On Radar Imaging of Current Features: Model and Comparison with Observations.

Dmitry Akimov, Bertrand Chapron, Johnny Johannessen,Vladimir Kudryavtsev
Nansen International Environmental and Remote Sensing Center

Dmitry.Akimov@niersc.spb.ru

A new radar imaging model of ocean current features is proposed. The simulated normalize radar cross seection (NRCS) takes into account scattering from "regular" surfaces (by means of resonant Bragg scattering and specular reflections) and scattering from breaking waves. The description of background wind waves and their transformation in non-uniform medium is based on solution of the wave action conservation equation. Wave breaking play a key role in the radar imaging model. Breaking waves scatter radiowaves (thus directly contribute to the NRCS), provide energy dissipation in wind waves (thus define the wave spectrum of intermediate scale waves), and generate short surface waves (thus affect Bragg scattering). Surface current, surfactants accumulated in the convergence zone and varying wind field are considered as the main sources for the NRCS manifestations of current features. The latter source can results from transformation of atmospheric boundary layer over the sea surface temperature front. It is shown that modulation of wave breaking significantly influences both radar returns and short wind waves. In the range of short gravity waves related to Ku- X-, and C-band, the modulation of Bragg waves through wave breaking is the governing mechanism. The model is tested against well-controlled experiments including JOWIP, SARSEX and CoastWatch-95. Application of the developed model for interpretation of ENVISAT ASAR signatures of coastal currents is presented.