of Australia and some part of east Indonesian. Such condition could be due to the lack of the utilized tide model, in this case CSR 3.0. In order to asses the possibility of the lack of the tide model, ORI 96 and AUS 98 were applied. The rms values decreased substantially become 2 to 67 cm. However high rms value still occurred in the northwest coast of Australia. Further the results are used as a basic of deriving gravity map and estimating the accuracy of the derived gravity map.

On the application of the results, we derived the gravity anomaly map of the Indonesian waters using Geosat-GM JGM-3 data. The derived gravity map reveals almost all major tectonic and topographical features. The accuracy of the derived gravity was estimated basing on the distribution of the Topex/Poseidon rms values. For this purpose, we first estimated coefficients of the fitting function of the rms SSH and standard deviation of the gravity anomaly. The coefficients obtained from the simulation process, where a certain level of random noise was added to the SSH and then the gravity map was re-computed. These process was done in several places which have different conditions and several times for each noise level. Refer to the original gravity map, the standard deviation of those gravity map were computed and finally fitted using the polynomial function.

The accuracy of the derived gravity map was estimated to be about 1 - 35 mgal. This value shows the influence of the SSH time variation to the accuracy of the gravity. We also compared the derived gravity map with the V9.1 global gravity and shipboard gravity data.