HYDROCHANGES: FIRST RESULTS AND PERSPECTIVES

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Abstract
Five years after its launching, the CIESM HydroChanges hydrological monitoring program (see www.ciesm.org/marine/programs/hydrochanges.htm for full partnership and details) has become routinely operational in most selected sites. An overview of the first scientific results is presented here.
Keywords : Hydrology, Time Series, Monitoring.

HydroChanges was initiated in 2002, following a dedicated workshop organised by CIESM. At each site, θ and S time series such as the ones shown on Fig. 1 and Fig.2 (S not shown for clarity) are collected, most often completed by current measurements. Even though the program is in its early stage, several papers partly or entirely based on HydroChanges data are presently under review or published by individual partners.At Gibraltar, Millot *et al* [1] first compared the Jan 2003-Apr 2004 θ and S time series sampled at 270 m in the deepest part of the Camarinal sill (Fig.1b) with all the historical data collected there since the '60s.They concluded that the deepest outflowing waters have been continuously changing from the mid-1990s, θ and S now being much warmer and saltier (+0.3°C and +0.06) than 20 years ago. They ascribed these changes to modifications of the outflow composition from [LIW-TDW-WMDW] to [LIW-TDW] only (TDW being a varying mixture of eastern EOW and western WMDW) and invoked the EMT as a possible cause for this dramatic evolution.

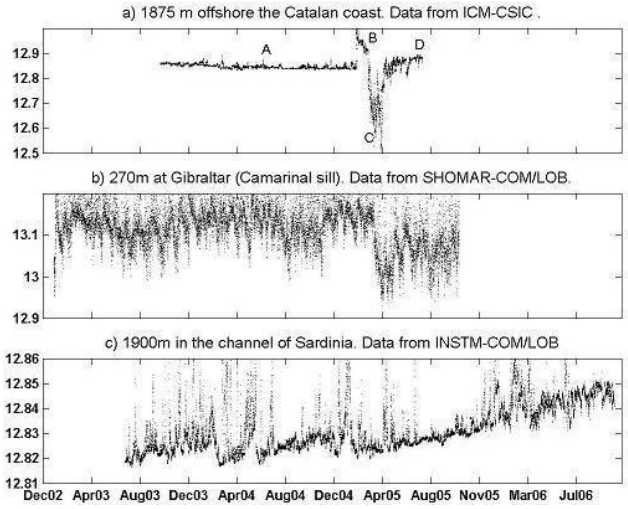

Fig. 1. θ time series collected in the western basin.

Analysis of the remaining Apr 2004-Oct 2005 data showed that the densest part of the outflow markedly changed near mid-Apr 2005 becoming again "more western than eastern" (Fig. 1b) [2]. Millot [2] also notes a significant increase of the inflow's salinity (at 80 m) of ∼0.05/year over the 2003-05 period and points out that salinification of AW was rarely considered for explaining the long-term historical trends observed in the whole sea. Another mooring maintained by UM at Gibraltar's Espartel sill, the "last gate" of outflowing waters to the Atlantic, has been operating since Oct 2004. It supports a SBE37 at 355 m, coupled with an upward-looking ADCP. According to García-Lafuente *et al* [3], the Oct 2004-Oct 2006 θ and σ_θ time series show a seasonal cycle with relatively warm and light waters outflowing in winter (with maximum volume transport in April). These features are linked by the authors to WMDW formation, supposed to replenish the deep western basin by the end of winter and thus to rise the interface between WMDW and the above waters. The saw-tooth pattern observed on the records (rapid cooling in winter and subsequent slow warming) is found consistent with this interpretation.
In the NW Med, the SBE37 and currentmeter deployed at 1875 m by ICM-CSIC recorded effects of WMDW formation and shelf-cascading during winter 2005. From Oct 2003, θ and S were found almost constant without any seasonal signal. They suddenly increased at the end of Jan 2005, dropped again in early Mar 2005 and displayed rapid fluctuations during ∼1 month before reaching new stable characteristics in Apr 2005. According to Font *et al* [4], the resulting water is a mixture of newly-formed anomalously warm and saline WMDW ("B" on fig. 1a) and of water resulting from an intense and persistent shelf cascading process ("C"). Font *et al* also note that the sudden variations in late January and early March preceded the dramatic changes in the structure of deep CTD profiles observed in the NW Med in spring 2005 by Schröder *et al* [5] who found a clear correspondence between this evolution and the propagation of the EMT signal from Sicily to the NW Med (Fig.2).

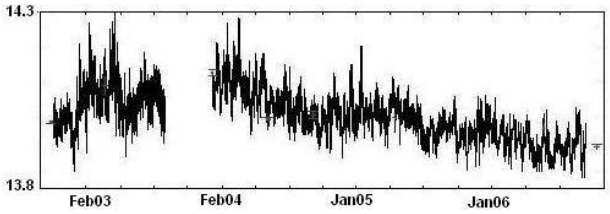

Fig. 2. θ time series collected at 450m in the western sill of the channel of Sicily by ISMAR-CNR. The highest θ and corresponding S (not shown) evidence a remarkable input of heat and salt in the western Med [5].

We trust that links between time series collected in the western basin can be established. We will present a preliminary analysis during the congress, as a starting point for further discussion among HydroChanges partners.

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