Section 1 - Personal data

Personal Data

Title	Dr
Name	Lionel
Surname	Renault
Email	lionel.renault@ird.fr
Position	Experienced researcher (professional researcher, lecturer or higher)
Your Scientific Background	Earth Sciences & Environment
Date of Birth	19/12/1980
Gender	MALE
Nationality	FRANCE
Have you already participated in the past to similar initiatives? or do you have already HPC experience?	No
Participation in the past to similar initiatives (other)	

Section 2: Your Organisation

Your Organisation

University/Organisation	Institut de Recherche pour le Dévelopement (IRD)
Organisation Legal Status	Public Research Organisation
Department	Ocean
Organisation Address	14 Avenue Edouard Belin
Town	Toulouse
Post code	31400
Country	FRANCE

Telephone	0695365506

Your Research Group

Your Research Group	LEGOS
Name of your Group Leader	Alexandre Ganachaud
Email of your Group Leader	alexandre.ganachaud@ird.fr
URL of your research group www page	http://www.legos.obs-mip.fr/

Section 3: Your Visit

When do you plan to come?

Preferred Start Date (dd/mm/yyyy)	15/09/2018
Expected Duration in weeks	13
HPC Access Centre	BSC
HPC Access Centre (secondary choice)	Not defined

Collaboration with host

nº	Host	Contacted This Host?
1.	ESP - Arsouze Thomas - Barcelona Supercomputing Center (BSC)	Yes

Add new host

nº	Host Name	Host Family Name	Host Institute	Host Department	Host Institute Country	Discipline	Host Researcher Telephone	Host Email	Host website	Contacted This Host?

Host collaboration description
This HPC-Europa3 project is expected to be a first step toward both a technical and scientific collaboration between the LEGOS/IRD and the BSC that will beneficiate to both parties. We will first implement and test within the ocean model NEMO two parameterizations of the partial re-energization of the ocean by the atmospheric response to the current feedback to the atmosphere. For both LEGOS/IRD and BSC, I will participate to the production of a set of two oceanic simulations in order to test and validate such parameterizations. I will also bring to the BSC a scientific expertise on mesoscale ocean-atmosphere coupling and on Western Boundary Currents Dynamic by analysing the global coupled simulation carried out by the BSC. The LEGOS/IRD on its side will benefit from me gaining experience on Earth models optimization, running and manipulating very large configurations, and on the expertise of tools developped by the BSC. The simulations produced within this framework will be extremely valuable for the scientific community as they will allow to determine how to best force an oceanic model by mimicking the Ocean-Atmosphere interactions. This collaboration will also open possibilities for developping a global forced oceanic simulation that would used one of the parameterization developped and tested through this project, this would also fully respond to BSC thematics.

Section 4: Your Proposed Project

Project

Project Title	How to Best Force an Ocean Model and Representation of the Western Boundary Currents in the 1/12 BCN coupled model
1. Main Field	Earth Sciences & Environment
2. Specific Discipline	Earth - Marine science/Oceanography
More about the code:	
Specify the code name	NEMO
Specify the web site of the code (if any)	https://www.nemo-ocean.eu/
Is there an existing serial code?	Yes
How big is it?	more than 10000 lines
What language is it written in?	Mixed C / Fortran

if other, please specify:	
How much of the code did you write yourself?	0 percent
Is there an existing parallel code?	Yes
What language is it written in?	Mixed C / Fortran
How was it parallelised?	MPI
if other, please specify:	
How big is it?	more than 10000 lines
How much of it did you write yourself?	0 percent
Libraries and Packages used:	netcdf, MPI, BLAS, LAPACK, HDF4, HDF5, NETCDF, PARMETIS, SCALAPACK, P-NETCDF, UDUNITS, GRIB_API, CDFTOOLS v2, CDO, NCO, PERL, PYTHON, AUTOCONF and AUTOMAKE
Will you produce new data during your visit?	Yes
If yes, will the produced data be of interest for your scientific community?	Yes
Will the data be accompanied by metadata to describe them?	Yes
Will it be possible for you to make data related to your project available in open-access?	Yes

Your motivation for a visit - what do you intend to do?

