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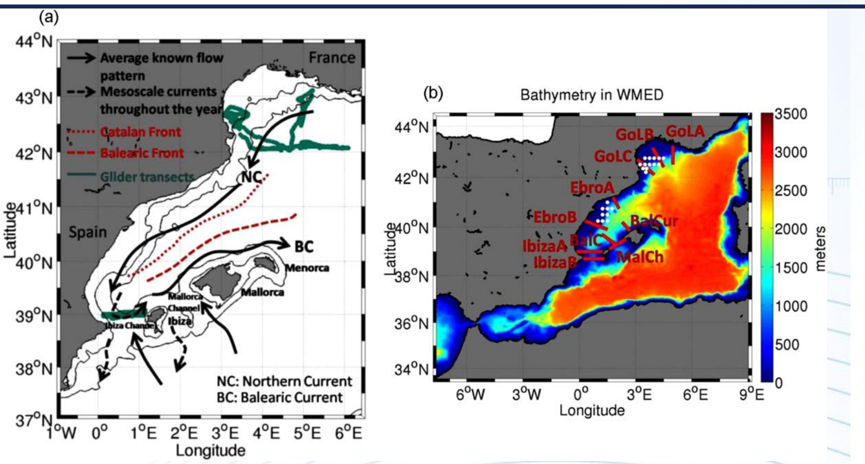
Winter Intermediate Water (WIW) in the Northwestern Mediterranean Sea (NWMED)

Key Words : WIW, numerical simulation, observations, NWMED

Mercator Ocean data : PSY2V4R3 2011 ; T, S; U, V, SSH over West Mediterranean area for initial and boundaries conditions for ROMS model—Winter-spring 2011.

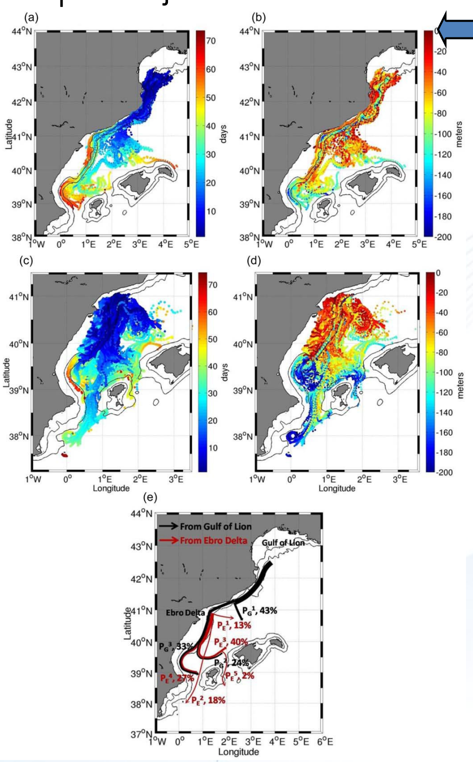
"Origin and pathways of WIW in NWMED using observations and numerical simulation". Some results from JGR, vol.118,6621 6633,doi:10.1002/2013JC009231,2013

The WIW formed along the continental shelves of the Gulf of Lion and Balearic Sea, circulates southward following 5 preferential pathways: WIW joins the northeastern part of the Balearic Sea, or flows along the continental shelves until joining the Balearic Current (maximum of 0.33 Sv in early-April) or further south until the Ibiza Channel entrance. Two additional trajectories, contributing to the exchanges with the southern part of the Western Mediterranean Sea, bring the WIW through the Ibiza and Mallorca Channels (maxima of 0.26 Sv in late-March and 0.1 Sv in early-April, respectively). The circulation of WIW over the NWMED at 50–200 m depth, its mixing and spreading over the Western Mediterranean Sea suggest that the WIW may have an impact on the ocean circulation by eddy blocking effect, exchange of water masses between north and south sub-basins of Western Mediterranean Sea through the Ibiza Channel or modification of the ocean stratification.



(a) General surface circulation in the NWMED; glider transects in Gulf of Lion (March 2011) and across the Ibiza Channel (January–June 2011). (b) WMOP model configuration. Color bar indicates model bathymetry. The sections (red lines) and the start positions of Lagrangian particles (white points), are superimposed.

Spatial trajectories:

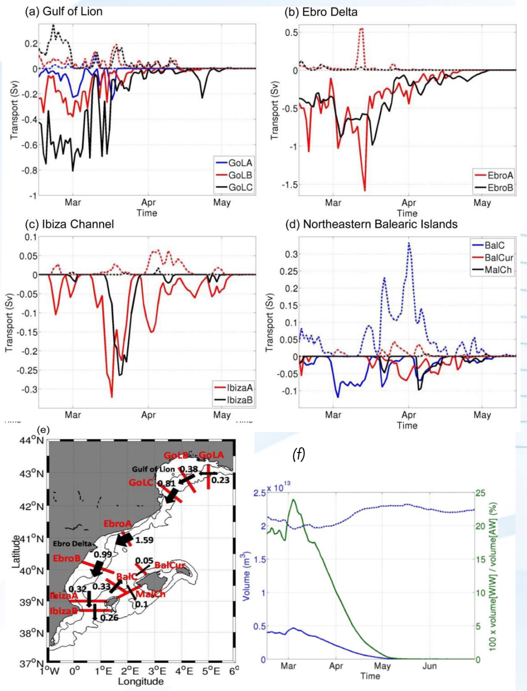


(a & b) *Gulf of Lion and (c & d) the Ebro Delta region with daily starts between 27 February and 5 March 2011. Color scale indicates (a and c) time in days or (b and d) depth in meters. Only one of four trajectories is shown here for clarity. (e) Scheme of main WIW pathways.*

Lagrangian trajectories of the simulated particles having the WIW characteristics are in good agreement with the literature, most of the simulated WIW is formed along the continental shelves of Gulf of Lion and Balearic Sea, and circulates southward (a, b) in the Balearic Sea reaching 100–200 m depth (b, d). (e): scheme of main WIW pathways. The results emerging from the WIW transports and Lagrangian trajectories are complementary and lead to the conclusion that during the winter-spring 2011, WIW is mainly formed in the western Gulf of Lion and the Ebro Delta region in February–March, circulates southward joining the northeastern Balearic Sea, or going further south and joining the Balearic Current, or going through the Ibiza and Mallorca Channels. Additionally, the WIW volume over the NWMED is significant representing more than 20% of the AW volume between the 28 February and the 11 March 2011, reaching its maximum of 24% the 4 March, supporting the importance of WIW in the NWMED (f).

Transports (Sverdrup) :

Inflow (dashed lines) and outflow (solid lines) transports (in Sv) of simulated WIW in the ten sections, indicated in Figure 1b (a–d). Scheme of the WIW transports maxima (in Sv) in every section (e).



(f) Volumes of simulated Atlantic Water and WIW (dashed and solid blue lines, respectively), and the percentage of the WIW volume in comparison with the AW volume (green line) as a function of time in the NWMED (0.5 W– 5 E, 38 N–44 N).

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