Geophysical Research Abstracts
Vol. 16, EGU2014-15997, 2014
EGU General Assembly 2014

Analysis of X-band radar images for the detection of the reflected and diffracted waves in coastal zones

Giovanni Ludeno (1,2), Antonio Natale (1), Francesco Soldovieri (1), Diego Vicinanza (3), and Francesco Serafino (1)

(1) 1Institute for Electromagnetic Sensing of the Environment, National Research Council, Napoli I-80124, Italy., (2) 2Second University of Naples, Department of the Industrial and Information Engineering , Aversa (CE), 81031, Italy., (3) Second University of Naples, Department of Civil Engineering , Aversa (CE), 81031, Italy.

The observation of nearshore waves and the knowledge of the sea state parameters can play a crucial role for the safety of harbors and ocean engineering. In the last two decades, different algorithms for the estimation of sea state parameters, surface currents and bathymetry from X-band radar data have been developed and validated [1, 2].
The retrieval of ocean wave parameters such as significant height, period, direction and wavelength of the dominant wave is based on the spectral analysis of data sequences collected by nautical X-band radars [3]. In particular, the reconstruction of the wave motion is carried out through the inversion procedure explained in [1-3], which exploits the dispersion relationship to define a band pass filter used to separate the energy associated with the ocean waves from the background noise. It is worth to note that the shape of such a band pass filter depends upon the value of both the surface currents and bathymetry; in our reconstruction algorithm these parameters are estimated through the (Normalized Scalar Product) procedure [1], which outperforms other existing methods (e.g., the Least Squares) [4]. From the reconstructed wave elevation sequences we can get the directional spectrum that provides useful information (i.e. wavelength, period, direction and amplitude) relevant to the main waves contributing to the wave motion.
Of course, in coastal zones a number of diffraction and reflection phenomena can be observed, due to sea-waves impinging obstacles as jetties, breakwaters and boats. In the present paper we want to show the capability to detect reflected and diffracted sea-waves offered by the processing of X-band radar data.
Further details relevant to the obtained results will be provided in the full paper and at the conference time.
References
[1] F. Serafino, C. Lugni, F. Soldovieri, “A novel strategy for the surface current determination from marine X-Band radar data”, IEEE Geosci. and Remote Sensing Letters, vol. 7, no.2, pp. 231-235, April 2010.
[2] Senet, C. M., Seemann, J., Flampouris, S., and Ziemer, F. (2008). Determination of bathymetric and current maps by the method DiSC based on the analysis of nautical X-Band radar image sequences of the sea surface (November 2007). IEEE Trans. on Geoscience and Remote Sensing, 46(8), 2267–2279.
[3] F. Ziemer, and W. Rosenthal, “Directional spectra from shipboard navigation radar during LEWEX”. Directional Ocean Wave Spectra: Measuring, Modeling, Predicting, and Applying, 1991 R. C. Beal, Ed., The Johns Hopkins University Press, pp. 125–127.
[4] Weimin Huang ; Gill, E.,” Surface Current Measurement Under Low Sea State Using Dual Polarized X-Band Nautical Radar”, Selected Topics in Applied Earth Observations and Remote Sensing, IEEE Journal of, vol. 5, no.6, page 186-1873, 2012.