

Oceanography Seminar

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“Diagnostic characteristics of submesoscale observations of coastal surface currents and chlorophyll concentrations”

Submesoscale coastal surface currents and chlorophyll concentrations at hourly and $O(1)$ -km resolutions, obtained from an array of high-frequency radars and geostationary ocean color imagery in a coastal region off the east coast of Korea over a period of one year (2013), are described in the wavenumber domain (k). The kinetic energy (KE) spectra of the surface currents become steeper at a scale of approximately 10 km from a slope of $k^{-5/3}$ to slopes between k^{-2} and k^{-3} at a length scale of 2 km and exhibit anisotropy which can be associated with the influence of anisotropic coastal boundaries (e.g., the shoreline and bathymetry) and weak seasonality that may result from persistent regional circulations and mixed layer depths modulated by seasonal super-harmonic frequencies. Moreover, the energy spectra of the chlorophyll exhibit anisotropy associated with bathymetric effects and regional circulation, and their decay slopes change from $k^{-5/3}$ to k^{-1} at $O(10)$ km scales and from k^{-1} to k^{-3} at $O(1)$ km scales. The spectral decay slopes of these energy spectra are consistent with the two-dimensional quasi-geostrophic turbulence theory, and their weak seasonality can be interpreted with the baroclinic instability in the weak seasonal mixed layer under the persistent and non-seasonal regional circulations. Additional comparisons of the KE spectra and fluxes of the surface currents off California will be presented.

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