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EARTH OBSERVATION SYMPOSIUM (B1)
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OPTIMAL RADAR SYSTEM AND CONFIGURATIONS FOR OBSERVATION OF WEAK CURRENT ON OCEAN SURFACE

Abstract

Monitoring the weak ocean surface current is one of the most important applications for microwave remote sensing observation.It is significant for both civil and martial maritime activities,such as detecting ocean internal waves,shallow sea topography and underwater moving targets.Microwave radar sensors mainly include Real Aperture Radar(RAR),high-resolution Synthesize Aperture Radar(SAR),and Bistatic SAR which is newly arisen.Modeling and simulation turn out to be primary instruments to provide optimal sensor system and configurations for the weak ocean surface current observation.Through this work,Signal Clutter Ratios(SCR) between weak ocean surface current and wind-generated waves is defined, in the frame of which the optimal configurations of RAR/SAR/biSAR with parallel flight squint mode are studied,under global wind speed statistical distributions,ocean surface waves/current radar imaging mechanism, and a bistatic ocean surface microwave scattering model including the large-/intermediate-/small- scale scattering and the second-order Bragg scattering.The comparision result among the SCRs of the three sensor systems shows that RAR,with the highest SCR, is the best system for weak ocean surface current observation. Because SAR/biSAR ocean surface waves velocity bunching modulaiton effect which RAR doesn't have,is much larger than current. This velocity bunching modulation effect mainly causes SCRs to decline.Considering RAR's azimuthal resolution depends on real antenna aperture length,it can be applied to intermediate-/small- scale ocean phenomena observation.The optimal configurations for RAR observation are X band,VV polarization,and incident angle from 40 to 60 degree.Because biSAR has the similar SCR performance to SAR,the optimal configurations for biSAR/SAR observations are X or L band,VV polarization, and incident angle ranges depending on working band and radar reciever parameters.As biSAR can conveniently carry out weak ocean surface current observation with more flexible fomation,it will be widely used to earth ocean observation better than SAR.