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A qualitative study of the mixing dynamics in the Southern Adriatic Sea in March 2009

Ana Rice (1), Jeffrey Book (1), Sandro Carniel (2), Hartmut Prandke (3), Katrin Schroeder (4), and Warren Wood (1)

(1) Naval Research Laboratory, Stennis Space Center, United States (ana.rice.ctr.es@nrlssc.navy.mil), (2) C.N.R. - Institute of Marine Science, Venezia, Italy , (3) ISW Wassermesstechnik, Petersdorf, Germany , (4) C.N.R. - Institute of Marine Science, La Spezia, Italy

Isopycnal and diapycnal mixing, in addition to mesoscale stirring are all important mixing mechanisms in the Adriatic Sea. In the Southern Adriatic, these mixing processes are manifested at a variety of scales along the Western Adriatic Current (WAC) front and also in areas where the cold and dense North Adriatic Deep Water (NAdDW) abruptly encounters the warmer, saltier, but typically less dense Levantine Intermediate Water (LIW). The focus of this study is to qualitatively define and assess meso, sub-meso and fine-scale mixing structures and mechanisms as a first step towards establishing the dynamic linkage between mixing scales.

The Adriasesimic09 cruise was conducted in March 2009 in the Southern Adriatic Sea to examine the pathways and evolution of NAdDW in sills and canyons. Simultaneous seismic and XBT measurements, in addition to CTD and microstructure data were collected. Use of the seismic oceanography technique produced maps of vertical thermal gradients along the survey lines with horizontal and vertical resolutions of 5-10 m. The images thus provide a unique opportunity to examine the fine-scale horizontal structures of water mass boundaries and relate them to observed mesoscale features. Results from the datasets show that the vertical cascading of NAdDW down the sill slope, which typically generates relatively fast mixing processes and strong temperature contrasts, was generally absent in March 2009 due to the anomalously low production of NAdDW that year. However, thermohaline intrusions, interleaving and mixing in and around the WAC are readily observed in the datasets. To analyze these structures we first developed a methodology to define and track the intrusions in temperature-salinity space. Turner Angles were then computed from the datasets to assess double-diffusive activity and link mixing processes to the high-horizontal resolution thermal gradients seen in the seismic oceanography observations.