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AYUDAS JUAN DE LA CIERVA-FORMACIÓN
HISTORIAL CIENTÍFICO-TÉCNICO DE LOS ÚLTIMOS CINCO AÑOS DEL EQUIPO DE INVESTIGACIÓN

(SCIENTIFIC/TECHNICAL RECORD DURING THE LAST FIVE YEARS OF THE RESEARCH TEAM*)*

Según el artículo 45 de la Resolución de convocatoria el equipo de investigación es el compuesto por el personal investigador que desarrolla la línea de investigación en la que se integrará el investigador candidato.
(According to what is established in article 45 of Call Resolution, the research team is defined as the one formed by the researchers developing the research line in which the candidate is to participate)

Especificar los trabajos de investigación desarrollados, publicaciones, proyectos, patentes, la capacidad formativa pre y posdoctoral y cualquier otro aspecto de interés.
(Please specify the research work that the team has developed, publications, funded projects, patents, capacity for providing guidance and training and any other aspect that may be of interest).

CUMPLIMENTAR PREFERIBLEMENTE EN INGLÉS – FILL IN BETTER IN ENGLISH

The candidate, Dr. Yohan Ruprich-Robert, plans to conduct research on the prediction and climate impacts of large-scale ocean dynamics at the Earth Sciences department of the Barcelona Supercomputing Center - Centro Nacional de Supercomputación, and his tutor investigator is the Co-leader of the Climate Prediction Group at the Earth Sciences department, Dr. Virginie Guemas.

Note: *A glossary of acronyms is given at the end of this document.*

Research Center: Barcelona Supercomputing Center-Centro Nacional de Supercomputación

The Barcelona Supercomputing Center - Centro Nacional de Supercomputación (BSC-CNS) is the national supercomputing facility of Spain. BSC-CNS's mission is to develop and manage information technology in order to facilitate scientific and technological progress. BSC-CNS hosts a range of high-performance computing (HPC) systems, including MareNostrum IV, with 165,888 cores and 11.15 Pflops peak performance. More than 50350 researchers and students, from more than 40 different countries, perform research in Computer Sciences, Life Sciences, Earth Sciences and Computational Applications in Science and Engineering at BSC-CNS. This multi-disciplinary approach and the combination of world-leading researchers and HPC experts with state-of-the-art HPC resources make BSC-CNS a unique research institution.

BSC-CNS is located on a campus of the Technical University of Catalonia (Universitat Politècnica de Catalunya - UPC) and has an agreement with the UPC to use university facilities and services. Furthermore, many of the group leaders at BSC-CNS are also university professors with broad knowledge and experience in advance research and teaching, i.e., the BSC-CNS substantially contributes to and benefits from UPC's higher educational environment. The BSC-CNS is a key element of and coordinates the Spanish Supercomputing Network (RES), which is the main framework for granting competitive HPC time to Spanish research institutions. Furthermore, BSC-CNS is one of five hosting members in France, Switzerland, Germany, Italy and Spain that form the core of the Partnership for Advanced Computing in Europe (PRACE) network. PRACE provides competitive computing time on world-class supercomputers to researchers in the 25 European member countries. BSC-CNS has been accredited as one of the first eight Severo Ochoa Centres of Excellence. This award is given by the Spanish Government as recognition for leading research centres in Spain that are internationally well known institutions in their respective areas. The candidate will carry out his project within the Earth Sciences department of the BSC-CNS.

Earth Sciences Department

The Earth Sciences department of the BSC-CNS (BSC-ES) conducts multi-faceted research in Earth system modelling. Established in 2006, the initial core activity was focused on atmospheric composition modelling. The designation of Prof Francisco J. Doblas-Reyes as Director of the BSC-ES in 2014 initiated the merging of the BSC-ES with the Climate Forecasting Unit of the Institut Català de Ciències del Clima (IC3-CFU), which he was leading at the time and

that had become in a short time a main European actor in the development of climate predictions and climate services. The newly merged department is structured around four groups with more than 70 employees, including technical and support staff. It is a highly productive scientific entity that has published more than 160 research articles in peer-reviewed journals over the last 5 years, including 5 in prestigious high-impact journals (for a complete list of the publications of the department see https://earth.bsc.es/wiki/doku.php?id=publications:publications). It also has a very dense international collaborative network counting at least 50 institutes worldwide. BSC-ES focuses research on atmospheric emissions, air quality, mineral dust transport, computational efficiency of air quality and climate codes, data storage, analysis and dissemination, and global and regional climate modelling and prediction. The BSC-ES works on the development of and conducts research with a multi-scale set of comprehensive single-component and coupled regional and global models.

