

TAIPro-2016 cruise

A Tyrrhenian and Algero-Provençal component of the MedSHIP programme

Project Acronym & Title: TAIPro 2016, a Tyrrhenian and Algero-Provençal component of the MedSHIP programme

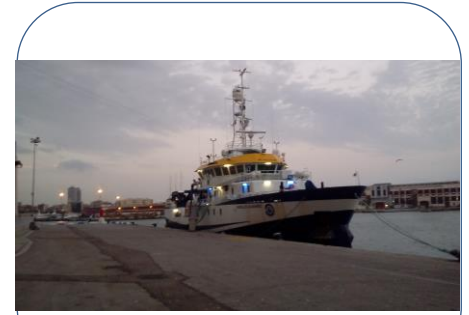
Area: Western Mediterranean Sea and Tyrrhenian Sea

Research Vessel: RV Angeles Alvariño, IEO, Spain

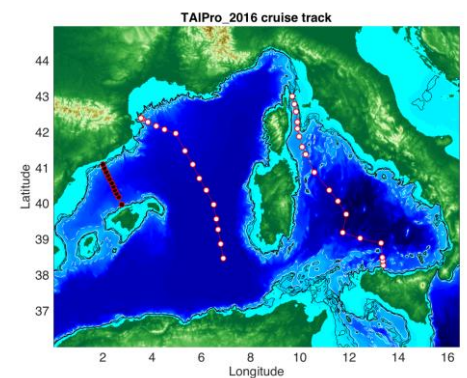
Chief scientist: Loïc Jullion, Mediterranean Institute of Oceanography, France

Other project partners: ISMAR (www.ismar.cnr.it), GEOMAR (www.geomar.de), LOV (<http://lov.obs-vlfr.fr/>), IEO (<http://www.ieo.es/>)

Date: 18-28 August 2016



RV Angeles Alvariño



Loïc Jullion
TAIPro 2016 Chief Scientist

Loïc Jullion, Mediterranean Institute of Oceanography, France

“The TAIPro cruise, together with two other cruises funded by EUROFLEETS2, will be the cornerstone of the Mediterranean repeat hydrographic survey program MedSHIP that will allow to monitor the evolution of the physical and biogeochemical state of the Mediterranean Sea. The collaborative scheme of EUROFLEETS allowed to bring together experts from 4 European countries, thus allowing to collect a state-of-the-art data set that will be freely available to the community.”

Main objectives

The global oceanic Meridional Overturning Circulation (MOC), its influence on our climate and on the oceanic productivity depend critically on how water masses transport heat, freshwater, carbon dioxide and nutrients around the ocean and how these water masses mix with each other. Changes in the MOC have been shown to play key role climate variability at mid- to long-time scales (decadal and longer). Changes observed in the properties of the oceanic water masses around the globe raise important questions about the sensitivity of the MOC to anthropogenic climate changes and the potential feedbacks on the climate and ocean biogeochemistry and ecosystem functioning. In this context, the GO-SHIP Program (Global Ocean Ship-based Hydrographic Investigations Program), created in 2007, aims at promoting and coordinating repeat hydrographic investigation on the global scale in order to provide approximately decadal resolution of the changes in inventories of heat, freshwater, carbon, oxygen, nutrients and transient measurements of the highest required accuracy to detect these changes. The time scales of the MOC circulation (100s to 1000s of years) necessitate sustained observing systems such as GO-SHIP maintained over very long time periods in order to differentiate anthropogenic variability from the natural variability of the climate system.

The Mediterranean Sea is in many ways a miniature ocean. It has deep-water formation varying on interannual time scales and a well-defined overturning circulation, and there are distinct surface, intermediate and deep water masses circulating between the western and the eastern basin. What makes the Mediterranean particularly useful for climate change studies is that its time scale is much shorter than for the global ocean, with a turnover time of roughly 60 years compared with more than 500 years for the global ocean. Changes can happen faster, on the time scale of a human lifetime. Numerical model studies suggest important changes in the Mediterranean Overturning Circulation driven by anthropogenic forcing. Thus the Mediterranean is useful as a laboratory for documenting changes within it (and hence anticipating similar changes in the global ocean) and for understanding the role of key processes involved in climate change (thus to make inferences on those processes on the global scale). Despite the importance of the Mediterranean Sea, the absence of coordinated repeat hydrographic sections covering the entire basin limits our ability to observe physical and biogeochemical changes. To fill this observational gap, Mediterranean marine scientists have designed a plan involving 5 hydrographic sections on which comprehensive physical and biogeochemical properties will be measured to highest international standards on a regular basis: there are 2 north-south sections in each of the eastern and western Mediterranean and a long, zonal section from the Strait of Gibraltar to the easternmost Mediterranean.

