Marine Monitoring of the China Seas

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Extensive activity is ongoing globally in developing systems for operational monitoring and prediction of the marine environment including the coastal zones and shelf seas. Apart from waves, the most common parameter of significant importance is the upper layer current and its mesoscale variability. The oceanographic mesoscale in the coastal zones is comprised of highly energetic features, including narrow coastal current systems and their eddy fields with strong zones of convergence and divergence. Adding to this is the frequent occurrences of wind driven upwelling and existence of Internal Waves (IWs).

The imaging mechanisms of several oceanic and atmospheric features in the Chinese seas have been studied using SAR images and a numerical radar imaging model.
Oceanic internal waves in the South China Sea have been investigated using SAR images. The observed radar backscatter modulations of IWs are due to induced surface current variations, but the degree of modulation depend on several factors, such as the phase speed of the internal waves, the ambient wind and viewing geometry. Simplified expressions relating the observed radar backscatter modulation to relevant geophysical parameters have been found using dimensional analysis. The derived expressions agree well with simulations with a sophisticated radar imaging model, which has been used to determine the free parameters. The resulting model can be used to extract geophysical information directly from SAR imagery of IWs. Validation against in situ measurements coincident in time and space with SAR imagery is remaining work.
Furthermore, the Doppler shift of Envisat ASAR imagery is being used as a new measure of the velocity of the ocean surface. It is demonstrated how this new information can be used for estimates of both surface currents and the near surface wind field.