Geophysical Research Abstracts, Vol. 7, 00895, 2005
SRef-ID: 1607-7962/gra/EGU05-A-00895

Spatial and temporal variability in sea surface temperature fronts in the California Current System from satellite observations

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Three and a half years (2001-Jun 2004) of Geostationary Operational Environmental Satellites (GOES) sea surface temperature (SST) frontal data over the shelf and slope along the U.S. west coast are used to analyze variability in the California Current System. Maps of seasonal probability of detecting a front (SPDF) reveal significant temporal and spatial variability in the area. Winter is characterized by very low SPDF along the entire coast. In spring, SPDF is still low north of Cape Blanco (43°N), but increases considerably south of it. This is consistent with the wind stress seasonal cycle and the seasonal development of upwelling fronts. The SPDF reaches maximum values in summer. The continuous input of energy from the wind to the system leads to intensification of the fronts and of the coastal upwelling jet. High SPDF are found around the 200 m isobath north of Cape Blanco, but span a much wider area south of it, presumably due to instability of alongshore currents and the generation of meanders and eddies, which increase in scale as the system adjust toward equilibrium. During fall, the SPDF decreases considerably, but the offshore extent of the area of higher activity is maximum. The interaction of the flow with major topography perturbations seems to strongly control the position of the fronts. Off Oregon, for example, high values of SPDF in 2001 are found inshore of the pinnacles of the Heceta Bank complex (44.2°N) during spring, but move over and seaward of the pinnacles during summer. Mooring observations show that the coastal jet moves seaward of the pinnacles over a period of ten days in early July during a strong upwelling favorable wind event. A similar offshore shift is observed in the daily GOES-derived SST fronts position. Flow topography interactions in the vicinity of topography perturbations are investigated in

more detail using a numerical model.