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 _Prof. Name and Surname MELCHOR GONZALEZ-DAVILA

Gender x Male O Female

Institution __UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA_____

Department / Research Group _______QUIMA GROUP_________

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Project partners
(repeat for each partner of the group)

Partner # 1

Title _Prof. Name and Surname J. MAGDALENA SANTANA CASIANO

Gender O Male X Female

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Department / Research Group ______QUIMA GROUP_______________

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email ____JMSANTANA@DQUI.ULPGC.ES

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

Expertise of the group in the domain of the application

The QUIMA group is responsible for the monthly determination of the carbon dioxide system at the European Station for Time-Series at the Ocean in the Canary Islands, ESTOC, from October 1995.The ULPGC-QUIMA has participated in the EU CANIGO project (1996-1999), collaborated with the EU ANIMATE project (2001-2004), member of the EU CARBOOCEAN project contributing with a new VOS (volunteer observing ships) line between UK and South-Africa to the Atlantic Observing System (2005-2009) and EU EUROSites (2008-2010) project in charge of the carbon system study in the ESTOC site and developing a new pH sensor. A pH sensor is deployed at the ESTOC buoy from 2009. Nowadays, QUIMA is involved in the EU CARCHANGE project (2011-2015) in charge of pH and pCO2 sensors in ESTOC and the QUIMA VOS line. Member of the French Project POMME 2000-2002 (programme Océanmultidisplinaire Mezzo Echelle) studying the carbon dioxide system in the Central Atlantic Ocean and in the GOOD-HOPE project inside the Polar Year 2007 French contribution in the South Atlantic Ocean. A new collaboration with the Shirshov Institute of Oceanology of Moscow has been established studying the carbon system along 59.5ºN after 2009.

Short CV of the PI

Professor in Marine Chemistry from 1984 at the Faculty of Marine Science and Full Senior Professor from 2010. From February 2012, Dean of the Faculty of Marine Science. Dr. in Physical Chemistry in 1987 with 5 stays with a total of 27 months of research at the RSMAS, University of Miami collaborating with Prof. Frank J. Millero in Marine Physical Chemistry and more than 10 collaborative papers. More than 80 ISI paper in international publications and more than 100 oral and poster presentations in international congresses related with Marine Chemistry. Has participated has PI in 10 National and regional competitive projects and in 5 EU projects: CANIGO, ANIMATE; CARBOCHANGE, EUROSITES and CARBOCHANGE and in international research programs POMME, PICASSO, BONUS GOOD-HOPE, CLIVAR 59.5ºN. From 2008, member of the scientific steering Committee of the International Ocean Carbon Coordination Project, IOCCP, leading the Time Series Station group.

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

A.J. Watson, U. Schuster, D.C. E. Bakker, N.R. Bates, A.Corbiere, M. Gonzalez-Davila, T.Friedrich, J. Hauck, C. Heinze, T. Johannessen, A. Kortzinger, N. Metzl, J.Olafsson, A.Olsen, A. Oschlies, X. A.Padin, B. Pfeil, J. M. Santana-Casiano, T.Steinhoff, M.Telszewski, A.F. Rios, D.W.R. Wallace, R.Wanninkhof. Tracking the variable North Atlantic sink for atmospheric CO2. Science 326 (5958), 1391-1393 (2009)

M. González-Dávila, J.M. Santana-Casiano, M.J. Rueda, and O. Llinás. Water column distribution of the carbonate system variables in the ESTOC site from 1995 to 2004. Biogeosciences, **7**, 3067-3081, (2010).

J. M. Santana-Casiano, M. González-Dávila. pH decrease and effects on the Chemistry of Seawater. Chapter 5 In: Oceans and the atmospheric carbon content. P. Duarte and J. M.

Santana-Casiano (eds). Springer. 95-114 (2011). DOI 101007/978-90481-9821-4-5.
M. González-Dávila, J. M. Santana-Casiano, R. A. Fine, J. Happell, B. Delille and S. Speich. Carbonate system buffering in the water masses of the Southwest Atlantic sector of the Southern Ocean during February-March 2008. Biogeosciences, 8, 1401-1413, (2011).
T. Friedrich, A. Timmermann, A. Abe-Ouchi, N. R. Bates, M. O. Chikamoto, M. J. Church, J. E. Dore, D. K. Gledhill, M. González-Dávila, M. Heinemann, T. Ilyina, J. H. Jungclaus, E. McLeod, A. Mouchet and J. M. Santana-Casiano. Detecting regional anthropogenic trends in ocean acidification against natural variability. Nature Climate Change. DOI: 10.1038/NCLIMATE1372. (2012).

