

SECRETARÍA DE ESTADO  
DE INVESTIGACIÓN  
DESARROLLO E  
INNOVACIÓN

SECRETARÍA GENERAL  
DE CIENCIA, TECNOLOGÍA  
E INNOVACIÓN

DIRECCIÓN GENERAL  
DE INVESTIGACIÓN  
CIENTÍFICA Y TÉCNICA

SUBDIRECCIÓN GENERAL  
DE RECURSOS HUMANOS  
PARA LA INVESTIGACIÓN

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MINISTERIO  
DE ECONOMÍA Y  
COMPETITIVIDAD

## AYUDAS JUAN DE LA CIERVA-INCORPORACIÓN 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 75 de la 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 75 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, haciendo especial referencia a los méritos del investigador tutor del investigador candidato.

*(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, with a special reference to the merits of the tutor investigator of the candidate)*

### CUMPLIMENTAR PREFERIBLEMENTE EN INGLÉS – FILL IN BETTER IN ENGLISH

The applicant, Dr. Antonis Gkikas, is currently working as a Postdoctoral researcher, in the framework of a Marie Curie-IEF scholarship, in the Earth Sciences Department of the Barcelona Supercomputing Center. His scientific interests lie in the field of dust aerosols' observations (ground and satellite) and modeling. The candidate, aims to sustain his current position conducting research in dust-radiation interactions and their associated impacts on Earth-Atmosphere system's radiation budget as well as on atmospheric dynamics, at short term temporal scales, based on regional modeling. His tutor investigator will be Dr. Oriol Jorba Casellas.

The Barcelona Supercomputing Center – Centro Nacional de Supercomputación (BSC-CNS) is the National Supercomputing Facility of Spain. BSC-CNS manages MareNostrum III with 48,128 cores and 1.1 Pflops capacity, one of the most powerful supercomputers in Europe, located in the former Torre Girona chapel in Barcelona. BSC-CNS also hosts other high-performance computing (HPC) systems such as MinoTauro, one of the most energy efficient supercomputers in the world. The mission of BSC-CNS is oriented to research, develop and manage information technology aiming at facilitating scientific and technological progress. At the BSC-CNS, more than 350 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. These multi-disciplinary synergies of world-leading researchers and HPC experts along with state-of-the-art HPC resources make BSC-CNS a unique research institution.

BSC-CNS is located on the 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 advanced research and teaching, i.e., the BSC-CNS substantially contributes to and benefits from UPC higher educational environment. The BSC-CNS is a key element of, and it coordinates, the Spanish Supercomputing Network, which is the main framework for granting competitive HPC time to Spanish research institutions. Also, BSC-CNS is one of the six hosting nodes in France, 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 25 European member countries. BSC-CNS has been accredited as one of the first eight Severo Ochoa Centers of Excellence. This award is given by the Government of Spain as recognition to leading research centers in Spain that are internationally well known in their scientific areas. More specifically, BSC-CNS received Severo Ochoa Center of Excellence support and accreditation (started in January 2012) for accomplishments in research and engineering, deploying exascale supercomputers and big data management strategies to tackle major societal problems in scientific areas such as human health, biomechanics, environment and climate.

The Earth Sciences department of the Barcelona Supercomputing Center (BSC-ES) was established to conduct multi-facet research in Earth system modeling. The BSC-ES focuses on research in atmospheric emissions, air quality, mineral dust transport and global-regional climate modeling and prediction. In 2014, the Center recruited the ICREA Professor Francisco Doblas-Reyes as new director of the BSC-ES. Dr. Doblas-Reyes is a first-rate researcher, who also holds the direction of the Climate Forecast Unit at the Institut Català de Ciències del Clima (IC3-CFU). He has expanded the scope of the BSC-ES by merging the original research group focusing on the development of atmospheric and chemical transport models for regional and global forecasting, with the IC3-CFU, which is one of the most active and well-known research groups on climate prediction and services in Europe. This merging, though challenging, is creating a more efficient and competitive department that holds a sufficient critical mass to compete with the top international research groups in Earth system modeling. Moreover, Dr. Pérez García-Pando, who initiated dust research at the BSC-ES in 2006, has been awarded recently with an AXA Chair on Sand and Dust Storms (SDS), placed at the BSC-CNS. Thanks to this financial support by the AXA Research Fund, Dr. Pérez García-Pando, who is an emerging leading expert in dust modeling working currently in NASA, will join the BSC-ES research group strengthening thus its high quality scientific level.

