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Physical Retracking of Cryosat-2 Low Resolution Mode data for ocean surface height and gravity field estimation in open ocean

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Cryosat-2 Low Resolution Mode (LRM) altimetric data is processed to determine precise ocean surface heights and gravity fields in open ocean. These ocean surface heights are corrected using various geophysical corrections available. The along track variation of the ocean surface height anomaly is used to determine the gravity field. The quality of this gravity field estimation is dependent on the precision in the ocean surface height anomaly. Thus a three/two parameter based physical model based on an error function is used, and the Cryosat-2 LRM waveforms are fit to this model. The fitting routines which employ the Levenberg Marquadt technique generate estimated values of retracked epochs which are used to compute the ocean surface heights.

A two step processing system made up of sequential 3 parameter (amplitude, rise time, retracked epoch) and 2 parameter (amplitude, retracked epoch) fitting models are used to determine precise ocean surface heights. The quality of the processing system is judged by evaluating the standard deviation of the ocean surface height anomaly obtained after all corrections and the mean sea surface/geoid are removed. The lower the value of the standard deviation of the ocean surface height anomaly, the better the quality of processing is. Hence, different processing schemes are considered and evaluated in order to conclude towards the best retracking procedure which would eventually result in high accuracy gravity field estimations.

Also, the quality on the precision is judged by analyzing the standard deviation in the gravity field anomaly. The gravity field anomaly is obtained by subtracting the retracked gravity field with the marine gravity field available. A lower value of the standard deviation in the gravity field anomaly indicates a more precise retracking algorithm. Using the two retracker performance evaluation strategies, namely the ocean surface height anomaly and the gravity field anomaly, it was concluded that the three/two parameter retracker provides precise estimates of the ocean surface heights and gravity fields in open ocean as compared to the ESA (European Space Agency) or RADS (Radar Altimetry Database System) retrackers.