# SURFACE CIRCULATION AND WATER MASSES PROPERTIES IN THE SICILY CHANNEL IN 2005-2006

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**Abstract**

An investigation, including repeated CTD casts (more than 90 profiles), seasonal deployments of surface drifters (31 units) and satellite SST images, was carried out between September 2005 and fall 2006 in the Sicily Channel. Preliminary results, particularly those concerning the spatial and temporal variability of the AW and its dynamics, are presented.

*Keywords : Temperature, Salinity, Remote Sensing, Circulation, Sicilian Channel.*

Introduction

It is well known that the Sicily Channel general circulation consists of a two layer system: the surface layer with Atlantic Water (AW) flowing eastward into the Eastern Mediterranean basin, and the subsurface layer of Levantine Intermediate Water (LIW) outflowing westward into the Western Mediterranean basin. The AW circulation is characterized by a substantial mesoscale variability [1]. Recently [2] have described qualitatively the general circulation of the area characterized by a main path of the AW as Atlantic Ionian Stream (AIS) which is strongest and most widely spread in summer. In winter this current is weaker and presents a different meandering while on the other side of the Channel the Atlantic Tunisian Current (ATC) becomes more energetic [3]. In general, the ATC has not been very well studied because of the scarcity of data in the Tunisian side. As a part of the EGYPT/EGITTO project, seasonal experiments were carried out in the Sicily channel, and particularly in the Tunisian side, in order to study the surface circulation features. A comparison between *in situ* sea surface temperature (SST), satellite-derived SST images and Lagrangian drifter trajectories between September 2005 and October 2006 is presented.

Data and Methods

The present work is based on a total of 90 CTD casts (Fig.1), measured with high spatial resolution during 4 cruises (November 2005, May, August and October 2006) carried out onboard the R/v Hannibal, 31 surface drifters equipped with a drogue centred at 15 m depth released between Cap Bon (Tunisia) and Mazzara del Vallo (Sicily, Italy) during 5 deployment episodes (September 2005, November 2005, February 2006, May 2006 and October 2006). The timing of these deployments, from research vessels (R/V Hannibal, R/V Urania) and ships of opportunity (Medmar fand GNV ferries) was chosen to explore the seasonal variability of the surface currents in the area. Daily SST composite images of the Sicily Channel were created using AVHRR data collected by a TeraScan satellite System located at OGS (Trieste, Italy).

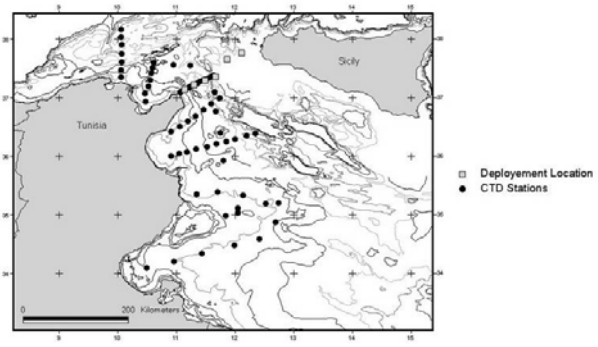


Fig. 1. The location of CTD measurements and drifter deployments in the Sicily Channel from September 2005 to October 2006.

Results

The distribution of temperature and salinity shows the presence of AW close to the Tunisian coast with absolute minimum of salinity equal to 37.1. The temperature is characterized at the surface by a larger variability due to the atmospheric forcing but we can identify the permanent presence of cold water at 150 m depth (Fig.2) close to the Tunisian slope [4], which is the signature of the Winter Intermediate Water (WIW) identified by [5]. The comparison between the spatial distributions of temperature, salinity and density in 50 m depth obtained in August and October 2006 shows a strong north-south gradient, which confirms that the AW features change greatly all along the Tunisian coast and between the seasons. The analysis of hydrographic data, satellite SST, and Lagrangian drifter trajectories between September 2005 and October 2006 shows that the surface circulation in the Sicily Channel is under the influence of strong variability, and that the path of the AW current follows several cyclonic structures. Indeed, the instability of the surface current at the entrance of the Sicily Channel is confirmed. The AW path presents different scenarios. This variability is not only explained in terms of the atmospheric forcing and the complexity of the bathymetry, but also by the path of the LIW. Indeed we were able to demonstrate interference between the two water masses, very influenced by wind forcing in this area [6]. This preliminary analysis of combined data confirms the existence of the ATC flowing along the Tunisian coast, and shows a change in its hydrological characteristic along the coast.

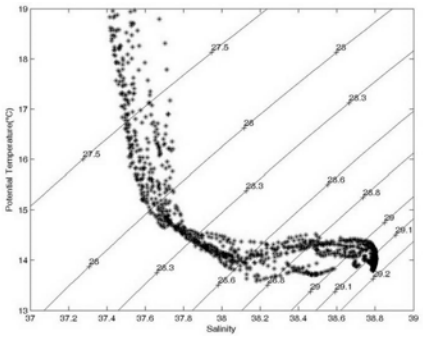


Fig. 2. $\theta$-S diagram from the August 2006 hydrographic data.

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