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High resolution simulations and glider observations in the eastern Alboran Sea (Mediterranean Sea): implications for vertical velocity estimates

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The transition region between the Alboran Sea and the Algerian sub-basin to the east is characterised by strong fronts and mesoscale anticyclonic eddies, and has correspondingly raised levels of eddy kinetic energy. The transient Almería-Orán front separates Atlantic Water (AW) flowing into the Mediterranean Sea, and recirculating Mediterranean Water (MW) that intrudes southwestward along the Spanish coast. Quasi-geostrophic vertical motions estimated from a combination of altimetry and glider observations by Ruiz et al. (2009) are of the order of ± 1 m day-1, although higher velocities (up to 20-25 m day-1) can be assumed for smaller scale structures embedded within the front, as revealed by chlorophyll data and pointed out by Tintoré et al. (1991).
In order to further investigate the vertical velocity spectrum we present results from a high resolution nested modelling study that focuses on the Almería-Orán front. The model is the primitive equation Regional Ocean Modeling System (ROMS). We identify the conditions under which the front forms using a 5 km resolution Mediterranean climatological solution that is run for 15 years. A series of one-way nested simulations then lead to a sub-km solution that permits a high resolution characterisation of the 3D structure of the front. These are then compared with glider observations collected during July 2009. Further, this work will support a high-resolution multi-platform experiment to sample the Almería-Orán front that is to take place in Spring 2014 as part of the European project FP7 PERSEUS.