IMS Seminar
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201 O'Neill, 3:30 pm

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Ph.D. proposal, Oceanography
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Mapping the Northeastern Chukchi Sea Surface Currents and their Dynamical Response Under Different Environmental Conditions

The primary objectives are to elucidate a detailed and reliable surface current pattern measured by high frequency (HF) radars and explain the dynamics of the current field in the Chukchi Sea. The main users of the results will be other scientists, industry, management agencies, and local communities concerned with the circulation dynamics of the Chukchi Sea shelf. Surface current information is relevant to understanding the potential impacts of hydrocarbon exploration, search and rescue operations, and Chukchi Sea marine ecosystem processes. An array of HF radars deployed along the northwest Alaskan coast during the ice free season since 2009 made near real time surface current measurements. Although the data coverage is unprecedented, several persistent data gaps exist due to intermittent ionospheric interference, periods of insufficient scattering waves on the ocean surface, and limitations of the HF radar's siting and signal strength. To fill the data gaps, reduce noise, and reconstruct the major sea surface current patterns, we apply optimal interpolation (OI) to form a more complete estimate of the vector currents. This study includes a detailed investigation of the OI method's benefits and limitations. Main uncertainties originate from the degree of distortion of the antenna pattern. In 2010 HF radar data twelve current patterns were extracted using a self organizing map (SOM) approach. We find that two oppositely oriented coherent coastal jets are associated with local southerly and northerly winds. A double vortex system is found during wind transitions. The results suggest that the remaining patterns are related to far field forcings such as coastal trapped and/or continental shelf waves, and/or changes in the strength and position of the Aleutian Lows. In the future I will investigate the dynamics of this and other circulation patterns identified by pattern recognition from SOM analysis. By using analytical and numerical models, different scenarios with different environmental conditions will be used to study the behavior of the flow pattern. Beside HF radars, hydrographic data, ship borne measurements, subsurface mooring and glider observations, will also be used to study the flow dynamics.