Intense observation of the deep convection in the NW Mediterranean Sea with a SEAEXPLORER glider fleet

A deep sea convection process particularly intense in early 2018 has been observed in the Northwestern Mediterranean Sea. The Laboratoire d'Océanographie de Villefranche-sur-Mer (LOV) and ALSEAMAR have been jointly deploying in the Nice-Calvi area a fleet of SEAEXPLORER glides over several months in order to monitor this phenomenon.
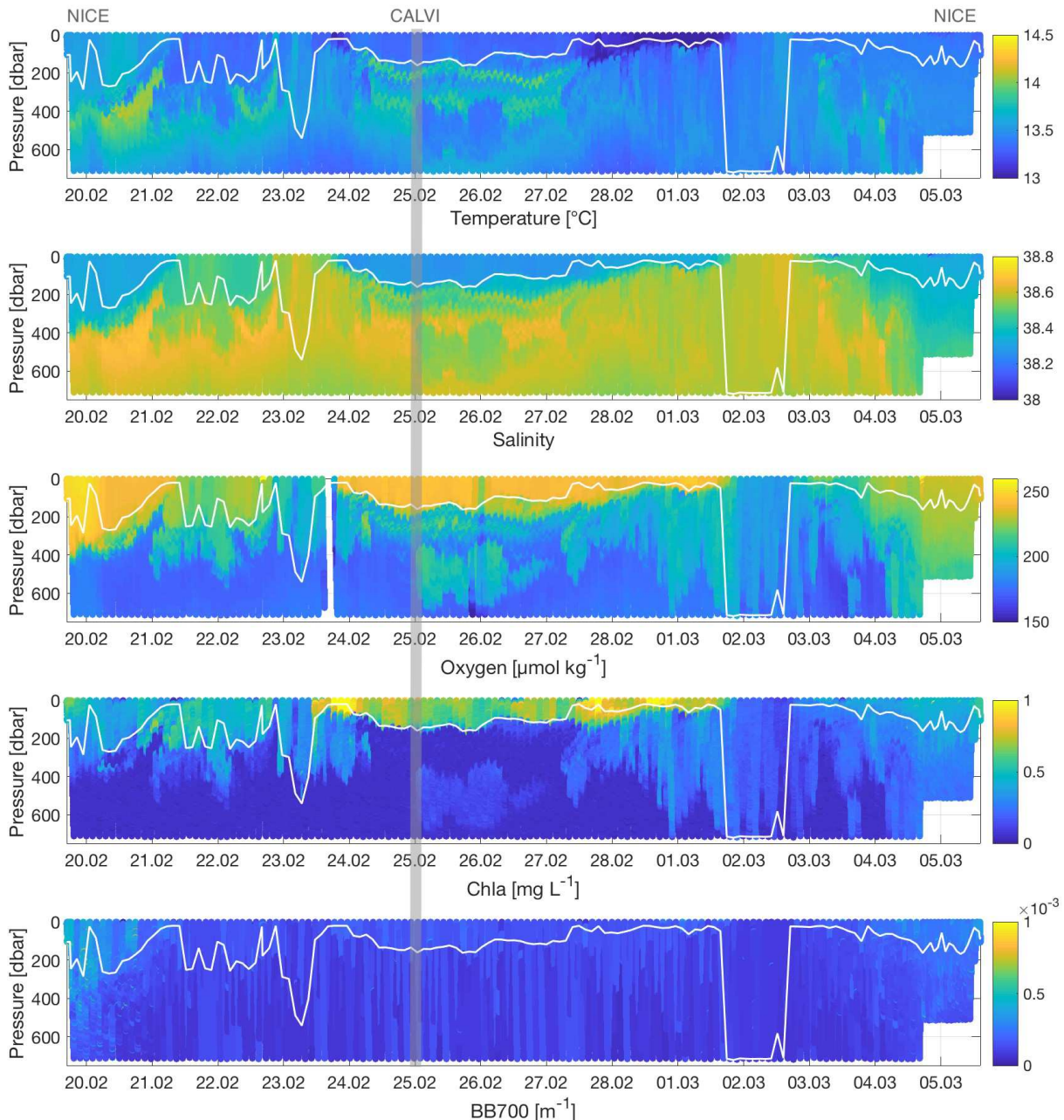

Fig.1. Example of a SeaExplorer dataset along the Nice-Calvi section at the end of February and early March 2018. The white line represents the mixed layer depth estimated from the potential density threshold 0.01 kg/m³. The grey shadow line corresponds to the waypoint near Calvi.

