JERICO

Application for Transnational Access

to Coastal Observatories

Description of the project (to be provided in pdf format)
Please contact the manager of the infrastructure/installation you wish to use before writing the proposal

PART 1: User group details

Indicate if the proposal is submitted by

O an individual
x a user group

Information about the applicants (PI and project partners)

Principal Investigator (user group leader)

Title Dr Name and Surname Laurent Coppola

Gender x Male O Female

Institution Observatoire Oceanographique de Villefranche/Mer

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Fax +33493763992

Project partners

(repeat for each partner of the group)

Partner # 1

Title Dr Name and Surname Dominique Lefevre

Gender x Male O Female

Institution Mediterranean Institute of Oceanography

Department / Research Group UMR 7294

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Country France

email Dominique.lefevre@univmed.fr

PART 2: Additional information about the applicant(s) expertise

Expertise of the group in the domain of the application

The group is expert on oceanic time series and biogeochemical water processes in the Mediterranean Sea. The group is focusing, in particular, on dissolved oxygen concentration and its variability in the water column.

Short CV of the PI

Laurent Coppola, Ph.D, is researcher in marine science, with 10 years of experience in marine biogeochemistry and a particular interest for marine particles fluxes, water mass circulation and biogeochemical properties. He is the chief scientist of the Dyfamed site and involved in the MOOSE (Mediterranean Ocean Observing System) French network. Laurent Coppola is also partner in the EMSO network. He has experience of EU funded projects (EUROSITES, JERICO, PERSEUS) including in particular his role of WP leader in the FP7 Collaborative Project EUROSITES. Laurent Coppola is also scientific steering committee member of the international eulerian network OCEANSITES.

A list of 5 recent, relevant publications of the participant(s) in the field of the project

P. Zunino, K. Schroeder, M. Vargas-Yáñez, G.P. Gasparini, L. Coppola,
M.C. García-Martínez, F. Moya-Ruiz. 2012. Effects of the Western Mediterranean Transition on the resident water masses: Pure warming, pure freshening and pure heaving. Journal of Marine System in press

Heimbürger L-E, Lavigne H., Migon C., Coppola L., D'Ortenzio F., Miquel J-C. and Estournel C. Interannual variability of the mass flux at the DYFAMED time-series station (Ligurian Sea). DSRII. In revision

K. Schroeder et al. Long-term monitoring of the hydrological variability in the Mediterranean Sea: the HYDROCHANGES network. In preparation.

PART 3: Detailed scientific description of the project

List the main objectives of the proposed research
(one page maximum)

Integration of the dissolved oxygen concentration in the long term time series data in the Ligurian basin to track the water mass variability, the impact of the water mass change on the oxygen content and to estimate the time lag between the eastern (Corsica Channel) and the western (Dyfamed) part of the Ligurian Sea.

Give a brief description of the scientific background and rationale of your project
(one page maximum)

Long-term monitoring of hydrological parameters (temperature and salinity), collected as time series with adequate temporal resolution in key-places of the Mediterranean Sea constitute a priority in the context of global warming. In the North-Western Mediterranean Sea, long term time series of potential temperature and salinity have shown a real increase in the Western Mediterranean Deep Water (WMDW) and in the Levantine Intermediate Water (LIW) comparable to the EMT for the deep waters especially since 2005 where deep convection in NW basin has been intensified (Béthoux et al. 1998, Millot et al. 2006, Schroeder et al., 2008). This change induced an uplifted of the old water mass by several hundreds of meters in almost the whole western basin, inducing an abrupt increase in the deep heat and salt contents, and a change in the deep stratification creating a new deep water mass spreading the whole western basin. This new deep water induces also higher dissolved oxygen concentrations (Schroeder et al. 2010) that could influence the deep marine ecosystem. However, oxygen concentrations remain poorly observed and represent a gap for our understanding on the water mass change and its consequences on biogeochemical processes.

