Geophysical Research Abstracts
Vol. 16, EGU2014-16156, 2014
EGU General Assembly 2014

Mixing processes and diapycnal heat and solute fluxes in the Peruvian upwelling region at 12°S

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Observations from an extensive measurement program conducted along the continental slope and shelf region off Peru at 12°S are used to investigate mixing processes and their impact on mixed layer heat budget and water column solute budgets. The data set was collected during austral summer in 2013 and consists of microstructure and CTD/O_2 profiles as well as shipboard velocity data from two successive cruises, a glider swarm experiment and current time series from a moored array.

During the observational period (Jan.-Mar. 2013), energetic non-linear internal waves were observed along the continental slope in water depths of up to 400m traveling onshore. At the shelf break at about 200m depth, surface intensifies packets of internal waves were generated that also propagated onshore. Individual waves within the packets displaced surface waters to up to 50m depths and had periods of about 5 minutes. Dissipation rates of turbulent kinetic energy evidenced strongly elevated mixing levels associated with the non-linear waves. Diapycnal heat fluxes in the upper ocean were as large as 180W/m2 during the presents of a bore indicating significant cooling of the mixed layer inward of the 200m-isobath due to the presents of the non-linear waves. The impact of the waves on the mixed layer heat budget and their role for nutrient transport from the deeper ocean to the euphotic zone will be discussed.