The ES-BSC is composed of four distinct but highly integrated groups: 1) Climate Prediction group, 2) Atmospheric Composition group, 3) Earth System Services group, and 4) Computational Earth Sciences group. The candidate will carry out his project in close collaboration with two of these research units: the climate prediction and the earth system services group.

The **climate prediction group (CPG)** undertakes advanced research to forecast climate variations from one month to several years into the future (also known as **seasonal-to-decadal predictions**) and from regional to global scales. This objective relies on expanding our understanding of the climate processes through a deep analysis of the strengths and weaknesses of state-of-the-art climate forecast systems in comparison with the most up-to-date observational datasets, and on exploiting these detailed analyses to refine the representation of climate processes in our climate forecast systems and their initialization. Emphasis is made on the role of the **large-scale ocean circulation and heat content distribution on climate prediction,** since the ocean represents the main source of memory and therefore of predictability on timescales of a few months to a few decades.

Many of the activities in modelling and prediction are based on research, development and predictions with the EC-Earth climate forecast system. EC-Earth is a state-of-the art coupled climate model that is being developed and used for climate predictions and projections by a European consortium of more than 20 operational and research institutions collaborating closely, including the ES-BSC. The CPG leads the generation of initial conditions and plays an active role in the production of historical climate reconstructions for the EC-Earth community, which are essential for the initialization of seasonal-to-decadal predictions and their evaluation. The group was an important contributor to the fifth phase of the Coupled Model Intercomparison Project (CMIP5), which is one of the key datasets used to produce the UN Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) and is already active in the planning and coordination of the next phase (CMIP6), for which it will produce groundbreaking high-resolution global climate simulations with EC-Earth (with horizontal spacing of 1/12° in the ocean and 15 km in the atmosphere). Positioned at the cutting-edge of climate prediction research, the group also has access to large multi-model databases from international projects (CMIP, SPECS, NMME …) for process analysis. Achieving the objectives rely on the combination of a large variety of expertise on climate processes within the group from the stratosphere down to the deep ocean and from tropical to polar latitudes, together with expertise on climate modeling and data assimilation, creating an optimal environment to carry out a post-doctoral project on **prediction of the large-scale ocean dynamics and its impact on the continents**.

The **earth system services (ESS)** group aims to bridge the gap between **climate information** and **end users** in key sectors of society (energy, urban development, infrastructure, transport, health and agriculture) via **tailored services** to societal actors. Members of this group actively work in identifying user needs, which partly guide research in the ES-BSC and aim to quantify the impact of weather, climate, aerosols and gaseous pollutants upon socio-economic sectors through the development of user-oriented services that ensure the transfer of the technology developed and the adaptation to a rapidly changing environment, especially of those highly vulnerable. They develop these non-profit services in-house in collaboration with public administrations, private contracts with companies or funding agencies, and spin-off companies that could exploit operational opportunities.

The other two groups that the applicant will interact with but not directly work with are the the computational earth sciences group and the atmospheric composition group. The former provides help and guidance to the scientists with the technical issues relating to their work and develops a framework for the most efficient use of HPC resources. Support includes optimization of the tools developed by scientists, development of automatic tools to compile, launch, monitor and post-process climate simulations and handle the large amount of data produced, as well as installation and upgrade of a variety of software to facilitate the scientists work. The latter group aims at furthering our understanding of the chemical composition of the atmosphere and its effects upon air quality, weather and climate, while improving predictions from local to global scales. This is addressed through the development and use of the NMMB/BSC Chemical Transport Model (NMMB/BSC-CTM), an online multi-scale non-hydrostatic chemical weather prediction system that can be run either globally or regionally. This group also develops and operates the CALIOPE system ("CALIdad del aire Operacional Para España"), which provides high-resolution short-term air quality forecasts for Europe, with a special focus over Spain and its main urban areas using the in-house HERMES emission model.

