

{rokbox title=|Map of the Strait of Gibraltar showing the main topographic features :: Image: Authors| thumb=|images/stories/ieo/imagenespublicaciones/centro-oceanografico-baleares-ieo-modelling-exchange-flows-strait-gibraltar-sanchez-roman-et-al-2018-thumb.jpg|}images/stories/ieo/imagenespublicaciones/centro-oceanografico-baleares-ieo-modelling-exchange-flows-strait-gibraltar-sanchez-roman-et-al-2018.jpg{/rokbox}

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Abstract: Vertical transfers of heat, salt and mass between the inflowing and outflowing layers at the Strait of Gibraltar are explored basing on the outputs of a three-dimensional fully nonlinear numerical model. The model covers the entire Mediterranean basin and has a very high spatial resolution around the strait ($1/200^\circ$). Another distinctive feature of the model is that it includes a realistic barotropic tidal forcing (diurnal and semi-diurnal), in addition to atmospheric pressure and heat and water surface fluxes. The results show a significant transformation of the properties of the inflowing and outflowing water masses along their path through the strait. This transformation is mainly induced by the recirculation of water, and therefore of heat and salt, between the inflowing and outflowing layers. The underlying process seems to be the hydraulic control acting at the Espartel section, Camarinal Sill and Tarifa Narrows, which limits the amount of water that can cross the sections and forces a vertical recirculation. This results in a complex spatio-temporal pattern of vertical transfers, with the sign of the net vertical transfer being opposite in each side of the Camarinal Sill. Conversely, the mixing seems to have little influence on the heat and salt exchanged between layers ($\sim 2\%$ – 10% of advected heat and salt). Therefore, the main point of our work is that most of the transformation of water properties along the strait is induced by the vertical advection of heat and salt and not by vertical mixing. A simple relationship between the net flux and the vertical transfers of water, heat and salt is also proposed. This relationship could be used for the fine-tuning of coarse-resolution model parameterizations in the strait.

Keywords: