Polarimetric Along-Track Interferometry: First Results from an Experimental AIRSAR Mode for Ocean Wave Breaking Detection

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The detection of breaking waves with an airborne or spaceborne sensor could provide valuable input for air-sea interaction monitoring, as well as quantitative input to surveillance radar clutter models. Radar techniques can be quite effective in detecting breaking events, and previous studies at moderate incidence angles have shown that the most successful detection is accomplished with dual-polarized backscattered amplitude, velocity, and spectral width statistics. Nearly all studies to date, however, have focused on ship, shore, or platform based radars, and synoptic scale measurements of breaking waves have proved elusive.

With the goal of increasing the coverage of such measurements, we have added a polarimetric, C-band along-track (POLCAT) interferometric synthetic aperture radar (SAR) mode to the NASA/JPL AIRSAR system. In this mode we collect the standard SAR ocean backscattering amplitude information at vertical and horizontal polarizations, and also estimate the scattering velocity at each polarization through along-track interferometry (ATI). In addition, we collect simultaneous L-band, dual-baseline ATI SAR data that we use to estimate the ocean coherence time, or the inverse of the target spectral width.

In this talk we present the results from our first experiment employing this set of multi-baseline, multi-frequency, dual-polarization AIRSAR modes. We establish the sensitivity of the various modes through analysis of ground calibration data. We also present imagery and statistics from an ocean deployment, and assess the feasibility of this technique for future ocean breaking wave experiments.

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