



## **A long and winding road: *Skeletonema* sp transport by Northern Adriatic Dense Waters to the Southern Adriatic Pit.**

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The semi enclosed Adriatic Sea is a sub basin of the Mediterranean Sea located in its northeastern part; it has a shallow northern part (average depth of 40 m) and a deep Southern Adriatic Pit (SAP) that reaches 1200m. The presence of a wide continental shelf exposed to strong heat and momentum fluxes during winter months makes the Northern Adriatic a formation site of dense waters, generally referred to as Northern Adriatic Dense Water (NAdDW). Once produced, it moves south as a quasi-geostrophically adjusted vein, flowing along the Italian coast and enters the SAP giving origin to descent and cascading dense shelf water bringing into the deep layers oxygen, nutrients and organic compound.

In February 2012 a long and intense cold air outbreak, with strong Bora winds, interested the northern part of the Adriatic sea causing a drop in water temperature to less than 6 °C and an increase in density to values as high as 1030.2 kg/m<sup>3</sup> (likely the maximum values since 1929). This resulted in a massive production of NAdDW.

In order to study the behavior of the NAdDW vein, a rapid response 2 legs cruise (ODW2012) was organized in the southern Adriatic. During the cruise, along with physical and chemical measurements, water and phytoplankton samples were collected at different depths. Usual abundance and distribution with a general decrease in phytoplankton abundance from the surface to the bottom were found in all stations with one exception. The bottom sample of a station located roughly 40 km at 120 m depth in front of Gargano showed a significantly high dominance (40%) of the small diatom *Skeletonema* sp whose flowering is typical in the surface waters of the northern Adriatic in late winter. The physical parameters of the water column showed signs of the passage of the dense water vein (lower temperature and higher dissolved oxygen concentrations) hence it was hypothesized that those diatoms were actively transported by the NAdDW near-bottom stream. A further indication comes from satellite images that show a strong phytoplankton bloom in the northern Adriatic during the dense water formation period. To test this hypothesis the transport pathways of *Skeletonema* sp were numerically modeled with a Lagrangian particle model (a specifically modified version of Ichthyop) forced by a high resolution hydrodynamical model (namely COAWST) that simulated the 3D thermoaline dynamics of the entire Adriatic Sea.

Numerical results show indeed that large amounts of *Skeletonema* sp right after the NAdDW formation leave the north Adriatic and is transported along the NAdDW vein for about 600 Km to the southern Adriatic, passing in front of the Gargano peninsula with high concentration near the sampled stations.

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