Benchmarking:	Not interested	Code development:	Secondary motivation
Collaborative project:	Main motivation	Consultancy:	Main motivation

Data Analysis:	Main motivation	Establishing Academic Link:	Secondary motivation
Optimisation:	If time permits	Parallelisation:	Not interested
Porting code:	Not interested	Production runs:	Secondary motivation
Training:	If time permits	Visualisation:	Not interested
Other:			

Tell us about your programming experience

	Level	**Years experience**
Unix	Expert	More than 5 years
Fortran	Advanced	More than 5 years
C	Intermediate (low)	More than 5 years
C++	No experience	Not applicable
MPI	Intermediate (high)	More than 5 years
Open MP	Intermediate (high)	More than 5 years
CUDA	No experience	Not applicable
OpenACC	No experience	Not applicable
OpenCl	No experience	Not applicable
OmpSS	No experience	Not applicable

Please characterise your typical production runs

Tell us about your present computing resources	
Machine architecture (please specify)	TGCC CURIE: 5040 B510 bullx nodes For each node: 2 eight-core Intel® processors Sandy Bridge EP (E5-

	2680) 2.7 GHz, 64 GB, 1 local SSD disk XSEDE COMET (USA):Dell Compute Nodes (1944 total) Intel Xeon E5-2680v3 2.5 GHz dual socket, 12 cores/socket; 320 GB SSD local scratch memory; 120 GB/s memory bandwidth
Processor speed (please specify)	2.7Ghz (curie) and 2.5 Ghz (comet)
Processor type (please specify)	curie: Intel processors Sandy Bridge EP (E5-2680) comet: Intel Xeon E5-2680v3
Number of nodes	> 1.000
Typical execution time per run	more than 24 hours
Please estimate the computing resources that you would expect to use during your visit	
Total CPU requirements (CPU hours)	30.000-40.000
Please specify the value = (elapsed time of a single run)*(number of CPU used in a single run) * (total number of runs)	2 x 20.000 using 1024 CPUs
Number of nodes	101-1.000
Total Memory requirements	901-9.000 Gb
Temporary disk space requirements for a single run	6To

Library requirements	netcdf,mpi
Compatible architectures (Select one or more, as applicable)	IntelX86 (e.g. Sandy Bridge, Ivy Bridge, Haswell, Broadwell, Skylake) AMD
Compatible architectures (other)	
Please justify your choice of resources (e.g. CPU requirements, no. of processors, compatible architectures)	During the 3 months stay at BSC,I intend to run a set of two forced oceanic simulations for a period of 5 years using NEMO. This effort is part of larger production run, in particular the french ANR project PULSATION. It aims to test the parameterization of the air-sea interactions suggested by the applicant in his recent papers. Please note that this effort is part of a larger production run

Project Proposal

Background information	Interactions between the ocean and the atmosphere largely influence the Earth's climate and ecosystems at the level of ocean basins. The main modes of climate variability (e.g., Madden-Julian Oscillation, El Niño, North-Atlantic Oscillation) are oceanatmosphere coupled modes. Ecosystems have a strong response to these variations through the physical influence of winds, light and temperature on the nutrient reservoir and therefore on the primary production and the trophic chain. While climate models (GCMs) generally agree globally and are relatively realistic, there is a large regional dispersion or common biases. Eastern Boundary Upwelling System (EBUS) and Western Boundary Currents (WBCs) are among the strongest bias areas (e.g., Richter (2015)). Part of those biases arise because of a poor representation of the mesoscale oceanic, atmospheric and biogeochemical dynamics. Those limitations have thus created a new line of research based on a regional approach to the interactions between the ocean and the atmosphere and aiming to understand and predict variability in key areas of the ocean. Mesoscale air-sea interactions, by modifying the energy budget of the

