HCS158 - Upwelling fronts and jets along the coast off Central Chile

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Upwelling fronts are one of the most distinctive features along the Eastern Boundary Current Systems. During upwelling seasons these fronts are associated to a surface thermal contrast between cold, recently upwelled, coastal waters and warmer oceanic waters. These contrasts are clearly visible in satellite images of sea surface temperature (SST), which allow analyzing spatial and temporal variability. The upwelling front, together with an alongshore jet that commonly is associated to the front, acts as an important dynamical and biological boundary between coastal and oceanic waters. It may define a natural offshore boundary for the coastal ecosystem in upwelling regions.
In this work, SST images from NOAA satellites were used to study the seasonal variability of the sea surface thermal fronts associated with upwelling off central Chile (33°-40°S). Additionally, geostrophic velocity fields derived from satellite altimetry and cruise data were also used to analyze the structure of the coastal jet during spring 2004.
The mean offshore boundary of the upwelling front presents, in general, alongshore changes related to the width of the continental shelf. But between 35°-37° —a region characterized by the presence of a seasonal filament— the upwelling front extends several tens of kilometers seaward. Near the offshore boundary of the upwelling front Chlorophyll-a concentration decay to values smaller than 1 mg m^{-3}, while typical coastal values remain larger than 5 mg m^{-3} during the complete year. Mean SST distribution showed that Concepción bay, and especially Gulf of Arauco, both equatorial facing bays, facilitate the development of upwelling shadow areas.
An alongshore jet is present in both, satellite altimetry and cruise data and its location and estimated speed are quite consistent in both data sets. The jet is surface-intensified but is clearly visible near 200 m in the southern hydrographic transects (38°-37°S) and below 400 m in the northern transects (35.5°-36°S), where surface speeds are smaller. This jet advects low salinity waters toward the north, reducing the salinity of the saltier coastal water recently upwelled.

HCS159 - Seasonal and Interannual Variability of the Peru Undercurrent

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Historical hydrographic cross-shelf sections data (1990-2006) from 5°S to 18°S off Peru, combined with coastal sea level, satellite altimeter data, Acoustic Doppler Current Profiler data and an equatorial Kelvin wave model are employed to investigate the seasonal and inter-annual variability of the Peru Undercurrent and its relationship to the equatorial Pacific. Three distinctive hydrographic features associated to the PUC are used, along with dynamic topography, to trace the mean path of the Equatorial Undercurrent and to investigate aspects of its seasonal variation. These features are the 13°C thermostad, the high-salinity core, and the high dissolved oxygen concentration.
In situ sea level data from 6 mareographic stations distributed alongshore Peru and temperature and salinity hydrographic data collected from the surface to 500 m depth in the 350 km band adjacent to the coast was used. Monthly and seasonal current fields were obtained using geostrophic approximation. These results were compared to ADCP measurements collected during some cruises of 2006 in order to validate the geostrophic calculation. These *in situ* data sets combined to the altimetric sea level are interpreted in the light of the estimates of the Kelvin wave amplitude along the equator as derived from linear model simulations and the SODA reanalyses. Results indicate that the propagating features as revealed by the *in situ* data are associated to the equatorial Kevin wave impinging at the eastern boundary of the tropical Pacific. The southward extension and amplitude of the PUC variability varies with the frequency of the equatorial forcing, the 1997-1998 El Niño imprinting the most dramatic change in the structure of the PUC. These changes superpose to some extent on the O_2 concentration pattern that exhibits a marked latitudinal heterogeneity; suggesting that the PUC participates to poleward transport of dissolved oxygen.

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