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Early transformation of the Mediterranean Outflow Water (MOW) in the Gulf Of Cádiz, SW Iberian Peninsula: pathways, mixing and temporal variability.

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The inverse estuarine circulation through the strait of Gibraltar is responsible for the overflow of dense, saline MOW towards the Atlantic basin. Initially as a gravity undercurrent, the MOW entrains large amounts of the overlying Eastern North Atlantic Central Water to become a multi-layered, buoyant plume at depths of 800-1300 m past Cape St. Vincent. Much of the entrainment occurs within 100 km of the Strait over a highly abrupt topography. In this work we analyze a repeated series of high-resolution CTD-LADCP observations along a number of standard sections crossing the early MOW. These data show that from the Strait of Gibraltar, the bottom-trapped flow bifurcates in the vicinity of the topographic features, diverting or rejoining the main MOW path as a function of the orientation of channels and valleys. As it turns anticyclonically, the undercurrent exhibits a cross-axis geostrophic gradient, with the margin closer to the slope being in near-geostrophic balance whereas the distal band is largely ageostrophic due to the flow curvature. Mixing is steered by the interplay of tidal stirring, bottom roughness, shear instability and double diffusion along the MOW path. Data also shows that seasonal variability is mostly related to the fluctuations in the overlying layer rather than to MOW dynamics. This is a contribution to INGRES3 project (Mediterranean outflow at Gibraltar, its influence on deep Mediterranean water ventilation and first transformation and coupling with North-Atlantic central waters in the Gulf of Cádiz, CTM2010_21229)