During last 5 years (2013-2017), BSC-ES was granted **9 EU H2020 projects, 5 EU FP7 projects, 5 EU Copernicus projects, 10 projects funded by the Ministerio de Economía y Competitividad (MINECO), 2 projects funded by the European Space Agency, 1 project funded by the French Ministry of Sciences, 1 project funded by the Flanders Research Fundation, and 1 project from ERA-NET and 3 from ERA4CS.** During that same period, BSC-ES also participated in 21 RES and 4 PRACE projects. BSC-CNS has been awarded with the *Severo Ochoa*'s Centre of Excellence project of the Spanish government since its first call (2011). Short descriptions of the most recent and most relevant projects are given towards the end of this document. The BSC-ES international activity includes the coordination of the two World Meteorological Organisation (WMO) regional centres specialised in sand and dust warning and forecasting, as well as the participation in climate services initiatives like the Climate Services Partnership (CSP). Members of the BSC-ES participate in committees of the World Climate Research Programme (WCRP), such as the CLIVAR Scientific Steering Group or the Working Group on Seasonal to Interannual Prediction (WGSIP).

Finally, the BSC-ES hosts a new AXA Chair on Sand and Dust Storms. This chair is an ambitious, comprehensive and long-term programme that combines fundamental research, operational forecasting and impact research, with the much-needed development of user-oriented products, services and capabilities, all under one roof. This unprecedented programme will improve our understanding of sand storms and their variability; quantify dust effects upon weather, climate, atmospheric chemistry and ocean biogeochemistry; develop and distribute skilful sand storm short and medium-range forecasts and long-range dust predictions and projections; assess sand storm impacts upon key sectors of society and economy; and promote capacity building, technology transfer, dissemination and public engagement.

Scientific expertise and capacity for training of the supervisor – Dr. Virginie Guemas

The tutor investigator of the candidate is Dr Virginie Guemas, who has led the climate prediction group in which the candidate will carry out his project for the last 3 years, is in close collaboration with the Earth system services group. She is a Ramon y Cajal fellow since November 2015 and an expert on sub-seasonal to decadal climate prediction. Her PhD, carried out at Météo-France (Toulouse, France) and funded by a highly competitive PhD grant from the Commissariat à l'Energie Atomique, was defended in 2009 and awarded the Adrien Gaussail PhD prize, granted every 2 years to a scientific PhD. She is member of the WCRP (World Climate Research Program) CLIVAR (Climate and Ocean Variability, Predictability, and Change) SSG (Scientific Steering Group). She has participated in 13 national and international research projects up-to-date. Currently, she is Principal Investigator (PI) of seven European projects funded under the FP7 (PREFACE, EUCLEIA), H2020 frameworks (IMPREX, APPLICATE, INTAROS), Copernicus (C3S-MAGIC), one MINECO-funded project (HIATUS), one PRACE-funded project (LSHIP) and she is WP leader in two H2020 projects (PRIMAVERA and APPLICATE). A more extensive description of these projects can be found below.

She was contributing author for the IPCC (Fifth Assessment Report) Chapter 11 Near-term Climate Change: Projections and Predictability", in the UN IPCC AR5 Working Group I – The Physical Sciences Basis report. The IPCC is a United Nations scientific intergovernmental body that was established in 1988 by the World Meteorological Organization and the United Nations Environment Programme. The IPCC is composed of the most prominent world experts in climate studies; its reports are authoritative and provide policy guidelines for governments to address climate change.

She is author of 50 articles on climate modelling and prediction in international peer-reviewed journals, among which seven in high-impact journals, such as Sciences, Nature Climate Change, Nature Communications and the Bulletin of the American Meteorological Society. Currently, she has a total of 784 citations , with a h-index of 15 and a i10-index of 19 (from Scopus). A list of 10 most relevant publications from Dr Virginie Guemas is given towards the end of this document.