	ocean, can strongly modulate the oceanic mean and mesoscale currents, partly resolving long-lasting biases in oceanic numerical modeling (e.g., Ma et al. (2016); Seo (2017); Renault et al. (2016a, 2017a)). In particular, although generally much weaker than winds, surface oceanic currents effect on s tress influences both the atmosphere and the ocean ("current feedback", e.g., Bye (1985); Duhaut and Straub (2006); Renault et al. (2017b)). By reducing the energy input from the atmosphere to the ocean, the current feedback slows down the mean oceanic currents (Pacanowski, 1987; Luo et al., 2005; Renault et al., 2016a). It also induces a dampening of the mesoscale activity by roughly 30% via an "eddy killing", i.e., a sink of energy from eddies to the atmosphere (e.g., Duhaut and Straub (2006); Renault et al. (2016b, 2017b)). It has been shown that such an interaction partly controls the dynamic of the Western Boundary Currents. The current feedback directly affects the surface stress. It induces at the mesoscale surface stress anomalies that are negatively correlated to the surface current. However, the surface stress anomalies also induce opposite wind anomalies: a negative current vorticity induces positive surface stress curl anomalies, which in turn leads to negative wind curl anomalies. For the ocean model the wind response to the current feedback is important as it counteracts the stress response, and partially re-energizes the ocean. From an oceanic perspective coupled simulations are computationally expensive because of the relative slowness of atmospheric models with respect to oceanic ones. Therefore, oceanic simulations are usually forced by an atmospheric analysis product (This is actually the case of the BSC forced oceanic simulations). Uncoupled oceanic simulations can be forced using prescribed surface stress or by using bulk formulae that usually estimate the surface stress using the absolute wind (e.g., at 10 meters). Such simulations overestimate the mesoscale activity because of their lack of a current feedback. This could partly be fixed by estimating the surface stress using the relative wind to the current. However, by ignoring the wind response to the current feedback, such simulations do not take into account the partial re-energization of the ocean (Renault et al., 2016b). Uncoupled simulations have to take into account the surface current in their estimation of the surface stress but also a parameterization of the wind response to the current feedback. Parameterizing the wind response to the current feedback in a forced ocean model is of uttermost importance for ocean modeling in general. The Barcelona Supercomputing Center (BSC) is a involved in the PRIMAVERA European project (Horizon2020, 2015-2019). This project aims to develop a new generation of advanced and well-evaluated high-resolution global climate models, capable of simulating and predicting global and regional climate. In this framework, the BSC has developed a coupled version of the EC-Earth 3.2 climate model at a groundbreaking horizontal resolution of about 15km in each climate system component (EC-Earth3_IFS-T1279_NEMOORCA12). This

	Glob15km simulation proposes to follow the entire HighResMIP coordinated exercise, within the set of simulations of the Sixth Phase of the Coupled Model Intercomparison Project (CMIP6). This protocole will offer a framework for building a large multi-model ensemble of high resolution simulations with a low resolution counterpart following a common experimental protocol, and allow identifying the robust benefits of increased model resolution. The set of 50 years of Glob15km simulation already existing at BSC is thus an unprecedented tool to evaluate mesoscale air-sea interactions on a long time frame and at global scale. In particular, this resolution should allow to explicitly resolve dynamical features missing at coarser resolution (such as EBUS and WBCs as identified above), but also provide an adequate basis for testing the effects of the current feedback. In addition, researchers at BSC run a wide range of ocean forced simulations in the framework of the climate prediction activities, with time scale ranging from seasonal to decadal. Improving the forcing of oceanic simulation by implementing new parameterizations, that will in particular affect the overall mesoscale activity and energy budget transfer to the ocean that can have consequent short term effects, is therefore crucial for BSC activities. The goals of the work proposed here are: 1) The first goal of this collaboration is to implement in the ocean model NEMO (used by the BSC researcher) the two parameterizations of the atmospheric response to the current feebdack suggested in recent papers by the applicant (related to objective 1 of the workplan). 2) The second goal is to test such parameterizations. To that end, we will design a ocean model configuration based on the global coupled simulations currently carried out by T. Arsouze (Glob 15km simulation). Short tests will be achieved to validate the parameterization and in order to prepare a long-term simulation (at least 10 years) for future collaborations (objective 2, 3, and 5 of the workplan) 3) The third goal is to develop and gather tools that will be used to validate the parameterization. Such a task will be based on existing simulations from the PULSATION project (their configuration is similar to that developed by the BSC) and will use as leverage the tools developed by the BSC and the tools developed by the applicant within the framework of the french ANR PULSATION project (PI: S. Masson).(Objective 3 of the workplan) item The last goal is to bring the expertise of the applicant to the analysis of the global coupled configuration Glob 15km carried by T. Arsouze and the BSC with a focus on the Western Boundary Currents dynamic and its links with the air-sea

