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The four major Eastern Boundary Upwelling Systems (EBUS) are characterized by the presence of numerous mesoscale eddies. They are preferentially formed along the continental coasts and then propagate westward to the open ocean where they progressivly dissipate. Thus, mesoscale eddies actively participate to the zonal redistribution of physical and biogeochemical properties from near-coastal upwelling regions to the open ocean. Although the main eddy caracteristics (size, duration, formation areas, propagation, etc) have been largely studied in the four EBUS, little is known about their physical vertical structure and the associated heat and salt contents. The main goal of this study is to merge 12 years (2000-2012) of satellite altimetry data with temperature and salinity profiles acquired by Argo floats in order to describe the vertical thermohaline structure of mesoscale eddies in the four EBUS.
In each EBUS, eddies are detected on sea-level altimetry maps and all available Argo profiles are classified into 3 categories depending whether they surface in anticyclonic eddies, cyclonic eddies or outside eddies. The vertical temperature and salinity anomalies associated with both anticyclonic and cyclonic eddies are depicted for each EBUS, showing clear differences in terms of eddy-core position and intensity. For instance, eddy vertical temperature anomalies in the Peru-Chile Upwelling System presents an anticyclonic eddy-core in subsurface (~300m) and a cyclonic eddy-core centered in the thermocline (~100m depth) ; in the California Upwelling System, both types of eddies are centered in the thermocline ; in the Canary Upwelling System, eddy-cores exhibit on average a deeper vertical extent and the signature of Meddies can sometimes be observed between 1100 m and 1600 m ; in the Benguela Upwelling Sytem, the maximum anomalies are found between 100 and 600 m, influenced by the passage of Agulhas Rings carrying Indian Ocean water in relatively deep layers. Furthermore, each EBUS is divided in subregions, where vertical temperature and salinity anomalies can be related to several processes and mecanisms such as large-scale water-mass distribution, front locations, wind-induced vorticity or near-coastal dynamics.
OSTS session
Science Results from Satellite Altimetry
Meeting name
Ocean Surface Topography Science Team (OSTST) Meeting
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