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Analysis on the Accuracy of Marine Gravity Inversion from the Wide-swath Altimeter Mission

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Marine gravity is mainly inversed by the nadir satellite altimetry observations. However, the accuracy of the east-west component of vertical deflection is significantly lower than the north-south component. The wide-swath altimeter is one of the main altimetry missions in the future. Its two-dimensional design is expected to obtain high-precision and high-resolution sea surface height simultaneously, and to improve the accuracy of the marine gravity inversion. Taking the SWOT (Surface Water and Ocean Topography) wide-swath altimeter mission as an example, based on the parameters including the ground track and the width of swath, the static sea surface height observations of SWOT, as well as the nadir altimeter missions Jason-1/GM, Cryosat-2/LRM, and SARAL/GM were simulated. Then, the vertical deflections were calculated from above observations to analyze the ability of marine gravity inversion in the South China Sea and part of the Indian Ocean. Compared with EGM2008 model, the vertical deflections determined by one cycle of SWOT are better than the result determined by combining Jason-1/GM, Cryosat-2/LRM, and SARAL/GM. And the results determined by SWOT improve the accuracy of the east-west component of vertical deflection significantly. And then, several specific errors of SWOT satellite were simulated, and their influence on the determination of the vertical deflection was analyzed. It is noted that these errors have certain influence on the accuracy, but can be weakened by using a simple Gaussian filter. In addition, the influence of SWOT sea surface height resolution on the gravity field inversion was analyzed. As a result, under the premise of the designed accuracy and resolution of the SWOT mission, its observations can improve the quality of marine gravity inversion effectively.