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Bathymetry Prediction in Shallow Water by the Satellite Altimetry-Derived Gravity Anomalies

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The satellite altimetry-derived free-air gravity anomalies (SAFAGAs) are correlated with undulations of crustal density variations under the seafloor. In this study, shipborne bathymetry from the Korea Rural Community Corporation (KRC) and the SAFAGAs from Scripps Institution of Oceanography were combined to predict bathymetry in shallow water. Density contrast of 5.0 g/cm3 estimated by the check points method of the gravity-geologic method (GGM) between seawater and the seafloor topographic mass was applied to predict bathymetry in shallow water areas outside of the Saemangeum Seawall located on the southwest coast of the Korean peninsula. Bathymetry predicted by the GGM was compared with depth measurements on the shipborne locations to analyze the bathymetry accuracy. The root mean square error (RMSE) of the differences of bathymetry between GGM and KRC on the KRC shipborne tracks in shallow water around the Saemangeum Seawall is 0.55 m. The topographic effects in off-tracks extracted from SAFAGAs in the GGM can be effectively utilized to predict bathymetry by combining with shipborne depth data in shallow water where shipborne depth data are limited. In addition, bathymetry and the SAFAGAs have a linear correlation in the 20∼160 km wavelength. The coherency analysis was performed by computing the cross-spectral coherence between satellite altimetry derived bathymetry and the SAFAGAs.

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