Doppler centroid anomaly extraction from SAR complex images

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Abstract

A new method for quantitative SAR imaging of ocean surface currents has been presented in the July 2005 issue of Journal of Geophysical Research–Ocean. This method is based on the analysis of Doppler centroid shift in the presence of moving ocean surface. The extraction of such Doppler centroid shift requires a precise knowledge of satellite attitude and some specific corrections to account for the doppler spectrum deformation.

These antenna misspointing together with the azimuthal variations of backscatter are responsible of a bias on the Doppler centroid shift which is not geophysical. It is shown that the use of restituted attitude files to estimate the variable SAR antenna misspointing and then to correct from non–geophysical bias is of primary importance. The burst mode is causing an additional bias to the Doppler centroid shift which is illustrated on ASAR Alternate Polarisation images. A simulation of the Doppler spectrum deformation in presence of burst mode is also illustrated and the correction to apply discussed. Analysing Alternate Polarization images, the Doppler shift difference between VV and HH polarisation itself is found to be of geophysical nature and has the advantage to be unbiased by antenna misspointing and azimuthal variations of backscatter. To illustrate the geophysical nature of such Doppler shift and Doppler shift difference VV–HH, maps of Doppler Centroid shift over high wind area and strong ocean surface currents are presented.