Dr Virginie Guemas has supervised so far three PhD students and several post-doctoral scientists. Virginie Guemas in particular, and ES-BSC in general, have been able to provide researchers with exceptional training support and conditions for their scientific growth, steering improvements in their scientific and management skills alike. The training capability of researchers is very extensive, and has been demonstrated through the successful experience in training numerous pre- and postdoctoral scientists. The ES-BSC has participated in 4 Initial Training Networks (ITN) from FP7 program and one from Horizon2020 program, and is continuously involved in the organization of numerous summer schools (e.g., European Network for Earth System modelling schools), workshops and other training events (e.g., PRACE Advanced Training Centre, PATC, courses) related to the use of HPC resources in atmospheric and climate modelling. Former postdocs and Ph.D. students hosted at the ES-BSC hold positions in several well-known scientific institutions and energy companies around the globe, such as the NASA Goddard Institute for Space Studies in USA (Dr. Carlos Përez García-Pando), the School of Geography and Environment at the University of Oxford in UK (Dr. Karsten Haustein) and EnBW Energie Baden-Württemberg AG in Germany (Dr. Matthias Piot). A complete list of Ph.D. thesis with research conducted at EC-BSC and under Dr Virginie Guemas supervision is given at the end of this document.

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Specific objectives of the candidate – Dr. Yohan Ruprich-Robert

Dr. Yohan Ruprich-Robert graduated in Climate sciences from the University Toulouse III (France) in 2014 (Laboratory: Centre Européen de recherche et de formations avancée en calcul scientifique - Cerfacs; supervisors: Dr. Christophe Cassou and Dr. Laurent Terray). He worked between 2014 and 2017 at Princeton University / GFDL (Geophysical Fluid Dynamics Laboratory; NJ, USA) as a postdoctoral researcher (supervisors: Dr. Tom Delworth and Dr. Rym Msadek) in close collaboration with NCAR (National Center for Atmospheric Research, Boulder, CO; collaborators: Dr. Gokhan Danabasoglu and Dr. Stephen Yeager) and WHOI (Woods Hole Oceanographic Institution, Woods Hole, MA; collaborator: Dr. Young-Oh Kwon). He is conducting since September 2017 postdoctoral researches in the very dynamic Earth Sciences department of BSC (Barcelona Supercomputing Center, Barcelona, Spain; supervisor: Dr. Virginie Guemas), who is fully integrated in the European climate sciences community. His mobility since obtaining his PhD allowed him to develop strong international collaborations.

During his doctoral and postdoctoral researches he developed strong expertise on decadal climate variability and potential predictability. Using several state-of-the-art climate models, he investigated the mechanisms driving the Atlantic Meridional Overturning Circulation (AMOC) decadal variability and its impacts on the North Atlantic – Europe climate. He performed ensemble member simulations to estimate the potential decadal predictability associated with AMOC variations and their climatic impacts. He set up an innovative experimental protocol, which allows to highlight the climate teleconnections associated with the observed North Atlantic decadal variability using coupled models. His protocol has been adopted by the Decadal Climate Predictability Panel (DCPP) of the 6th Coupled Model Intercomparison Project (CMIP6) and it is currently used for internationally coordinated experiments (cf. CMIP6 DCPP-component C). Those simulations are the object of the present proposal.

The main focus of the present proposal is to better estimate and understand the teleconnections between the AMV and the European climate in order to precisely determine their predictability. This activity will be inserted in the broader PRIMAVERA project funded by the European commission under the Horizon 2020 program, which goal is to deliver novel, advanced and well-evaluated high-resolution global climate models (GCMs), capable of simulating and predicting regional climate with unprecedented fidelity, out to 2050. This capability will deliver innovative climate science and a new generation of advanced Earth System Models. Sector-specific end-users in policy and business will be identified and engaged individually, with iterative feedback, to ensure that new climate information is tailored, actionable and strengthening societal risk management decisions. The proposed objective will contribute to reinforce the emerging position of *ES-BSC*, and Spain, in seasonal-to-decadal climate prediction. Conversely, the candidate will benefit from the scientifically-rich environment in the group, which will significantly help to complete his post-doctoral training and his exceptional international recognition as an ocean and climate prediction expert.

