



ON THE THERMOHALINE ENGINE OF THE AEGEAN SEA

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The deep basins of the North Aegean are filled with locally formed very dense water, despite the very high stratification of the upper water column resulting from the outflow of very light, brackish water from the Black Sea into the Mediterranean. Furthermore, the Aegean is a source of deep and bottom water, which occasionally overflows into the Eastern Mediterranean. The interaction between the North and South Aegean, and the relative importance of the basins as dense water formation sites, is still unknown. In this study we attempt an assessment of the exchange between the North and South Aegean through buoyancy budget estimations. This will provide a first-order estimate of the North Aegean contribution to the interannual variability of the Eastern Mediterranean Deep Waters, as well as a better understanding of the thermohaline circulation within the Aegean Sea. Our budget estimation consists of comparing the buoyancy change of the deep basins between successive CTD campaigns with the time integrated buoyancy flux through the surface (considering the Dardanelles outflow as a surface flux). Surface buoyancy exchanges are estimated using heat and freshwater data from the ECMWF dataset. For the buoyancy forcing through the Dardanelles we exploit the output of a state-of-the-art hydraulic model simulating the exchange flow through the Turkish Straits system, developed and fine-tuned in the framework of a bilateral Greek-Ukrainian project. For the buoyancy content estimation of the deep basins we isolate periods where there are enough CTD observations covering most of the North and South Aegean. Considering one box per basin, the results suggest that the North Aegean behaves as a dilution basin throughout the year, constituting a source of buoyancy for the South Aegean. However, this contradicts the fact that the North Aegean contains by far the densest waters. This paradox can be explained by in-

roducing two-layer boxes, using the vertical buoyancy flux through the interface as a tuning parameter. The results shed light into the functioning of the Aegean Sea; when there is considerable buoyancy loss through the surface of the North Aegean there can be export of dense waters to the South. During those incidents large quantities of surface waters are advected from the South to the North, in order for the North Aegean to remain a source of buoyancy for the South, thus altering the thermohaline balance of the Aegean and accelerating its conveyor belt.