MEDITERRANEAN SUBSURFACE CIRCULATION AND THERMOHALINE PROPERTIES FROM ARGO DATA

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1. INTRODUCTION

In order to examine the subsurface currents and the thermohaline properties of the Mediterranean Sea, we used profiling floats deployed as a part of the International Argo program, since 2000. About 40% of these floats were programmed to execute 5-day cycles drifting at a neutral parking depth of 350 m and providing CTD profiles from either 700 or 2000 m up to the surface.

2. MEDITERRANEAN SUBSURFACE CIRCULATION

The Argos positions of this reduced dataset were used to estimate the circulation at the parking depth. This study involves a sofisticated determination of the surface and sub-surface displacements. From these, the subsurface velocities at the 350 m parking depth were estimated and finally used to compute pseudo-Eulerian statistics and to study the mean circulation and eddy variability in the intermediate layer of the Mediterranean Sea (Fig. 1). In the Western Mediterranean Basin, the velocity field describes the characteristic cyclonic paths in the Algerian and Liguro-Provençal basins (Fig. 1a); moreover, it follows the Liguro-Provençal-Catalan and the Algerian currents. In the Eastern Basin the mesoscale and sub-basin scale circulation is dominated by eddies (Fig. 1b); the float velocities follow the Ierapetra (IE), Egyptian (EE), Libyan (LE), Herodotus Trough Eddy (HTE) and Eratosthenes Seamount (ESE) anticyclonic eddies, and Cretan (CG) and Rhodes (RG) cyclonic gyre.

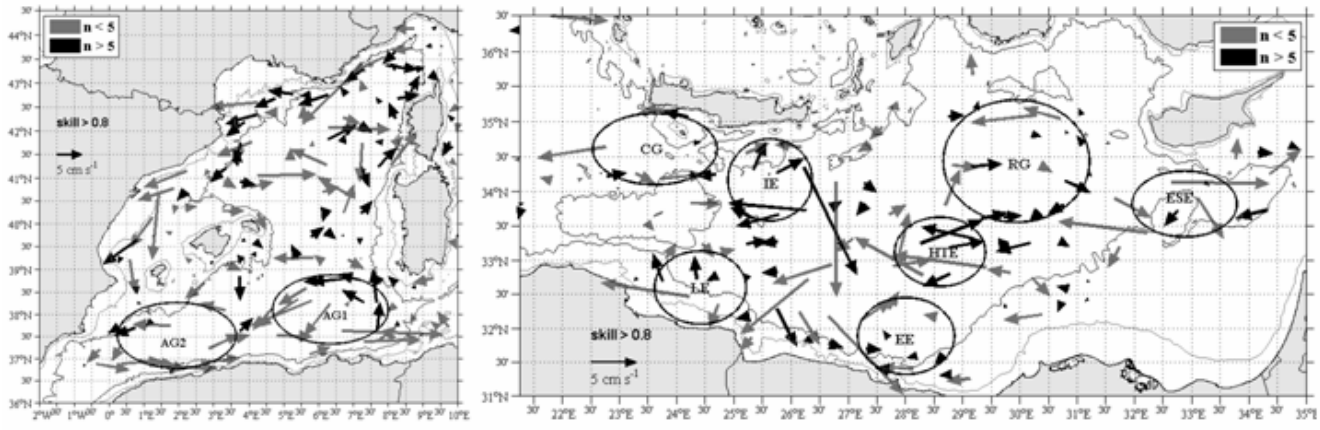

Figure1 - Pseudo-Eulerian mean subsurface circulation field (boxes of 0.5°x0.5°): Algerian Gyres (AG1, AG2), Cretan Gyre (CG), Ierapetra Eddy (IE), Egyptian Eddy (EE), Libyan Eddies (LE), Herodotus Trough Eddy (HTE), Rhodes Gyre (RG), Eratosthenes Seamount Eddy (ESE).

3. MEDITERRANEAN THERMOHALINE PROPERTIES

We also used 10 years (entire dataset) of Argo data (2000-2009) to study the spatial structures and the temporal variability of temperature and salinity in the Mediterranean Sea at the surface, at 700 and 2000 m and at the depth of the salinity maximum. The dataset allows us to reconstruct the main spatial structures of salinity and temperature in the entire Mediterranean in 2° X 2° boxes. The salinity maximum is searched in a depth range from 0 to 700 m in order to track the Levantine Intermediate Water (LIW) that originates in the Levantine basin, near the surface, and then propagates westwards while sinking (Fig. 2). The LIW has large values of salinity (about 39.5) in the eastern Mediterranean while in the western basin it reaches

38.5. The analysis of the temporal variability in selected sub-basins of the Mediterranean reveals a positive trend of salinity at the depth of the salinity maximum in the Levantine basin, especially from 2005 to 2009 when the maximal value approaches 39.6.

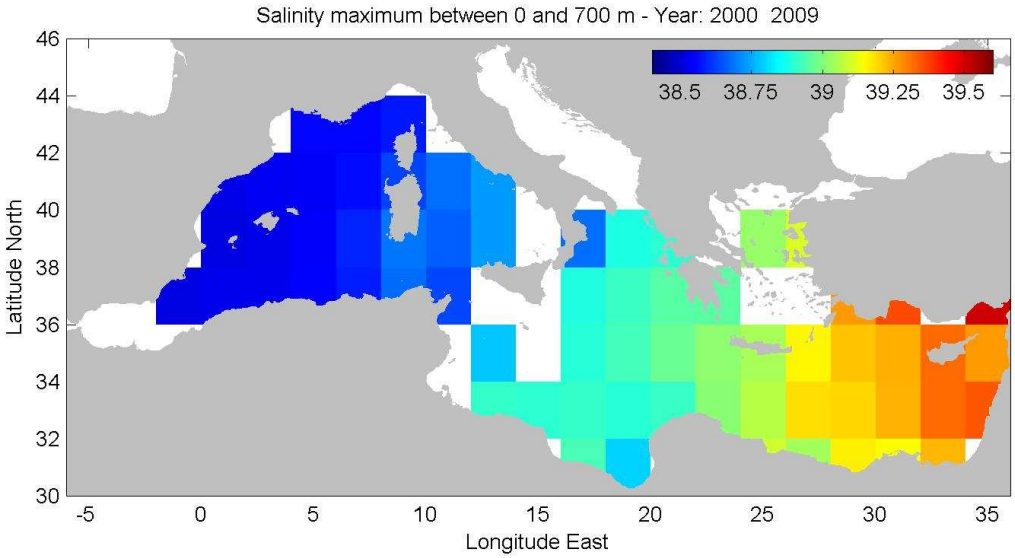

Figure 2. Ten year (2000-2009) mean value of salinity maximum between 0 and 700 meters in the Mediterranean Sea.