NEW ELEMENTS ON THE SURFACE CIRCULATION IN THE EASTERN BASIN OF THE MEDITERRANEAN

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Abstract
An intensive survey of the circulation in the eastern basin of the Mediterranean is currently underway. One of the goals is to settle the controversy about the surface circulation main path, depicted either as first meandering offshore across the basin ("Mid-Mediterranean Jet"), or as a counter-clockwise circuit along the slope at the basin scale. Observations (both in situ and remotely sensed) focussed mainly on the southern part of the basin, where only a few in situ observations -if any- were available, and on sampling mesoscale eddies. The first results of the programs EGYPT and EGITTO, initiated in September 2005 and expected to last till mid-2008, are presented.
Keywords : Circulation, Circulation Experiments, Eastern Mediterranean, Mesoscale Phenomena, Remote Sensing.

Historical schema and the most recent ones [1,2] depict a circulation of the Atlantic Water (AW) as a counter-clockwise circuit at basin scale, while the schema issued from the POEM experiment (1985-1995) depict a jet first meandering offshore across the basin (the "Mid-Mediterranean Jet"), before splitting, west of Cyprus [3]. This is partly due to the fact that in situ observations are very scarce in the southern part of the basin, and that the role of the mesoscale phenomena has been misinterpreted. The programs EGYPT (Eddies and GYres Paths Tracking; http://www.ifremer.fr/lobtln/EGYPT) and EGITTO (http://doga.ogs.trieste.it/sire/drifter/egitto_main.html) have been designed to acquire observations (both in situ and remotely sensed), from late 2005 to mid-2008. To date, 3 transits (EGITTO-1, Nov. 2005, EGYPT-0, Feb. 2006, and EGITTO-2, Oct. 2006) and one campaign (EGYPT-1, Apr. 2006) have allowed deploying 7 moorings equipped with 30 currentmeters and 10 hydrological probes, 81 surface drifters and 12 Argo profilers. Over 220 XBT and 125 CTD casts have been made, with a sampling interval ranging from 10 to 20 km at most (figure 1). Surface temperature and salinity were recorded underway, as well as ADCP current. Whenever possible, routes and sections were chosen in near-real time according to the mesoscale features detected on satellite images. During the transit EGITTO-1 5 eddies were sampled in the southern part of the basin, 2 during EGYPT-0, and 1 during EGITTO-2. During the campaign EGYPT-1 2 eddies were sampled with XBTs in the southern Ionian, and a dense CTD network was designed to sample a Libyan eddy (LE) centred near 33°30'N and 23°30'E (diameter 100 km), as well as the eddy Ierapetra-2005 (I-2005), centred around 33°30'N and 26°E (diameter 150 km). A transect across the whole basin from the Libyan to the Cretan shelves across LE has also been performed. Additional observations will be acquired during a transit from the Cretan to the Libyan shelves in Mar. 2007 (at least 5 surface drifters will be launched), and during the final campaign EGYPT-3 in 2008 (recovering of the mooring network).

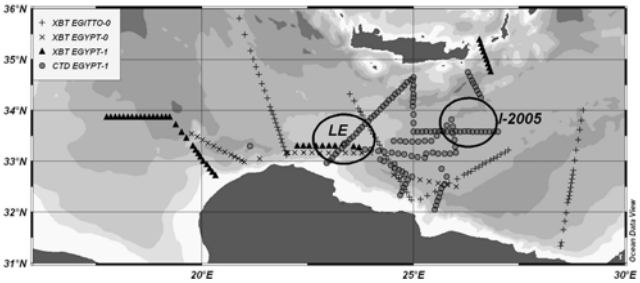

Fig. 1. Sampling stations during EGITTO and EGYPT cruises.

Results
It is shown that thermal infrared (colour not excluded) satellite images can be efficiently used to detect and track eddies in the eastern basin too. All eddies have vertical extents >few 100s of meter at least (>1000 m for LE and I-2005, see Beranger et al., this issue, for more details). Recent AW was entrained inside and around LE, the less saline water (<38.4) of the transect being found on its northern edge. The CTD section from the Libyan to Cretan shelves across LE showed that recent AW was found only in and around LE. Drifters trajectories can be diverted sharply offshoreward by eddies located along the southern slope. This explains the occurrence of recent AW found associated with a northward current on the western side of I-2005: although I-2005 was in the central part of the basin, a coastal eddy upstream was diverting the AW flow offshore in a paddle-wheel-like effect. Most of the eddies are very coherent, so that several of the surface drifters seeded inside eddies remained trapped for months. This happened with I-2005 and with LE, which has been tracked drifting westward from April to October 2006 at least.

Conclusion
On the whole, and as shown also by Gerin et al. (this issue), the surface current is flowing eastward along the continental slope off Egypt and northward along Israel and Lebanon. Since there is a general agreement on the circulation (alongslope too) in the northern part of the basin, these results tend to favour the hypothesis of a surface circulation alongslope at basin scale, which is also comforted by some models ([4], and Beranger et al., this issue). However, mesoscale phenomena can locally and temporarily modify it (up to reverse it), and are responsible for the dispatching of recent AW offshore.

Note: EGYPT-EGITTO contributors are C. Millot and G. Rougier (LOB, CNRS/Université de la Méditerranée, La Seyne, France.), J.-L. Fuda (COM, CNRS/Université de la Méditerranée, Marseille, France), P.-M. Poulain, R. Gerin, E. Mauri and G. Notarstefano (Istituto Nazionale di Oceanografia e di Geofisica Sperimentale, Trieste, Italy), M. Emelianov, A. Julià and J. Font (Institut de Ciències del Mar, CSIC, Barcelona. Spain), C. Guillerm (INSU/CNRS Division Technique, Brest, France), A. El Gindy (Alexandria University Department of Oceanography, Alexandria, Egypt) and M. Said (National Institute for Oceanography and Fisheries, Alexandria, Egypt).

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