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Turbulence suppression at water density interfaces: observations under moderate wind forcing.

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Water column stratification has a strong influence on the behaviour of turbulence kinetic energy (TKE) dissipation rates. Density gradient interfaces, due to thermohaline characteristics and to suspended sediment concentration, can act as a barrier and significantly damp TKE.
Between January 30th - February 4th 2014 (CARPET2014 oceanographic campaign on R/V URANIA) we collected the very first turbulence data in the Gulf of Trieste (a small bay located in the North-eartern part of the Adriatic Sea). Observation consisted of 38 CTD casts and 478 microstructure profiles (145 ensembles) collected with a free-falling probe (MSS90L). Among those 48 were grouped in three sets of yoyo casts, each lasting for about 12 consecutive hours. The meteorological conditions during the campaign were of moderate wind (average wind speed 10 m s-1) and heat flux (net negative heat flux ranging from 150 to 400 W m-2).
The water column characteristics in the Gulf during the campaign evolved from well-mixed to stratified conditions with waters intruding from the Adriatic Sea at the bottom. Two types of water intrusions were found during yoyo casts: one coming from the Adriatic Sea northern coast (i.e. warmer, saltier and more turbid) and one coming from the open sea in front of the Po Delta (i.e. cooler, fresher and less turbid). Our observations show that under moderate wind forcing, the GOT was not completely mixed due to the interfaces created by the bottom waters intruding from the open sea.
The comparison of microstructure profiles collected during well mixed and stratified conditions permitted us to highlight the effect of different stratification on TKE dissipation rates. While during well mixed condition TKE profiles are governed just by their forcing, the two intrusions showed different impacts on TKE dissipation rate profiles. The coastal one, with high turbidity, acted as a barrier to surface driven turbulence dumping it of almost two order of magnitude, while the one coming from the open sea, with low sediment concentrations and a smaller vertical density gradient, was not able to suppress downward penetration of turbulence from the surface.