	interactions. (Objective 4 of the workplan) I conducted my thesis (2005-2008) at the Laboratory of Geophysical and Oceanographic Space Studies (LEGOS, Toulouse) in the ECOLA team (Echanges Cote- LArge), under the direction of B. Dewitte (IRD / LEGOS) and Y. duPenhoat (IRD / LEGOS). My research aimed to study the impact of mesoscale atmospheric structures on the ocean variability. My approach combined the use of observed data (satellites and in situ) and oceanic and atmospheric modeling based on the Regional Ocean Modeling System (ROMS, Shchepetkin and McWilliams (2005)) and the Weather Research and Forecast model (WRF, Skamarock et al. (2008)). During my thesis I developed a collaboration with the University of Chile (Department of Meteorology, Team of René Garreaud) where I spent nine months which allowed me to deepen my culture on the Eastern Boundary Upwelling System (EBUS) off Peru-Chile, and then joined the IRD collaborative network in Peru by participating in the IMARPE training program, especially by training a Peruvian student on the atmospheric model WRF (Miguel Saavedra). I then did a post-doc in Spain, at SOCIB / IMEDEA, where I took the responsibility of the Modeling Department. This experience allowed me to deepen and extend my competences in coupled modeling by addressing air-sea coupling and physical-biogeochemical coupling, and transpose my modeling platform to another region, i.e., the Mediterranean Sea, while maintaining collaborations with Chile (CEAZA). I also maintained a sustained training activity by supervising a master, a PhD, and a post-doc (see related publications). My expertise and the problems I have tackled have naturally led me to extend my network of international collaborations (Rutgers University, USGS, CEAZA), and to France (MIO and LEGI). Finally, from June 2013, after 4 years in Spain, I moved to the United States to take a position as a Researcher at the University of California, Los Angeles (UCLA) within J.C. McWilliams' team. I managed a small Research team financed by a NSF 3M $ (PI) that I obtained in 2014 on the impact of climate change on the ecosystem of the 4 main EBUS (i.e., California, Benguela, Canary Islands, Chile). I was also Co-PI of a project on the acidification and deoxygenation of the Upwelling of California (PI, J.C. McWilliams), which allowed me to deepen my knowledge and skills in biogeochemistry and to develop new collaborations with the University ofWashington (C. Deutsch). I was also interested in the average circulation of large basins and its major currents (Gulf Stream and Agulhas), and their regional impacts. In a precursor work, using coupled ocean-atmosphere simulations, , I have recently shown the need to resolve small scales interactions

between the ocean and the atmosphere to represent realistically the mean and mesoscale oceanic currents, and the primary production in the EBUS, challenging simple upwelling indices based on wind along the coast as well as the classic paradigm how to force an oceanic model on which I will discuss in the following chapters. My projects allowed me to supervise researchers (1), and post-doctoral (3) and to collaborate with students (2) and to develop my network of international collaborations (UCLA, University of Washington, University of Oregon, Universidad de Concepcion (Chile), University of Cape Town (South Africa), Nanjing University) and national (INRIA, LOCEAN, LOPS, LEGOS). I recently integrated the IRD as a "Chargé de Recherche". My research project naturally follows my research line I developped throughout my carrier and aims to better understand the Ocean-Land-Atmosphere interactions, their impact on the biogeochemical variability and mean state, and how to parameterized them in a forced ocean model.

Bibliography

Bye, J. A., 1985: Large-scale momentum exchange in the coupled atmosphere-ocean. Elsevier oceanography series, 40, 51–61.

Duhaut, T. H., and Straub, D. N., 2006: Wind stress dependence on ocean surface velocity: Implications for mechanical energy input to ocean circulation. Journal of Physical Oceanography, 36(2), 202–211.

Luo, J.-J., Masson, S., Roeckner, E., Madec, G., and Yamagata, T., 2005: Reducing climatology bias in an ocean-atmosphere CGCM with improved coupling physics. Journal of climate, 18(13), 2344–2360.

Ma, X., Jing, Z., Chang, P., Liu, X., Montuoro, R., Small, R. J., Bryan, F. O., Greatbatch, R. J., Brandt, P.,Wu, D., et al., 2016: Western boundary currents regulated by interaction between ocean eddies and the atmosphere. Nature, 535(7613), 533–537.

Pacanowski, R., 1987: Effect of equatorial currents on surface stress. Journal of physical oceanography, 17(6), 833–838.

Renault, L., McWilliams, J. C., and Penven, P., 2017a: Modulation of the Agulhas Current Retroflection and Leakage by Oceanic Current Interaction with the Atmosphere in Coupled Simulations. Journal of Physical Oceanography, 47(8), 2077–2100.

