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Thermohaline variability in the Adriatic and Northern Ionian Seas observed from the Argo floats during 2010-2014

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The Adriatic Sea is the northernmost basin of the Eastern Mediterranean Sea (EMed). At its southern end, the basin communicates with the adjacent Ionian Sea through the 80 km wide and 850 m deep Strait of Otranto. Due to the river discharge in the north and due to the strong winter cooling, the Adriatic is both a dilution basin and the dense water formation region. The basin-wide circulation is cyclonic. The circulation is however, energetic also at smaller spatial and temporal scales, and several circulation cells and mesoscale features are regularly observed equally along the littoral and in the open sea. The North Adriatic Dense Water (NAdDW) formed during winter is the densest water of the whole Mediterranean Sea (up to 1060 kg/m3). It flows as a density driven bottom current from the northern shelf toward south, filling the deep layers of the middle and southern Adriatic pits. The deep open-sea area of the South Adriatic Pit (SAP, 1200 m) feels the influence of a water mass exchange through the Strait of Otranto. Specifically, it receives salty and warm surface and Levantine Intermediate Waters from the Ionian Sea. Through the open-sea winter convection that homogenizes and ventilates 400-800 m thick upper water column, this salty water contributes to the formation of the Adriatic Deep Water (AdDW, 1029.17-1029.20 kg/m3), which is not as dense as the NAdDW. Both dense waters eventually mix and spill across the sill ventilating the deep and bottom layers of the Ionian Sea, and driving the deep thermohaline cell of the EMed.
Thermohaline properties of the Adriatic Sea vary at wide spatial and temporal scales, and this in turn affects the properties of its dense waters. The long-term scales are of a particular interest, as they are often associated with the biogeochemical and biotic variability such as intrusion of alien species into the Adriatic Sea and interconnection with the adjacent Ionian basin. Due to the extremely variable meteo- and climatic conditions, the signal of the Adriatic dense waters can be fairly irregular and impulsive. Sporadic in-situ surveys by research vessels are not always sufficient to capture this irregularity and its consequences on the circulation.
The Lagrangian platforms are disseminated within the whole Mediterranean through the international Argo program. They are a useful tool to assess some of the spatial and temporal variability in the two basins. Combining the information from the floats and in-situ CTD profiles from oceanographic campaigns, we picture the inter-annual variability of the thermohaline properties in general during 2010-2014. In addition, the peculiarities of the very dense water overflow that during 2012 spilled out form the Strait of Otranto into the Northern Ionian is evidenced. Also, by the remotely sensed sea surface topography, we depict the most prominent circulation features of the upper layer.