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Temperature and salinity observations with high lateral resolution using acoustic data in the Gulf of Cadiz, NE Atlantic Ocean

Berta Biescas-Gorriz (1), Barry Ruddick (2), Mladen Nedimovic (3), Valentí Sallarès Casas (4), Guillermo Bornstein Ortega (4), and Jhon F. Mojica Moncada (4)

(1) Istituto di Scienze Marine, ISMAR-CNR, Venice, Italy (berta.biescas@gmail.com), (2) Department of Oceanography, Dalhousie University, Halifax, Canada, (3) Department of Earth's Sciences, Dalhousie University, Halifax, Canada, (4) Institut de Ciencies del Mar, ICM-CSIC, Barcelona, Spain

We present a methodology for inverting temperature and salinity from time and space-coincident acoustic reflectivity and XBT data. This method recovers low frequency content (< 10 Hz) of the impedance from XBTs and the high frequency content (> 10 Hz) from acoustic reflectivity. Afterwards, maps of temperature and salinity are calculated from impedance using the GSW equations of state and an empirical T-S relation. Acoustic data allows to recover the main physical parameters of the ocean along lateral sections of hundreds of km, covering all the full-depth water column and with vertical and lateral resolutions of 10 m and 100 m, respectively. This method was applied in the Gulf of Cadiz, NE Atlantic Ocean to recover the main physical oceanographic parameters in the ocean with accuracies of δTsd = 0.1 C, δSsd = 0.09 and δsd = 0.02kg/m3 for temperature, salinity and potential density. Inverted temperature anomalies reveal baroclinic thermohaline fronts with intrusions. The observations support a mix of thermohaline features created by both double-diffusive and isopycnal stirring mechanisms.