Renault, L., McWilliams, J. C., and Penven, P., 2017b: Modulation of the Agulhas Current

	Retroflection and Leakage by Oceanic Current Interaction with the Atmosphere in Coupled Simulations. Journal of Physical Oceanography, Accepted(X), XX. Renault, L., Molemaker, M. J., Gula, J., Masson, S., and McWilliams, J. C., 2016a: Control and Stabilization of the Gulf Stream by Oceanic Current Interaction with the Atmosphere. Journal of Physical Oceanography, 46(11), 3439–3453. Renault, L., Molemaker, M. J., Mcwilliams, J. C., Shchepetkin, A. F., Lemarié, F., Chelton, D., Illig, S., and Hall, A., 2016b: Modulation of Wind Work by Oceanic Current Interaction with the Atmosphere. Journal of Physical Oceanography, 46(6), 1685–1704. Richter, I., 2015: Climate model biases in the eastern tropical oceans: causes, impacts and ways forward. Wiley Interdisciplinary Reviews: Climate Change, 6(3), 345–358. Seo, H., 2017: Distinct Influence of Air–Sea Interactions Mediated by Mesoscale Sea Surface Temperature and Surface Current in the Arabian Sea. Journal of Climate, 30(20), 8061–8080. Shchepetkin, A. F., and McWilliams, J. C., 2005: The Regional Oceanic Modeling System (ROMS):Asplit-explicit, free-surface, topography-following-coordinate oceanic model. Ocean Modelling, 9(4), 347–404. Skamarock, W., Klemp, J., Dudhia, J., Gill, D., and Barker, D., 2008: A description of the Advanced Research WRF version 3. NCAR. Tech. rep., Note NCAR/TN-4751STR.
Case for HPC-EUROPA funding	My research would benefit from HPC-Europa funding by the rich interaction with the local scientific host that it will allow. In particular the HPC-Europa framework is crucial to achieve the goals of this project as it will allow the applicant to have an access to the HPC supercomputer and, thus, to design in collaboration with T. Arsouze a new oceanic model configuration and to have access to their existing simulations. The forced simulations designed within this project will lay ground for performing a global oceanic simulation that will allow to fully test and validate the parameterization of the atmospheric response to air-sea interactions developed within this project. It will therefore not only strongly benefit the modeling community but also, in particular, the BSC center that also aim to run forced oceanic simulations. This collaboration will also allow to bring the applicant's knowledge on Western Boundary Currents and mesoscale air-sea interactions to the BSC by participating to the analysis of existing or on-going

	simulations. It will allow a transfer of knowledge from both a technical (management of a high-complexity configuration) and scientific (analysis of a global simulation, with global large scale interactions, at a regional scale resolution) perspective. Finally, this project is geared to re-enforce and complement the applicant's knowledge of Earth System interactions by expanding his area of research from mostly regional modeling to global modeling. The experience he will gain by collaborating with BSC and the PRIMAVERA project will provide new competencies in state-of-the-art methodologies for the analysis of complex coupled systems. LEGOS/IRD and UCLA (his former job) has been in the forefront of the research in ocean-atmosphere coupled modeling, in particular through the implementation of the OASIS_MCT coupler into the ROMS_Agrif model and recent studies on the importance of air-sea coupling in determing the mean ocean dynamic. The applicant will therefore have the opportunity to bring and share his knowledge on air-sea coupling, ocean mesoscale variability, and Western Boundary Currents dynamics with the BSC. Through the project the applicant will also further improve his experience with the processing and analysis of large numerical model data. Finally it will also allow him to enlarge his professional network.

Project Workplan
Project Workplan

The objectives for this 13 weeks visit at BSC are :

1) Implement and test the 2 parameterizations of the current feedback in the NEMO model. Time needed: 3 weeks.

2) Design a forced oceanic simulations and carry out short runs. Time needed: 3 weeks.

3) Gather and develop tools to analyze the new simulations by comparing them to the coupled simulations in term of ocean-atmosphere energy exchange, and mean and eddy kinetic energy. Time needed : 6 weeks. Note this task will be based on previous development made by the applicant and by using tools developed by the BSC.