In February-March 2018, intense winds and cold air temperature induced a strong evaporation and heat loss increasing the density of the surface layer until it sinks via convection to an intermediate depth. This intense mixing, revealed by a deep mixed layer, occurred in the Ligurian Sea at 50-80 km off Nice (Fig.1). Due to this intense

dilution, the Levantine Intermediate Water (LIW), usually characterized by a maximum of T and S and a minimum of O_2 at 300-700m lost its characteristics becoming less warm, less salty and more oxygenated. In addition to this O_2 supply, the deep mixed layer induces usually a replenishment of nutrients to the surface waters which determines the onset of the following spring bloom.
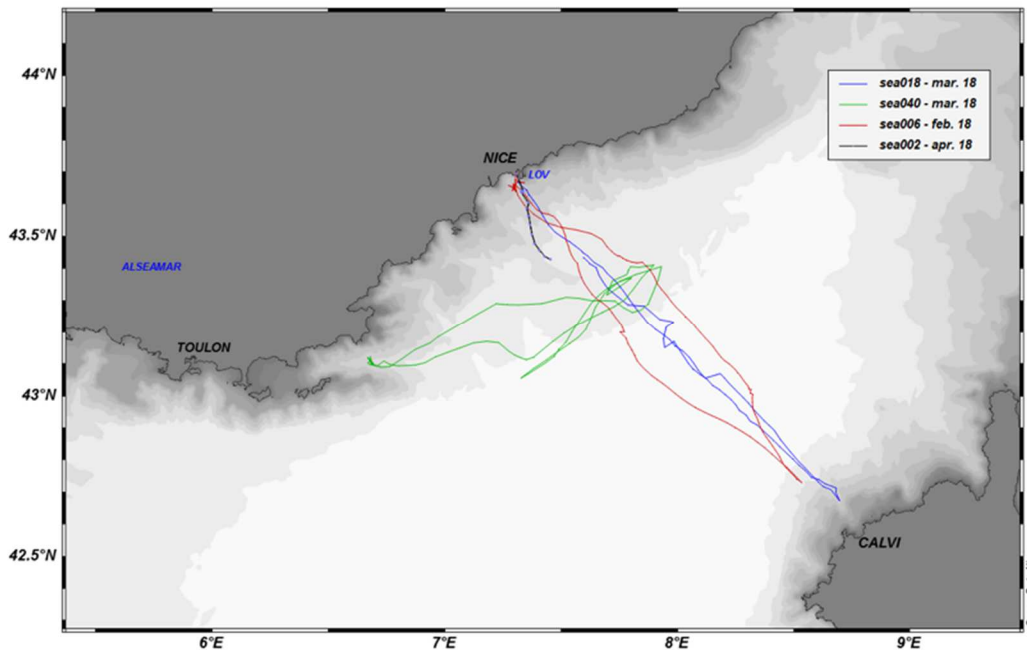

Figure 2: Transects followed by the gliders deployed in the area between February and April.

The SEAEXPLORER gliders used for this campaign are equipped with Sea-Bird's GPCTD and SBE 43F dissolved oxygen sensor, as well as other sensors such as Nortek's AD2CP current profiler and WET Labs ECO Puck measuring chlorophyll-a, turbidity and CDOM. Among the gliders operating are some of the SEAEXPLORER X2, the second generation of SEAEXPLORER glider which has a 1000 m depth capability.