Contribution submission to the conference Heidelberg 2015

Coastal upwelling velocities inferred from helium isozope disequilibrium — Reiner Steinfeldt[1], Jürgen Sültenfuss[1], •Marcus Dengler[2], Tim Fischer[2], and Monika Rhein[1] — [1]Universität Bremen, Institut für Umweltphysik — [2]Helmholtz-Zentrum für Ozeanforschung Kiel (GEOMAR)

Oceanic upwelling velocities are too small (in the order of 10-5 m/s) to be measured directly. Here we use oceanic measurements of the helium-3/helium-4 isotopic ratio as an indirect means to infer these velocities. The water that upwells into the oceanic mixed layer from below is typically enriched in the lighter isotope helium-3. This excess of helium-3 originates from venting of primordial helium through hydrothermal activity. Helium data have been collected on four cruises within the coastal upwelling regions off Mauritania and Peru.

Near the coast, the helium derived upwelling velocities are in good agreement with the wind driven flow calculated from Ekman theory. At some locations in the open ocean, however, the helium method results in much higher vertical velocities compared to the wind derived Ekman divergence. This enhanced upwelling might be attributed to eddy activity. Both advective and turbulent (derived from microstructure measurements) fluxes of heat and nutrients into the mixed layer are determined. In coastal upwelling regions, these fluxes play a key role in fostering ocean primary productivity and cooling of sea surface temperature.

Part: UP
Type: Vortrag;Talk
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