Physical and biochemical high-resolution variability of the Almeria-Oran front in the spring to summer transition

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Abstract (Oral Presentation)

Remote sensing studies and in-situ observations of the western Mediterranean have indicated that the Almeria-Oran front has a significant physical and biochemical impact in the Alboran Sea and Western Mediterranean. The inflowing low salinity Atlantic Water (AW) generally forms two large anticyclonic gyres (the Eastern and Western Alboran Gyres) in the Alboran Sea. The Eastern Alboran Gyre forms a strong front on its eastern side with high salinity waters recirculating from the western Mediterranean Sea, this is most commonly known as the Almeria-Oran (AO) front. The boundaries between low salinity AW and recirculating Mediterranean waters have characteristically strong salinity gradients that define density fronts in the upper ~200 m. The seasonal variability of the AO front is poorly understood, and knowledge of its biochemical impact is still incomplete. Instability of the AO frontal boundary provides an essential mechanism for transferring heat, salt and other properties from the surface to the interior of the ocean and vice versa. Observations during the Calypso Pilot study in 2018 show that in addition to the frontal boundary, seasonal increases in the heat fluxes into the upper ocean during the observation period cause warming to the surface temperature that reaches up to 3 °C in the upper 50 m between the end of June and early July. This increase in surface temperature contributes to the reestablishment of the seasonal thermocline. Ship-based and glider observations in the area between May and July 2018 capture the key features of the Almeria-Oran front during the spring to the summer transition period. The glider observations reveal that the Almeria-Oran front exists over a wide range of cross front length scales, between 10 to 20 km, which is not always detectable at the surface. The high-resolution measurements from the glider show a noteworthy baroclinic component in the instability of the frontal jet. Our biochemical observations also support the vertical transport as revealing an enchantment of CHL and Oxygen saturation at the frontal interface between the isopycnals of 27.5 and 28.5 kg m3. Furthermore, upward transport is hinted at on the isopycnals 26.5 – 27 kg m-3. Also, altimetry, SST, and ocean color have been used to investigate how mesoscale activity affects the temporal and spacial variability of the Almeria-Oran Front. A better understanding of this vertical exchange will help us to evaluate changes in the biogeochemical cycling.