



New Approach for SAR Echo Modelling over Ocean Surface and its Application to Sentinel-3

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In this paper a new approach in the derivation of a closed form model for synthetic aperture radar (SAR) echo waveform over ocean surface is described. The presented model is particularly suitable to be used in SAR retracking algorithm of the incoming next generation altimeters (i.e. Cryosat and Sentinel 3) for the retrieval of ocean geophysical parameters.

A novel and fully general closed form solution of the flat surface impulse response (PFS) for near-nadir short pulse radar altimeter is presented in case of elliptic antenna pattern, spherical earth, geometrical optics scattering and mispointing errors in azimuth and elevation.

The developed analytic solution is shown to generalize the current partial solutions known in literature.

An application of the proposed general model to SAR altimetry is addressed introducing into the model the synthetic pattern instead of real antenna pattern so that at the end a synthetic PFS is achieved.

The triplefold convolution of synthetic PFS with radar system point target and height density probability is evaluated by exploiting the Prony's method in case of absence of mispointing errors.

Plots and simulations results have been generated according to the specific Sentinel-3 configuration.