The Ligurian Sea is one of the two important sub-basins of the WMED. It represents the connection between the Tyrrhenian Sea and the Gulf of Lion. It is characterized by a basin-scale cyclonic circulation with strong currents around its edge, the Northern Current flowing close to the Italian and French coasts and the western Corsica Current (Astraldi and Gasparini, 1992), flowing west of Corsica (figure 1). This cyclonic gyre has been attributed to geostrophic adjustment to winter deep-water formation (Crépon et al., 1989) and the influence of cyclonic wind stress curl (Herbaut et al., 1997). In this region two deep moorings monitor the water mass variability: the Dyfamed site (43°25N, 7°52E) and the Corsica Channel (43°02N, 9°41E). Both moorings showed in 400m depth (LIW level) a rapid increase in potential temperature following by a rapid decrease, suggesting dramatic changes occurring over recent years (figure 2). Herrmann et al. (2010) suggested that the absence of DWF events during the milder '90s have favoured the progressive accumulation of heat and salt in the intermediate layer, which then have been transferred to the new deep waters formed in early 2005 (Schroeder et al., 2010; Zunino et al., 2012).

Our objectives here is to add oxygen measurements at the Dyfamed (DYF) and the Corsica Channel (CC) sites by implementing an oxygen sensor (optode) in order to be able to trace the water mass variability and to estimate the time lag between both sites.

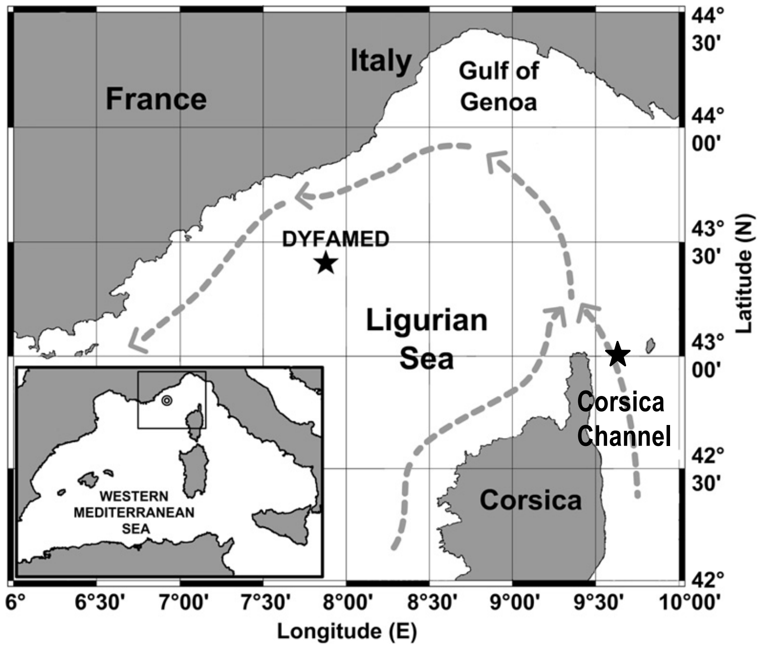


Figure 1. Location of DYFAMED and CORSICA Channel sites with the main LIW circulation (from Millot and Taupier-Letage 2005)

Figure 2. Potential temperature evolution at 400m depth in the Sicily Channel (above), the Corsica Channel (middle) and DYFAMED (below).

Astraldi M., and Gasparini G.P., 1992. The seasonal characteristics of the circulation in the North Mediterranean Basin and their relationship with the atmospheric-climatic conditions, J. Geophys. Res., 97, 9531-9540.

Béthoux, J.P., Gentili, B. and Tailliez, D., 1998. Warming and freshwater budget change in the Mediterranean since the 1940s, their possible relation to the greenhouse effect. Geophys. Res. Lett., 25(7), 1023-1026.

Crépon M., M. Boukthir, B. Barnier, F. Aikman III, 1989. Horizontal ocean circulation forced by deep water formation. Part I: an analytical study. Journal of Physical Oceanography, 19, 1781–1792.

Herbaut C., L. Mortier, M. Crépon, 1997. A sensitivity study of the general circulation of the western Mediterranean. Part II: the response to atmospheric forcing. Journal of Physical Oceanography, 27, 2126–2145

Herrmann, M., Sevault, F., Beuvier, J. and Somot, S., 2010. What induced the exceptional 2005 convection event in the Northwestern Mediterranean basin? Answers from a modeling study. J. Geophys. Res., 115(C12051), doi:10.1029/2010jc006162.

Millot, C. and Taupier-Letage, I., 2005. Circulation in the Mediterranean Sea. The Handbook of Environmental Chemistry, K, 29 - 66, doi:10.1007/b107143

Millot, C., Candela, J., Fuda, J.-L. and Tber, Y., 2006. Large warming and salinification of the Mediterranean outflow due to changes in its composition. Deep-Sea Res., 53(4), 656-666, doi:10.1016/j.dsr.2005.12.017.