Relevant Projects

Here, we highlight the projects where the BSC-ES plays a key role and whose outcome will benefit the applicant:

1. **PRIMAVERA** (Process-based climate siMulation: AdVances in high resolution modelling and European climate Risk Assessment) is an EU H2020 project (start date: 11/2015; lasting 36 months; funding: 14.967.969€). The goal of PRIMAVERA is to deliver novel, advanced and well-evaluated high-resolution global climate models capable of simulating and predicting regional climate with unprecedented fidelity, out to 2050. Sector-specific end-users in policy and business are engaged individually, with iterative feedback, to ensure that new climate information is tailored, actionable and strengthen societal risk management decisions. This project gathers experts from 19 research centers across Europe.

2. **PREFACE** (enhancing PREdiction oF tropical Atlantic ClimatE and its impacts) is an EU FP7 project (start date: 11/2013; lasting 11 months; funding: 12.170.344€). It involves 28 institutional partners across 18 countries in Europe and Africa. This project aims to reduce uncertainties in our knowledge of the dynamics of Tropical Atlantic climate, particularly of climate-related ocean processes and circulation, coupled ocean-atmosphere-land interactions, and internal and externally forced climate variability. Also, it plans to improve the simulation and prediction of Tropical Atlantic climate on seasonal and longer time scales, and contribute to better quantification of climate change impacts in the region.

3. **VOLCADEC** (Volcanic activity in seasonal to decadal climate forecasts) is a project funded by the MINECO (start date: 01/2016, lasting 36 months, funding 168.190€). Its main objective is to assess the impact of volcanic eruptions on the global climate, especially on the large-scale ocean circulation, the occurrence of El Nino events, the phase of the North Atlantic Oscillation and the Arctic sea ice cover and its dependence on the background climate state. The main application of these analyses is to improve the representation of the climate response to volcanoes in climate predictions, but also to improve the representation of the scenario of emissions of volcanic aerosols in a climate forecasting framework.

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4. **HIATUS** (XXIst century surface temperature Hiatus: Investigation, Attribution, Thorough Understanding and Sensitivity experiments) is a project funded by the MINECO (start date: 01/2016, lasting 36 months, funded 101.640€). Its objective is to exploit successful climate predictions of the global warming slowdown which occurred in the last decade to investigate the reasons for this global warming slowdown, based on innovative sensitivity experiments and exploiting advanced observations. The main application will be to forecast whether the climate is expected to experience a rebound effect and when.

5. **APPLICATE** (Advanced Prediction in Polar regions and beyond: Modelling, observing system design and LInkages associated with a Changing Arctic climaTE) is an EU H2020 project (start date: 11/2016; lasting 34 months; funding: 8.715.066€). Its main objective is to improve the understanding of processes involved in polar climate variability and teleconnections with the mid-latitudes. This goal will be achieved through novel model developments, a wide variety of ambitious sensitivity experiments, the exploitation of new polar observations and improved understanding of polar climate and linkages predictability. This project gathers experts from 16 research centers across Europe.

6. **SPECS** (Seasonal-to-decadal climate Prediction for the improvement of European Climate Services) is an EU FP7 project (start date: 11/2012; lasting 39 months; funding: 11.766.236€) supported by 19 European institutions and a Brazilian institution and is coordinated by BSC-ES. The main scientific objective of SPECS is to deliver a new generation of European climate forecast systems and efficient regionalisation tools. These will produce local climate information over land at seasonal-to-decadal time scales with improved forecast quality including a critical prediction of extreme climate events. It aims, among other things, to coalesce many different research efforts with climate services (both public and private).

7. **EUCP** (European Climate Prediction system) is an EU H2020 project (start date: 12/2017; lasting 48 months; funding 12.999.515€) whose main goal is to develop an innovative European regional ensemble climate prediction system based on a new generation of improved and typically higher-resolution climate models, covering timescales from seasons to decades initialised with observations, and designed to support practical and strategic climate adaptation and mitigation decision-taking on local, national and global scales. This project gathers experts from 16 research centers across Europe.

8. **IMPREX** (Improving Predictions and management of hydrological EXtremes) is an EU H2020 project (start date: 10/2015; lasting 36 months; funding: 7.996.848€). The goal of IMPREX is to improve forecast skill of meteorological and hydrological extremes in Europe and their impacts by applying dynamic model ensembles, process studies, new data assimilation techniques and high resolution modelling. This project gathers experts from 23 research centres across Europe.

