

**VOCALS/Southeast Pacific science: Understanding ocean processes during VOCALS-Rex cruise in the South East Pacific in a data assimilation framework**

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Peruvian Current system plays a key role in the climate variability of the Eastern Tropical Pacific and also has teleconnections to other regions of high climate impact like the Tropical Pacific. Strong coastal jets and winds influence this region strongly. The oceanic circulation is characterized by strong eddy activity with short zonal scales. The highly active primary production in this region with a very strong concomitant upwelling is of great importance to the surrounding economies. This research focuses on the mesoscale dynamics of the ocean in the South East Pacific (SEP). Mesoscale eddies generated in the upwelling regions along the west coast of South America, which affect the distribution of sea-surface temperature (SST) in the SEP are studied in an ocean data assimilation framework. Data assimilation of the sea surface temperature, sea surface height and subsurface temperature and salinity data measured from CTD cast from a ship cruise for a period of two months in 2008 is achieved by using the inverse Regional Ocean Modeling System (iROMS), a 4D-variational data assimilation system for high-resolution basin-wide and coastal oceanic flows. Sensitivity analysis using the adjoint ocean model is applied for the South East Pacific with the aim of exploring the sensitivity of the physical circulation in the data assimilated ocean state estimate to variations in surface forcing mainly. Indices of upwelling, potential for baroclinic instability as a proxy for the eddy generation locations are identified and sensitivities of these indices to variations in circulation and forcing during the cruise period are calculated. We present the methods and results for the assimilation and also sensitivity tests of the ocean state in this region to various forcing conditions.