Schroeder K., Ribotti A., Borghini M., Sorgente R., Perilli A. and Gasparini G.P., 2008. An extensive western Mediterranean deep water renewal between 2004 and 2006. Geophys. Res. Lett., 35 (L18605): doi: 10.1029/2008GL035146.

Schroeder, K., Josey, S.A., Herrmann, M., Grignon, L., Gasparini, G.P. and Bryden, H.L., 2010. Abrupt warming and salting of the Western Mediterranean Deep Water after 2005: atmospheric forcings and lateral advection. J. Geophys. Res., doi:10.1029/2009jc005749.

Zunino P., Schroeder K., Vargas-Yáñez M., Gasparini G.P., Coppola L., García-Martínez M.C and Moya-Ruiz F., 2012. Effects of the Western Mediterranean Transition 1 on the resident water masses: pure warming, pure freshening and pure heaving. Journal of Marine Systems, doi: j.jmarsys.2012.01.011.

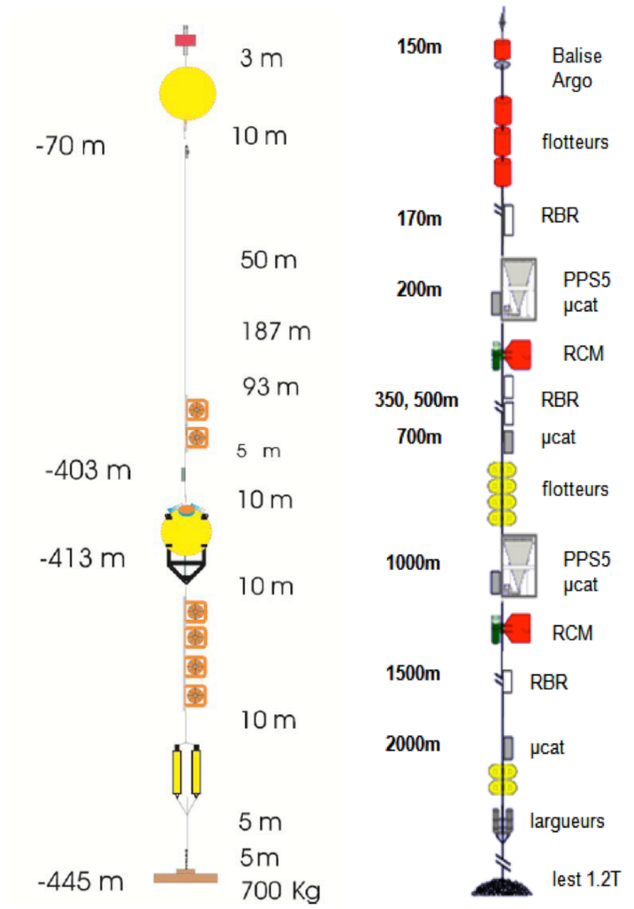
Present the proposed experimental method and working plan

(one page maximum)

The DYFAMED site (2350m depth) and the CORSICA Channel (445m depth) are permanently monitored since 1988 and 1985 respectively to observe the water masses evolution and more specifically the shift of the LIW property due to the climate change. These observations are done through fixed moorings regularly maintained to record temperature, salinity and currents data. Since 2005 and 2009, the CC and DYF moorings are respectively equipped with precise sensors Seabird SBE37 (0.001°C). Both moorings are maintained every year through annual/semi-annual scientific cruises in order to collect T-S data, to clean and to calibrate the sensors and to repair the mooring line (figure 3).

Here, the objective is to install on oxygen optical sensor (optode 4330 Aanderaa) on the Corsica Channel mooring at 400m depth as it will be done from 18 to 27 July 2012 (cruise MOOSE GE) at the Dyfamed mooring (400m and 2000m). The implementation of the DO sensor can be done during the Urania cruise which is planned by CNR from 16-25 November 2012 to maintain moorings in the Tyrrhenian Sea, the Sicily strait and the Corsica Channel.

Figure 3. Design of the CC (left) and DYF (right) moorings



The optode sensor fits to the long term monitoring, as the data drift is very low and the data accuracy higher than other chemical sensor. The optode will record the dissolved oxygen concentration every 6min through a data logger equipped with lithium battery. This sensor will be preliminary calibrated in laboratory with Winkler titration and during the cruise before and after the mooring deployment (in situ calibration). The DO sensor in CC will be deployed for 2 periods of 6 months to be consistent with the DYF site (where data are collected every 12 months). Data will be recovered, validated with Winkler titration, and analysed together other parameters measured in the site after each period.