PART 3: Detailed scientific description of the project

List the main objectives of the proposed research

1. Study the daily, monthly, seasonal and inter-annual pH variability in coastal waters.
2. Determination of the main controlling factors affecting the expected acidification.
3. Correlation with physical, chemical and biogeochemical factors controlling the coastal area.
4. Applicability of the pH sensor in coastal areas and for long deploys.
5. Reinforcement of the relations between institutions working in linked activities.

Give a brief description of the scientific background and rationale of your project

The ocean acidification is a major result of the approximately 80 million tons of carbon dioxide (CO_2) released into the atmosphere every day, as a result of fossil fuel burning and also due to deforestation and production of cement. Carbon dioxide in the atmosphere dissolves in the surface waters of the oceans and it generates important changes in sea water chemistry. CO_2 and water molecules form the weak carbonic acid H_2CO_3. This acid dissociates into hydrogen ions (H^+) and bicarbonate ions (HCO^{3-}). The increase in H^+ ions reduces the *pH* (measure of acidity) and consequently, the oceans acidify. Moreover, part of the CO_2 reacts with carbonate ions (CO_3^{2-}), decreasing its concentration. Numerous marine organisms such as corals, molluscs, crustaceans and sea urchins rely on carbonate ions to form their calcareous shells or skeletons. Today, the carbonate ions are abundant and surface waters are super saturated with respect to aragonite and calcite, the two forms of calcium carbonate in seawater. Acidification plus the decrease in carbonate ion concentration might be catastrophic for calcifying organisms, an important part of the marine food chain and ocean biodiversity.

CO2 uptake by the ocean, and thus ocean acidification, is strongly regional and seasonal variable (Watson et al., 2009). Coastal waters are badly sampled for carbon dioxide and only some CO_2 sensors have being recently deployed along USA coastal waters and North of Europe. One of our pH sensors which have a 0.001 pH unit reproducibility deployed in an important region as it is the east coastal Mediterranean seawater will be a great added value for a) the pH development system, b) the monitoring of ocean acidification in the Mediterranean Sea and c) for the JERICO project.

Present the proposed experimental method and working plan

The pH sensor developed by the QUIMA-ULPGC group can be deployed in any buoy with a power supply of 12-19 V and is able to transmit real time data of pH in total scale at in situ temperature, sea temperature and salinity to the central unit of the buoy. The data can be plotted and be public available as soon they are received and quality controlled (QC) by the QUIMA group or any person who works in carbon dioxide chemistry. Most of the problems are more related to data transfer errors that to pH system reading. The QC is a process that takes not more than some minutes after data reception.

The proposed experimental method consist in fixing the pH sensor to the body of the buoy or to the mooring in the depth range from surface to 10 m, as we are interested at this moment in the variation of pH for surface waters, provide power and receive data. The resolution for the pH reading can be adjusted as indicated by the buoy provider (3 hours at this moment). The values of pH will be related to other parameters determined by sensors deployed together at the buoy as temperature, fluorescence reading as aN indicator of chlorophyll, pCO2 sensor and nutrient sensor.

Working Plan:

Month 1. Development of cables for power supply and communication. Telemetry adjustments in the buoy device in order to include the new sensor

Month 2. Installation of the sensor in the buoy, test of communications and deployment of the buoy. Calibration of sensors and equipments

Month 2-8. Data reception, QC of data, public release, inclusion in the data dissemination web page of the Institution.

Month 8. Recovery of the buoy and sensor, cleaning and testing.

Indicate the type of access applied for

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

X 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 The proposed project will start on July 2012 and will run until March 2013 covering the whole scale of the observed water temperature variability. The exact initiation and termination of the experiment will depend on the availability of the hosting buoy and the R/V that will be used for the deployment. Possible delays could also emerge from the preparatory phase (integration of the sensor on the hosting buoy) and the necessary lab testing.
The calibration experiments will take place at the HCMR calibration lab right after the deployment, requiring approximately 1 month.

Month 1. Telephonic, email and video-conference contacts among researcher groups to define and develop the cables for power supply and communication. Preparation of telemetry adjustments in the buoy device in order to include the new sensor.

Month 2. QUIMA group members at the HCMR for helping in installation of the sensor in the buoy, test of communications and deployment of the buoy. Expected time 7-10 days. Calibration experiments in order to check the accuracy and reliability of the sensors

Month 2-8. After a data is received at the HCRM from the buoy, it will be sent to QUIMA-ULPGC for QC. In the meantime, rough data will be public and after QC the final data will be included in the data dissemination web page of the HCRM. ULPGC will receive also the full data set provided by the buoy. However, the owner of the full data set will be HCRM.

