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Increasing the resolution of marine gravity from CryoSat-2 using 20 and 80Hz altimetry

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Achieving a high resolution marine gravity field is essential for the derivation of bathymetry, exploring the ocean tectonics, and practically, safe navigation of ships in the poorly surveyed regions. The accuracy of marine gravity can be improved by the improved altimeter range and dense track coverage. With the launch of CryoSat-2 in 2010, the altimeter range precision is improved by the synthetic aperture radar (SAR) mode. The tracks also cover up to higher latitudes (88°), providing dense spatial coverage in the polar regions. The gravity signal can be recovered from the along track surface slopes (gradients). The accuracy of the recovered gravity signal is dominated by the accuracy of range precision. Therefore, an optimum retracker for the derivation of accurate sea surface height (SSH) estimate should be identified at the first step.

In this paper, we will first wok on adapting the SAMOSA retracker to optimally fit to the SAR waveforms in the Arctic by additional amplitude fitting. Then, we use the 20 Hz L1c release of the CryoSat-2 products to estimate the SSH and further derive the sea surface height variations to recover the marine gravity. Precision analysis will also carried out to several empirical retrackers to compare the performance of the retrackers. Additionally, the high burst rate and high pulse repetition frequency in the SAR mode also enabled higher along track sampling through post-processing, e.g., 80 Hz posting rate on the surface. We will initially investigate the use the 80 Hz date from the ESA-GPOD service to investigate fine scale regional marine gravity signals. We expect that by more dense along track sampling, the along track SSH variations can be well represented and the along track oceanic surface slopes can be refined when downsampled.