9. **DANAE** is a project funded by the MINECO (start date: 01/2016, lasting 36 months, funded 146.410€). The goal of DANAE is twofold: on the one hand, to gain understanding in the mechanisms responsible for the predictability; and, on the other hand, to gain insight into the sources of prediction skill and point at the key elements/processes that need to be better represented in seasonal forecast systems. The systematic assessment of the atmospheric pathways proposed here may address the elusive unifying view of the canonical ENSO-NAE relationship in mid/late-winter.

10. **EUCLEIA** (EUropean CLimate and weather Events: Interpretation and Attribution) is an EU FP7 project (start date: 09/2015; lasting 4 months; funding: 2.990.915€). It aims to provide well verified assessments of the extent to which weather- related risks have changed due to human influences on climate, as well as to identify those types of weather events where the science is still too uncertain to make a robust assessment of attributable risk. It gathers experts from 11 academic, research and operational institutions across Europe to develop a system that will deliver reliable and user-relevant attribution assessment on a range of time scales from immediate aftermath of extreme events to seasonal and annual basis.

11. **INTAROS** (Integrated Arctic observation system) is an EU H2020 project (start date: 11/2016, lasting 48 months, funding 15.490.141€). Its main objective is to gather new observational data from the Arctic, gather them in widely distributed database with an efficient data portal and assess the added-value of these novel observations in a wide range of applications, including polar climate forecasting. This project gather experts from 48 research centers across Europe.

12. **C3S-MAGIC** (C3S - Metrics and Access to Global Indices for Climate Projections) is a Copernicus project (start date: 10/2016, lasting 30 months, funding 1.140.000€) whose objective is to develop a web interface from which a wide variety of metrics could be computed and visualized by any user to assess the trustworthiness of any climate model against any observational dataset by relying on the wide databses created within the framework of the successive Coupled Model Intercomparison Project. This web interface would also allow for plotting any climate quantity from climate projections, with a potential weighting according to user needs. This project gathers experts from 7 research centers across Europe.

13. **IS-ENES2** (Infrastructure for the European Network of Earth System Modelling) is an EU FP7 project (start date: 04/2013; lasting 3 months; funding: 7,999,941€) supported by 23 European partners. IS-ENES2 is the second phase project of the distributed e-infrastructure of models, model data and metadata of the European Network for Earth System Modelling (ENES). This network gathers together the European modelling community working on

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understanding and predicting climate variability and change. ENES organizes and supports European contributions to international experiments used in assessments of the Intergovernmental Panel on Climate Change. This activity provides the predictions on which EU mitigation and adaptation policies are built.

14. **ESiWACE** (Centre of Excellence in Simulation of Weather and Climate in Europe) is an EU H2020 project (start date: 09/2015; lasting 21 months; funding: 4,951,048€) supported by 16 European partners. ESiWACE will substantially improve efficiency and productivity of numerical weather and climate simulation on HPC platforms by supporting the end-to-end workflow of global Earth system modelling in HPC environment. This will be obtained by improving and supporting (1) scalability of models, tools and data management on state-of-the-art supercomputer systems (2) Usability of models and tools throughout the European HPC eco-system, and (3) the Exploitability of the huge amount of resulting data.

15. **Montblanc** (European scalable and power efficient HPC platform) is an EU FP7 project (start date: 10/2015; lasting 9 months; funding: 7,968,375€) supported by 13 European partners. It aims at to design a new type of computer architecture capable of setting future global HPC standards, built from energy efficient solutions used in embedded and mobile devices. The third phase adopts a co-design approach to ensure that hardware and system innovations are readily translated into benefits for HPC applications. It aims at designing a new high-end HPC platform that is able to deliver a new level of performance / energy ratio when executing real applications.

