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SEABED MORPHOLOGY RETRIEVAL IN COASTAL AREAS FROM ALOS AND COSMO-SKYMED SAR DATA

Abstract

Information about sea floor morphology and its dynamics are essential for monitoring and control of geomorphological risk in coastal regions. Accurate measurements allow to perform warp analysis and forecasting of potential flooding effects while supporting measurements for marine pollution monitoring and underwater coastal archaeological researches. Measurement of sea water depth and investigation of the morphology of sea floor are referred as bathymetry and it is aimed at the production of the relevant bathymetric Digital Elevation Models (DEM).

SAR4BAT project (SAR data fusion for bathymetric data retrieval of sea bottom in coastal areas) is funded by Italian Space Agency and it is focused on development of SAR-based bathymetric products for coastal area by processing SAR data from ALOS and COSMO-SkyMed satellites. Synthetic Aperture Radar (SAR) signals are unable to penetrate sea surface and reach seabed. Therefore, indirect processes with sea floor morphology sensed through its effects on sea surface must be used. Promising techniques for SAR-based bathymetry have been studied in the last years but they still need additional research to be effectively used. Improvement of these techniques could provide up-to-date bathymetric maps for coastal regions with appropriate resolution to monitor geological processes.

The performed research has focused on the two different indirect processes which have been identified up to the present to relate the sea surface features visible on SAR images to seabed morphology and water depth: the indirect process based on swell waves and the one based on sea surface currents. Both the methods have been deeply studied and proper mathematical expressions have been identified to retrieve bathymetric data from SAR images. Implementation of the developed algorithms has been performed on coastal regions in the Mediterranean Sea and several image processing techniques have been tested to enhance reliability of bathymetric sea surface features detection. Bathymetric data have been retrieved by using both the two indirect processes and comparison with the values reported on the Nautical Chart provided by the Italian Navy Hydrographic Institute have been performed. The assessment of algorithms performance and the obtained results will be reported in the paper.