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Impact of CryoSat-2 for marine gravity field - globally and in the Arctic Ocean

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Abstract

CryoSat-2 offers at least four important improvements compared with conventional altimetry which should benefit marine gravity in general but particularly at high latitude. Firstly the ESA CryoSat-2 signal to noise ratio should be a factor of two better than conventional altimetry. Secondly the 369 days repeat offered by CryoSat-2 provides denser coverage than older geodetic mission data set like ERS-1. Thirdly, the 92 degree inclination of CryoSat-2 is designed to map more of the Arctic Ocean than previous altimetric satellites. Finally, CryoSat-2 is able to operate in two new modes (SAR and SAR-in) designed to improve the sea surface /ice height mapping in the Polar Regions. We have investigated the use of two years of CryoSat-2 LRM data as well as CryoSat SAR and SAR-in data for deriving a global gravity field as well as a regional marine gravity field in the Arctic. Both conventional ESA Level 2 GDR data, NOAA LRM data, but also Level1b (LRM, SAR and SAR-in waveforms) data have been analyzed. A suite of eight different empirical retracers have been developed and investigated for their ability to predict marine gravity in the Arctic Ocean. The impact of the various improvement offered by CryoSat-2 in comparison with conventional satellite altimetry have been studied and quantified both globally but particularly for the Arctic Ocean using a large number of marine and airborne surveys providing “ground truth” marine gravity.

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