The user team and the CNR team in La Spezia will meet twice, after the first six months for data treatment/interpretation and after one-year for common analysis of data from the CC and DIF sites.

Indicate the type of access applied for

x remote *(the measuring system is implemented by the operator of the installation and the presence of the user group is not required)*

O partially remote *(the presence of the user group is required at some stage e.g. installing and un-installing)*

O in person/hands on *(the presence of the user group is required/recommended during the whole access period)*

Indicate the proposed time schedule including expected duration of access time ***(half a page maximum)***

(18 to 27 July 2012: deployment of the DO sensors on the DYF site)

16-25 November 2012: deployment of the DO sensor in the CC site

May/June 2013: collect of the DO sensor and data acquisition, DO sensor in situ calibration (Winkler titration) and re-deployment of the DO sensor for the next 6 months

July 2013: collect of the DO data from the DYF site and comparison between both sites (in term of T, S, currents and DO data)

Host infrastructure

Indicate the type(s) of JERICO host facility(s) you are interested in
(Tick more than one if it is useful for your project)

O ferrybox x fixed platform O glider O calibration laboratory

Indicate the specific JERICO host facility(ies) you wish to choose

Corsica Channel mooring (CNR-ISMAR)

Explain briefly why you think your project will be best carried out at the specified host facility(ies)

The Corsica Channel is a strategic site where a branch of the LIW is passing through before reaching the DYFAMED site (cyclonic circulation). From previous time series data, a time lag has been observed in term of T-S change in the LIW level. To solve this issue, regular and long term oxygen measurements might give us a good opportunity to understand and to estimate accurately this time lag. This also gives us the possibility to quantify the variability of the LIW property due to the climate change already observed in the Mediterranean Sea.

If possible, list other JERICO facility(ies) where you think your experiment could alternatively be carried out

None. This proposal should be done in the Corsica Channel fixed platform

Additional information

Is there a facility similar to the one you wish to utilize in your country?

O Yes x No

If yes, please indicate your reasons for requesting access to the JERICO facility you have chosen

Have you already submitted an Access Proposal to any of the participating facilities under this or previous EU Programs?

O Yes x No

If yes, please indicate the name of the institution, submission date and reference number for each such proposal

Is this a resubmission of a previously rejected proposal? *(Select "yes" if this application is a revised version of a proposal submitted to JERICO before that was rejected by the Selection Panel)*

O Yes x No

If yes, please give the exact reference number and submission date. Kindly describe briefly the changes made in comparison to the rejected version.

Is this a continuation of an earlier project funded under a previous call for Transnational Access in JERICO at the same facility?

O Yes x No

If yes, please give the exact reference number and submission date. Kindly indicate also what has been achieved in the previous experiment and the reasons why the objectives have not been fully met.

PART 4: Technical information

Wherever possible, please specify your requests regarding the use of your chosen facility's equipment/instruments/sensors, including any additional services, data or other requirements.

The operator of the installation is requested to do water sampling and Winkler titration before and after the DO sensor deployment in order to calibrate in situ the oxygen data from the optode.

List all material/equipment you plan to bring to the JERICO facility (if any):

One optode sensor Aanderaa
One data logger with Li battery (Squidd)

Please provide a detailed and realistic budget for the expenses you expect to incur for travel/boarding and the shipment of equipment, if applicable in your case *(note that a maximum of two travel grants will be assigned to each user group, depending on the length of the requested period of stay)*.

Shipment of equipment (two ways) = 300 euros x 2 (to CNR and than back home)

Travel/visit to CNR for **2 scientists x 5 days** for data treatment/interpretation after 6 and 12 months = **3000 euros**

Please tick the appropriate boxes and give detailed information for the kind of risks associated with your proposed activity

x Chemical : no chemical risk or contamination (optical sensor)
☐ Biological :
☐ Radiological :
☐ Other :

JERICO

Date of compilation 2th April 2012

Signature of the PI ____________________

Signature of an appropriate authorised person
(e.g. Head of Department, Research Office) ____________________

P/O le Directeur

Grégory Maggion
Secrétaire Général OOV

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This section reserved to the JERICO TNA Office

Date of proposal receipt by email ____________________

Assigned reference number ____________________

Signature of receiving officer ____________________