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Prominent sub-mesoscale variability in the west Sardinian Sea as revealed by a multi-platform sampling strategy

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Between 8 and 23 June 2014 in the framework of the REP14-MED sea trial, a huge dataset of temperature and salinity measurements at very high resolution was collected in the west Sardinian Sea (Western Mediterranean) by means of ship-borne CTD casts, eleven gliders, and towed instruments. Zonal hydrographic sections were oriented orthogonal to the coastline of Sardinia and extended from the coast over the wide continental shelf into the deep ocean. While the CTD casts partly reached the seabed in the deep ocean at about 2800-m depth, the maximum sampling depth of the gliders was constrained to about 200-m or 1000-m depth, respectively, depending on the pressure rating of the devices. The depth range of the towed instruments was limited to about 200m (ScanFish®) and 170m (CTD chain). The collected data has a maximum horizontal resolution better than 10m which allows a detailed description of processes occurring at the sub-mesoscale. Results from the analysis of the data reveal that both the temperature and salinity fields are characterized by multiple interleaving features and vertical structures that can be only few tens of metres wide, but may extend from the surface down to approximately 100-m depth into the thermocline. At several locations the mixed-layer shoaled or deepened, suggesting the presence of isolated upwelling or downwelling events, which may have a significant impact on biogeochemistry, mixing, and on vertical fluxes of heat and salt. Moreover, along several sections it is possible to clearly identify a front (>100m depth), separating the saltier and warmer waters closer to the coast from the colder and fresher waters observed off shore. Results are expected to provide a significant contribution to the current knowledge of the hydrography in the west Sardinia Sea, which to date has only been scarcely investigated and for the first time with such high resolution.