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Reconstruction of the sea surface elevation from the analysis of the data collected by a wave radar system

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X-band radar system is able to provide information about direction and intensity of the sea surface currents and dominant waves in a range of few kilometers from the observation point (up to 3 nautical miles). This capability, together with their flexibility and low cost, makes these devices useful tools for the sea monitoring either coastal or off-shore area. The data collected from wave radar system can be analyzed by using the inversion strategy presented in [1,2] to obtain the estimation of the following sea parameters: peak wave direction; peak period; peak wavelength; significant wave height; sea surface current and bathymetry. The estimation of the significant wave height represents a limitation of the wave radar system because of the radar backscatter is not directly related to the sea surface elevation. In fact, in the last period, substantial research has been carried out to estimate significant wave height from radar images either with or without calibration using in-situ measurements. In this work, we will present two alternative approaches for the reconstruction of the sea surface elevation from wave radar images. In particular, the first approach is based on the basis of an approximated version of the modulation transfer function (MTF) tuned from a series of numerical simulation, following the line of[3]. The second approach is based on the inversion of radar images using a direct regularised least square technique. Assuming a linearised model for the tilt modulation, the sea elevation has been reconstructed as a least square fitting of the radar imaging data[4].

References

[1]F. Serafino, C. Lugni, and F. Soldovieri, “A novel strategy for the surface current determination from marine X-band radar data,” IEEE Geosci.Remote Sens. Lett., vol. 7, no. 2, pp. 231–235, Apr. 2010.
[2]Ludeno, G., Brandini, C., Lugni, C., Arturi, D., Natale, A., Soldovieri, F., Serafino, F. (2014). Remocean System for the Detection of the Reflected Waves from the Costa Concordia Ship Wreck. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, 7(7).
[3]Nieto Borge, J., Rodriguez, G.R., Hessner, K., González, P.I., (2004). Inversion of Marine Radar Images for Surface Wave Analysis. J. Atmos. Oceanic Technol. 21, 1291–1300.
[4] Fucile, F., Ludeno, G., Serafino, F.,Bulian, G., Soldovieri, F., Lugni, C. “Some challenges in recovering wave features from a wave radar system”. Paper submitted to the International Ocean and Polar Engineering Conference, ISOPE, Rhodes 2016