TAIPro-2016 represents the Western Mediterranean basin component of the MedSHIP initiative (composed of three proposals funded by EUROFLEET2, CRELEV-2016 in the Eastern Mediterranean Sea led by Giuseppe Civitarese and ESAW in the Central and Southern Adriatic Sea led by Vedrana Kovacevic). The cruise occupied three meridional sections: one across the relatively flat and deep Algero-Provencal basin, one across the deep and rugged Tyrrhenian Sea and one across the Catalan Basin.

There are 2 primary objectives for the TAIPro cruise:

- 1) Monitor the changes in physical and biogeochemical properties.
- 2) Observe changes in the circulation: How often and how much deep water is formed. Are the currents changing in position and strength?

Work progress and main achievements

TAIPro-2016 (A component of the MedSHIP program)

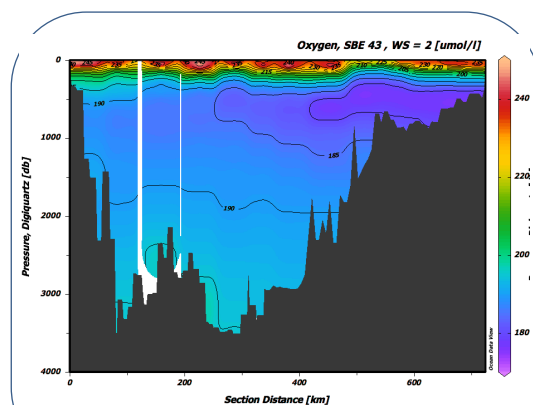
During this cruise, the ship stopped at specific locations (the dots on the map above). At each station, we measured:

- 1) the thermohaline properties of Mediterranean water masses at the basin-scale;
- 2) the concentration in nutrients, and oxygen;
- 3) the Dissolved Inorganic Carbon (DIC) storage in the Western Mediterranean Sea;
- 4) the changes in the ventilation of the deep and intermediate water masses thanks to the transient tracers (CFCs and SF6);
- 5) the concentration in dissolved barium, nitrogen and oxygen isotopes;
- 6) the profile of ocean velocity

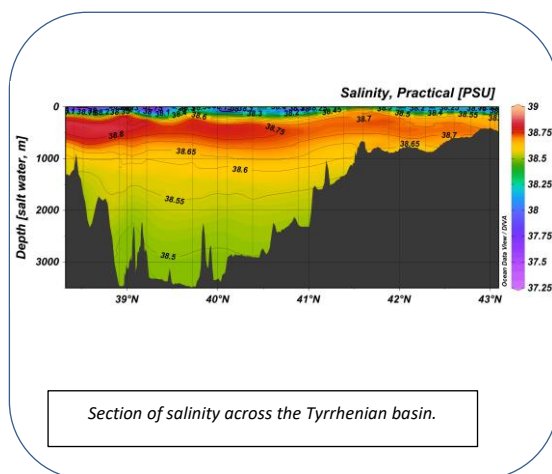
Most of the parameters were measured onboard (except nutrients, isotopes of dissolved barium, oxygen and nitrogen that will be measured in the lab). The figures on the right show

We also collected underway data (meteorological data, surface temperature, salinity, upper ocean velocity and bathymetry).

All the data will be freely available at: <http://cdiac.ornl.gov/> and <http://cchdo.ucsd.edu/>



Section of oxygen concentration across the Tyrrhenian basin.



Section of salinity across the Tyrrhenian basin.

For more information: <http://www.loicjullion.net/TAIPro.php>

<http://www.go-ship.org>