EARTH OBSERVATION SYMPOSIUM (B1)
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ANALYSIS OF SAR MONITORING CAPABILITIES FOR COASTAL BATHYMETRY

Abstract

The present paper reports on the preliminary results of SAR4BAT project funded by Italian Space Agency with Kell srl as prime contractor and University of Naples as technical consultant. SAR4BAT project is aimed at the development of SAR-based products for coastal area bathymetry. Bathymetry is intended as the measurement of the morphology of sea floor and then the production of the relevant bathymetric Digital Elevation Models (DEM). This information is essential for monitoring and control of geo-morphological risk in coastal regions (e.g. warp analysis and forecasting of potential flooding effects) and it can also support measurements for marine pollution monitoring. In addition, accurate measurements of sea floor morphology can be useful in underwater coastal archaeological applications, for monitoring the sites or supporting the researches. The key-point of any SAR-based bathymetric technique is that microwave signals emitted by SAR, whose wavelength is typically shorter than a few tens of centimetres, are able to penetrate into seawater only to a depth which is negligible in comparison to the electromagnetic wavelength. Therefore, it is possible to state that, for all practical purposes, SAR signals are not able to penetrate sea surface and that echoed signals from sea are actually sea surface echoes. This means that bathymetric data retrieval from SAR images must be based on indirect processes with sea floor morphology sensed through the effects it may have on sea surface. For this purpose two different indirect processes have been identified to relate sea surface conditions: (1) wave-based techniques relying on the ability of underwater bottom morphology to modify the characteristics of sea surface waves; (2) current-based techniques relying on the ability of the local bathymetry to influence sea surface currents. As a consequence particular attention must be paid about the correct characterization of the local sea state conditions that are able to activate the indirect process through which bottom topography is sensed by SAR. The results presented in this paper include a state-of-the-art analysis of SAR-based bathymetric data retrieval and the selection of specific techniques and methods for reliable SAR-based bathymetric

DEM generation. In the ambit of SAR4BAT program, such techniques, which have been typically applied in open waters showing strong tidal currents or significant wave motions and over sandy sea beds will be tested in the Mediterranean basin (Gulf of Naples), which is characterized by a different water dynamics over a (prevalently) rocky sea floor.