16. **QA4Seas** (Quality Assurance for Multi-model Seasonal Forecast Products) is an EU FP7 project (start date: 07/2016; lasting 15 months; funding: 1.681.759€). It aims at developing a strategy for the evaluation and quality control of the multi-model seasonal forecasts provided by the Copernicus Climate Change Service to respond to the needs identified among a wide range of stakeholders. The quality assessment will be user driven and will put at work the best expertise available on the evaluation of the multi-faceted quality aspects of state-of-the-art seasonal forecast systems. A thorough survey will be undertaken and analysed to provide a detailed mapping of the user needs, identifying those features that should be addressed with priority. The project is promoted by the Barcelona Supercomputing Center (BSC-CNS), which leads a consortium of six institutions well known for their expertise in their engagement with users of seasonal predictions.

17. VISCA is a H2020 project (start date: 05/2017, lasting 36 months, funding 2.793.000€). The main objective of VISCA is making South-European wine industries resilient to climate changes, while minimizing costs and risks through an improvement of the production management (quality and quantity of final product). This objective will be achieved with the integration of climatic data, phenological, irrigation models, and end-users requirements into a Decision Support System (DSS) co-designed with wine producers from Spain, Italy and Portugal. VISCA will supply well-founded decisions of specific aspects of crop planning (e.g., budburst, harvesting, defoliation, minimum water needs), and suggest preventive actions against extreme events and long-term suitability maps.

18. MEDGOLD is a H2020 project (start date: 12//2017, lasting 48 months, funding 4.990.000€). Turning climate-related information into added value for traditional MEDiterranean Grape, OLive and Durum wheat food systems. MED-GOLD will demonstrate the proof-of-concept for climate services in the agriculture sector by developing case studies for three hallmarks of the Mediterranean food system: grapes, olives and durum wheat. The MED-GOLD project aims to develop climate services for olive, grape, and durum wheat crop systems that are the basis for producing olive oil, wine and pasta. This set of crops and related food products is of utmost climatic, ecological, economic, and cultural relevance to the Mediterranean region.

Peer-reviewed publications from Earth Science Department (from 2013): 156

Relevant Publications from Dr. Virginie Guemas (from 2013)   [h-index: 15; i10-index: 19; total citations: 788. Source: Scopus]
Listed below are some of the main papers published in the past 5 years by the suggested mentor of the applicant. The list of publications for the Earth Sciences department as a whole can be found here: https://earth.bsc.es/wiki/doku.php?id=publications:publications

1. Bellprat O, Massonnet F, Siegert S, Prodhomme C, **Guemas V**. Doblas-Reyes F, Uncertainty propagation in observational references to climate model scales, 2017. *Remote Sensing of Environment,* 203, 101-108, doi:10.1016/j.rse.2017.06.034.
2. Ardilouze C, Batte L, Bunzel F, Decremer D, Deque M, Doblas-Reyes F, Douville H, Fereday D, **Guemas V**, MacLachlan C, Muller W, Prodhomme C, 2017, Multi-model assessment of the impact of soil moisture initialization on mid-latitude summer predictability. *Climate Dynamics*, 49 (11-12), 3959-3974, doi:10.1007/s00382-017-3555-7**.**
3. Volpi D, **Guemas V**, Doblas-Reyes F, 2017, Comparison of full field and anomaly initialisation for decadal climate prediction : towards an optimal consistency between the ocean and sea-ice anomaly initialisation state. *Climate Dynamics*, 49 (4), 1181-1195, doi:10.1007/s00382-016-3373-3.

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4.   Massonnet F, Bellprat O, **Guemas V**, Doblas-Reyes F, 2017, Using climate models to estimate the quality of global observational data sets. *Science,* **d**oi : 10.1126/science.aaf6369.

5.   Prodhomme C, Batte L, Massonnet F, **Guemas V,** Davini P, Doblas-Reyes F, 2017, Benefits of increasing the model resolution for the seasonal forecast quality in EC-Earth. *Journal of Climate*, doi/10.1175/JCLI-D-16-0117.1.

6.   Volpi D, **Guemas V**, Doblas-Reyes F, Hawkins E, Nichols N, 2017, Decadal climate prediction with a refined anomaly initialisation approach. *Climate Dynamics*, 48 (5), 1841–1853, doi:10.1007/s00382-016-3176-6.