Month 8. QUIMA group members at the HCMR for helping in the recovery of the buoy and sensor, cleaning and testing. Expected time 7-10 days

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 ● fixed platform O glider ● calibration laboratory

Indicate the specific JERICO host facility(ies) you wish to choose
HCMR Saronicos coastal buoy and HCMR calibration lab in Crete.

Explain briefly why you think your project will be best carried out at the specified host facility(ies)
The Hellenic Centre for Marine Research aims at the systematic and multidisciplinary study, understanding and monitoring of the physical, chemical, biological and geological processes which regulate all aspects of the marine environment and the ecosystems functioning, the ocean-atmosphere and ocean-solid earth interplay and the solid earth dynamics. It has the highest expertices on mooring in the West Mediterranean coastal areas both in mooring design and real time telemetry. The seawater conditions around Creta and Greece coastal areas are one of the most sensible environments with an important sea life very susceptible for ocean acidification and carbonate dissolution problems related to the carbon dioxide increase in seawater. The high seasonal sea temperature cycle together with the primary productive for the area make the West Mediterranean area one of the most sensible for pH records and future climate change. The possibility of this linked activity between HCRM and QUIMA-ULPGC, is of special interes for both institutions: the pH characterization of the area for the HCRM and the applicability of the sensor in different environments, for QUIMA-ULPGC.
The pH sensor developed by the QUIMA-ULPGC group has never been deployed and tested in the oligotrophic environment of the Eastern Mediterranean, while the presence of a pCO2 sensor recently acquired by HCMR will provide a very good opportunity to couple the sensors. Furthermore, HCMR is carrying out routine in situ measurements of pCO2 and pH in the Aegean Sea that can be used as reference / background information for the proposed experiment.

If possible, list other JERICO facility(ies) where you think your experiment could alternatively be carried out
None

Additional information

Is there a facility similar to the one you wish to utilize in your country?
No at this moment

O Yes O 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 QUIMA-ULPGC will need the Saronicos HCMR buoy with the pCO2 sensor installed as well as all the required cabling for a total of 8months.
Additionally the calibration lab will be used for one month after the deployment. For the experiments standard calibration facilities are required ie. Water baths, cables, PC's

List all material/equipment you plan to bring to the JERICO facility (if any):
1 pH sensor with internal temperature sensor included and an external microcats for temperature and salinity record.
1 Alkalinity system for calibration
1 box of empty bottles for sampling and measuring of Total inorganic carbon.

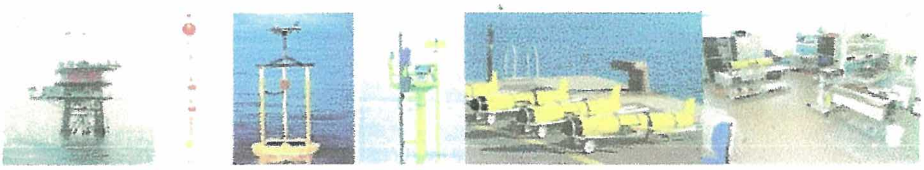
Please provide a detailed and realistic budget for the expenses you expect to incur for travel/boarding and the shipment of equipment, if applicable in your case *(note that a maximum of two travel grants will be assigned to each user group, depending on the length of the requested period of stay)*.
1. Travel to Crete to install the equipment, 2 people, including flight, hotel and subsistence: 2*700+10 days*100+2 people*10*75 = 3900 euros. 10 days to installs and calibrate the equipments
2. Travel de Crete to remove the equipments, 1 people, including flight, hotel and subsistence: 1500. 5 days to remove, recalibrate the equipments and work with data.
3. Shipping cost of 3 boxes with sensor and equipment for calibration plus glass bottle samples : 700 euros

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

- ☐ Chemical :
- ☐ Biological :
- ☐ Radiological :
- ☐ Other :

CAPACITIES

FerryBox



Date of compilation February 16, 2012

Signature of the PI

Signature of the Vice-rector of Research and Innovation of ULPGC (D. Fernando Real Valcárcel)

UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA
El Vicerrector de Investigación, Desarrollo e Innovación

This section reserved to the JERICO TNA Office

Date of proposal receipt by email ______________________

Date of proposal receipt by regular post ______________________

Assigned reference number ______________________

Signature of receiving officer ______________________