4) In parallel of task (3) start assessing the representation of the Western Boundary Currents and of the air-sea interactions in the BSC 1/12˚ global coupled model. A special focus will be done on the representation of the ocean-atmosphere exchange of energy, the mean and eddy kinetic energy, and the representation of the Gulf Stream separation and post-separation, and the Agulhas retroflection. Time needed: 6 weeks.

5) Prepare future simulation. Time needed: 1 weeks.

The requested time visit of 13 weeks is longer than the average visit length of 7 weeks. However, this is necessary because of the various tasks needed to start this collaboration.

Section 5: Attachments

Curriculum vitae
LIONEL RENAULT

Researcher
Born: 19th December 1980 in Marseille (France)
Nationality: French
Languages: French (native language), English (fluent), Spanish (fluent), Catalan (good level), German (notions)
lionel.renault@ird.fr
lrenault@atmos.ucla.edu

PROFESSIONAL PREPARATION

Centrale Marseille, Marseille, France
2001¬2004. Specialization in marine engineering, coastal engineering section.

Université Paul Sabatier, Toulouse, France
2004–2005. M.Sc.II, Science of the Universe, Ocean, Atmosphere and Continental Surfaces.

Laboratoire d'Etudes en Géophysique et Océanographie Spatiales, Toulouse, France
2005–2008. Ph.D. in Physical Oceanography.

APPOINTMENTS

Institut de Recherche pour le Développement (IRD), LEGOS, Toulouse, FRANCE
Researcher (2017-present). Conducted research on Ocean-Atmosphere coupling, Physical-biogeochemical interactions, regional modeling of mesoscale and submesoscale. Expert on Eastern and Western Boundary Upwelling System, Mediterranean Sea, numerical modeling, and Ocean-Atmosphere coupling.

University of California–Los Angeles
Assistant Researcher, Department of Atmospheric and Oceanic Sciences, Team of Prof. J.C. McWilliams, June 2013–2017.
Conducted research on Ocean-Atmosphere coupling, Physical-biogeochemical interactions, regional modeling of mesoscale and submesoscale. Expert on Eastern Boundary Upwelling System (EBUS), Mediterranean Sea, numerical modeling, and Ocean-Atmosphere coupling.

IMEDEA and SOCIB, Palma de Mallorca, Spain
Postdoctoral Scholar and Researcher, 2009–2013. Lead modeler at the SOCIB modeling facility. Conducted research on ocean–atmosphere interactions, coupled simulations, and mesoscale and interannual variability.

Laboratoire d'Etudes en Géophysique et Océanographie Spatiales (LEGOS, France) and Universidad de Chile (Chile)
PhD student. Conducted research on mesoscale atmospheric forcing on the Humboldt Current System using both regional models and observations.

SKILLS

Development: Fortran77/90, C/C++, MPI
Scientific calculus: Matlab, Python, IDL. Numerical simulations: ROMS, WRF, SWAN, COASWST, OASIS, MCT.
OS: Linux, Mac, Windows.
In situ measurments (CTDs, XBTs, drifters).
Languages: French: Native; English: Fluent; Spanish: Fluent; Catalan : Good

MENTORING

In Spain, Dr. Renault advised two postdoctoral scholars (M. Juza, L. Arancha), one Ph.D. student (R. Escudier), and one M.Sc. student (F. Desbiolles). At UCLA, he also advised three postdoc (A. Jousse, F. Kessouri, and R. Chen) and one researcher (S. Masson).

REVISIONS OF PEER REVIEWED ARTICLE AND OUTREACH

JGR Ocean and Atmosphere, Ocean modeling, JPO, GRL, Natural Hazard, Progress in Oceanography, Nature Geoscience, Nature Communication, USGC internal reviews
Evaluation of French national project (IRD, 1 project) and National Science Foundation (3 projects).
Press releases following the publications of Renault et al., 2011 and Renault et al., 2016.
Press releases following the NSF grant in 2014.
Member of the PhD comity of Romain Escudier.