7.   García-Serrano J, Frankignoul C, King MP, Arribas A, Gao Y, **Guemas V**, Matei D, Msadek R, Park W, Sanchez-Gomez E, 2017, Multi-model assessment of linkages between eastern Arctic sea-ice variability and the Euro-Atlantic atmospheric circulation in current climate, *Climate Dynamics*, 49 (7-8), 2407-2429, doi:10.1007/s00382-016-3454-3.

8.   Krikken F, Hazeleger W, Vlot W, Schmeits M, Guemas V, 2016, Skill improvement of dynamical seasonal Arctic sea ice forecasts. *Geophysical Research Letters*, 43, 5124-5132, doi:10.1002/2016GL068462.

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Recent Ph.D. thesis under the supervision of Dr. Virginie Guemas:

1. Danila Volpi
Title: Benefits and drawbacks of different initialization techniques in global dynamical climate predictions
Reading date: 03/2015

2. Aude Carreric
Title : ENSO diversity under climate change
Planned reading date : 2018

3. Ruben Cruz Garcia
Title : *Regional Arctic sea ice predictability and prediction on seasonal to interannual timescales*.
Planned reading date : 2019

Recent Ph.D. thesis at the Earth Sciences Department (from 2012)

1. Rubén Cruz García
Title : *Regional Arctic sea ice predictability and prediction on seasonal to interannual timescales*.
Planned reading date : 2019

2. Verónica Torralba
Title: Seasonal climate prediction for the wind energy sector: methods and tools for the development of a climate service

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Expected Reading date: 06/2018

3. Lluís Vendrell
Title: High-resolution dust modelling based on the non-hydrostatic mesoscale model NMMB/BSC-Dust
Reading date: 11/2017

4. Luis Rodrigues
Title: Calibration and combination of seasonal climate predictions in tropical and extratropical regions.
Reading date: 01/2016

5. Danila Volpi
Title: Benefits and drawbacks of different initialization techniques in global dynamical climate predictions
Reading date: 03/20154.

6. Michele Spada
Title: Development and evaluation of an atmospheric aerosol module implemented within the NMMB/BSC Chemical Transport Model (NMMB/BSC-CTM)
Reading date: 11/2015

7. Albert Soret Miravet
Title: Air quality management: assessing the impacts of on-road transport strategies and industrial emissions in urban areas
Reading date: 12/2014

8. Marc Guevara Vilardell
Title: Development of a high-resolution emission model for air quality modelling in Spain
Reading date: 12/2014

9. Alba Badia i Moragas
Title: Implementation, development and evaluation of the gas-phase chemistry within the Global/Regional NMMB/BSC Chemical Transport Model (NMMB/BSC-CTM)
Reading date: 12/2014

10. Ángel A. Rincón Rodríguez
Title: Sistema de pronóstico de radiación solar a corto plazo a partir de un modelo meteorológico y técnicas de post-proceso para España
Reading date: 06/2013

11. Simone Marras
Title: Variational Multiscale Stabilization of Finite and Spectral Elements for Dry and Moist Atmospheric Problems
Reading date: 12/2012

12. Karsten Haustein
Title: Development of an atmospheric modeling system for regional and global mineral dust prediction: Application to Northern Africa, Middle East and Europe
Reading date: 01/2012

13. Sara Basart Alpuente
Title: Desert dust characterization in Northern Africa, Middle East and Europe through regional dust modelling, and satellite-borne and ground-based observations.
Reading date: 01/2012

Glossary

AR5 - Fifth Assessment Report

BSC-CNS - Barcelona Supercomputing Center – Centro Nacional de Supercomputación

BSC-ES - Earth Sciences department of the Barcelona Supercomputing Center

CFD – Computational Fluid Dynamic

CLIVAR – Climate and Ocean: Variability, Predictability and Change (one of four core projects of the WCRP

CMIP - Coupled Model Intercomparison Project

ESM – Earth System Model

HPC - High-Performance Computing

IC3 - Institut Català de Ciències del Clima

ICREA - Catalan Institution for Research and Advanced Studies

IPCC - Intergovernmental Panel on Climate Change

PI - Principal Investigator

PRACE - Partnership for Advanced Computing in Europe

RES - Red Española de Supercomputación

UN - United Nation

UPC - Universitat Politècnica de Catalunya

WCRP – World Climate Research Programme

WMO - World Meteorological Organization