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The Future of SAR-Based Oceanography: High-Resolution Current Measurements by Along-Track Interferometry

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Abstract

Since the Seasat mission in 1978, an impressive amount of information on oceanic and atmospheric features over the ocean has been derived from the thousands of images provided by spaceborne synthetic aperture radars (SARs). One important quantity that cannot be derived easily from conventional SAR data is the velocity of objects—current features and waves are visible in SAR intensity images because they modulate ocean surface roughness and slope, not because of direct sensitivity to their motions. Because of this indirect imaging mechanism, the quantitative interpretation of SAR signatures of spatially varying currents is challenging, and absolute current velocity retrievals are not possible at all. This situation can be improved by implementing operational along-track interferometry (ATI) capabilities on future SAR satellites. The ATI technique permits direct velocity measurements with spatial resolutions on the order of 100 m, which would be attractive for many applications. The ATI concept was developed more than 25 years ago, and its potential has been demonstrated in a number of experiments with airborne and spaceborne systems. This article provides an overview of the state of the art, promising applications, and expected further developments.

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