FIELD EXPERIENCE

2012: TOSCA cruise, Ibiza Strait, 26-30 October 2012; R/V García del Cid (Spain). PI: Alejandro Orfila (IMEDEA, Spain); 2 days; ADCP, CTD, XBT, drifters, …

FUNDING RECEIVED SO FAR

2014: NOAH grant (1.2M€)
2014: NSF grant (2.96M€)
2014: Bureau of Ocean Energy Management (0.36M€);
2007: Comité National de Géodesie Française, Grant to attend the IUGG conference, Perugia, Italia.
2007: University of Paul Sabatier (Toulouse, France), grant for internship in Chile ATUPS (1756 €)
2006: University of Paul Sabatier (Toulouse, France), grant for internship in Chile ATUPS (1756 €)
2005: University of Paul Sabatier (Toulouse, France) merit scholarship (3200€)

MAIN COLLABORATORS

James C. McWilliams (UCLA), Curtis Deutsch (UW), M. Jeroen Molemaker (UCLA), Alexander Shchepetkin (UCLA), Alex Hall (UCLA), Hartmut Frenzel (UW), Sebastien Masson (UCLA/LOCEAN), Francois Colas (LOCEAN), Boris Dewitte (IRD/LEGOS, France), Florian Lemarié (INRIA France), Dudley Chelton (Oregon University), Patrick Marchesiello (IRD/LEGOS, France), Jonathan Gula (Université de Brest), Pierrick Penven

(IRD/LPO, France), Dehayes Julie (LOCEAN), Pous Stephane (LOCEAN), Alejandro Orfila (IMEDEA, Spain), Ananda Pascual (IMEDEA, Spain), Alexandre Jousse (UCLA), Romain Escudier (IMEDEA/LEGI), Juan Manuel Sayol (IMEDEA), Fayçal Kessouri (UCLA), Bianchi Daniele (UCLA).

Curriculum vitae (attachment)

- CV_Lionel_Renault_English_May2018.pdf

List of publications

(38) Renault, L., Masson, S., Gula, J. and McWillams J.C, 2017. Dampening of Submesoscale Currents by Mechanical Air-Sea Coupling. Submitted to Scientific Report.
(37) Desbiolles, F., Blamey, R., Illig, S., James, R., Rondrotiana, B., Renault, L., Reason, C., 2017. Upscaling impact of Wind/SST mesoscale interactions on Southern Africa Austral Summer Climate. Submitted to Geophys. Res. Lett.
(36) Meroni, A., Renault, L., Parodi, A. and Pasquero, C., 2017. Role of the oceanic vertical thermal structure in the modulation of heavy precipitations over the Ligurian Sea. Submitted to Pure and Applied Geophysics.
(35) González-Wangüemert M., L. Basso, A. Balau, J. Costa, L. Renault, E. Serrao, C.M. Duarte, and I. E. Hendriks, "Population structure of Pinna nobilis around the Balearic Islands, Western Mediterranean", submitted to EOS (2016).
(34) Wesselmann M., González-Wangüemert M., Serrao E., Engelen A., Renault L., Garcia-March J.R., Duarte C.M., Hendriks I.E., Genetic and oceanographic tools reveal high population connectivity and diversity in the endangered pen shell Pinna nobilis. Scientific reports 8.1 (2018): 4770.
(33) Renault, L., McWilliams, J.C. and Masson S., 2017. Satellite Observations of Imprint of Oceanic Current on Wind Stress by Air-Sea Coupling. Scientific reports 7.1 (2017): 17747.
(32) Barkan, R., McWilliams, J.C., Shchepetkin, A.F., Molemaker, M.J., Renault, L., Bracco, A. and Choi, J., 2017. Submesoscale Dynamics in the Northern Gulf of Mexico. Part I: Regional and Seasonal Characterization, and the Role of River Outflow. Journal of Physical Oceanography, (2017).
(31) Srinivasan, K., McWilliams, J.C., Renault, L., Hristova, H.G., Molemaker, J. and Kessler, W.S., 2017. Topographic and Mixed Layer Submesoscale Currents in the Near-Surface Southwestern Tropical Pacific. Journal of Physical Oceanography, 47(6), pp.1221-1242.
(30) Renault, L., McWilliams, J.C. and Penven, P., 2017. Modulation of the Agulhas Current Retroflection and Leakage by Oceanic Current Interaction with the Atmosphere in Coupled Simulations. Journal of Physical Oceanography, 47(8), pp.2077-2100.
(29) Renault, L., Molemaker, M.J., Gula, J., Masson, S. and McWilliams, J.C., 2016. Control and Stabilization of the Gulf Stream by Oceanic Current Interaction with the Atmosphere. Journal of Physical Oceanography, 46(11), pp.3439-3453.
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Any further suggestions for a more effective marketing of the HPC-Europa3 Programme
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