The BSC-ES works on the development of and conducts research with a multi-scale set of comprehensive single-component and coupled general circulation models. For example, the high-resolution (horizontal resolution from 12 km down to 1 km) air quality forecasting system CALidad del aire Operacional Para España (CALIOPE), provides essential variables on hourly basis to end-users interested in monitoring and reducing the impact of air pollution on human health. The simulation domains cover different regions of interest, from local hot spots to national or European level. Furthermore, BSC-ES is developing and operating an integrated meteorology-air-quality Nonhydrostatic Multiscale Meteorological Model on the B grid/BSC Chemical Transport Model (NMMB/BSC-CTM), an advance chemical weather prediction system for applications on global to regional domains, at sub-synoptic and mesoscale resolutions. BSC-ES also uses the BSC-DREAM8b (Dust REgional Atmospheric Model 8b) model for daily operational mineral dust forecasts for the Euro-Mediterranean region and collaborates with the UN World Meteorological Organization (WMO) and the Spanish Meteorological Agency (Agencia Estatal de Meteorología - AEMET), hosting the Regional Center for Sand and Dust Warming System (SDS-WAS) covering Europe, Northern Africa and the Middle East. In parallel, BSC-ES has developed a versatile regional climate modeling capability with the Advanced Research WRF (Weather and Research Forecasting model) and its predecessor MM5 (Fifth-Generation PSU/NCAR Mesoscale Model), at different configurations covering Spain and Catalonia to explore impacts of the climate change and provide possible adaptation policies in the future.

BSC-ES research activities focus on atmospheric/dust modeling through research and in-house developments of the chemical weather prediction system NMMB/BSC-CTM. The NMMB/BSC-CTM model is running operationally in the BSC-ES (<https://www.bsc.es/earth-sciences/nmmbbsc-project>). In addition, the model contributes to the WMO Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS) Regional Center as well as to the Barcelona Dust Forecast Center (BDFC; <http://dust.aemet.es/about-us>). For the SDS-WAS, the model is configured to run for a regional domain covering the Northern Africa, Middle East and Europe while the same simulation domain is kept for the BDFC, at 10 km horizontal resolution. Apart from regional simulations, the model is running operationally also for the whole globe contributing to the International Cooperative for Aerosol Prediction (ICAP) Multi Model Ensemble in conjunction with ECMWF MACC, JMA MASINGAR, NASA GSFC/GMAO, FNMOC/NRL NAAPS, NOAA NGAC and Met Office Unified Model.

Since 2008, under the supervision of Dr. Oriol Jorba Casellas, the research team of the BSC-ES is working extensively on the development of the NMMB/BSC-CTM model in collaboration with NOAA/National Centers for Environmental Prediction (NCEP), NASA Goddard Institute for Space Studies and the International Research Institute for Climate and Society (IRI). The in-house developments of the NMMB/BSC-CTM model have been funded by several Spanish national projects (CGL2006-11879/CLI, CGL2008-02818/CLI, CGL2010-19652, CGL2013-46736, Consolider CSD2007-0050, SEV-2011-00067) of the Ministry of Economy and Competitiveness. The model, thanks to its non-hydrostatic dynamical core, is capable to run at a wide range of spatial scales, from global to regional level, providing forecasts for meteorological and dust fields. Moreover, it consists of sophisticated schemes describing the atmospheric processes, dust life cycle, chemistry and radiation. The meteorological driver (Non-hydrostatic Multiscale Model on the B grid NMMB), has been developed within the Earth System Modeling Framework (ESMF) at the National Centers for Environmental

Prediction (NCEP) adapting the general modeling architecture of the NCEP regional WRF Non-hydrostatic Mesoscale Model (WRF-NMM). The dust module, developed by the BSC-ES team, is online coupled with the meteorological driver and describes in detail the components of dust aerosols' life cycle, namely the emission, dry/wet deposition and transport into the atmosphere. The radiation transfer scheme Rapid Radiative Transfer Model (RRTM), coupled with aerosol module and the meteorological driver, is used in numerical simulations. Finally, the model also includes the option to solve the comprehensive chemistry of the troposphere with a detailed gas-phase chemical mechanism with 51 chemical species and 156 reactions.

The tutor investigator of the candidate, Dr. Oriol Jorba Casellas, received his degree in Industrial Engineer (1999), his Diploma of Advanced Studies in Environmental Engineering (2002) and his Ph.D. in Environmental Engineering (2005), by the Technical University of Catalonia (UPC), Barcelona. In 2005, he was enrolled as researcher at the Earth Sciences Department of the Barcelona Supercomputing Center, and in 2008 he moved to the Atmospheric Modeling Group Manager position at BSC. He held a research position at the University of California, Irvine (USA) in 2011, and at the NASA Goddard Institute for Space Studies (USA), in 2013. His main scientific interests lie in the field of high resolution mesoscale meteorology and air quality, development of online meteorology-chemistry models, boundary layer and atmospheric chemistry studies and environmental impact assessment. During his research career, he has participated in more than 20 Spanish projects and European projects of the FP5 and FP7 Framework Programme such as, APPRAISAL (999.999€), EARLINET (53.655€), IS-ENES (7.600.000€), FIELD-AC (200.037€), IS-ENES2 (9.639.307€), RETHINK big (1.922.000€) and he is the principal investigator of the Spanish research project CGL2008-02818 and CGL2013-46736. Moreover, he has contributed to projects (IS-ENES, IS-ENES2, RETHINK big) in the field of atmospheric modeling through simulations in HPC environments. He is leading the research project on the development of the multiscale chemical weather forecasting system NMMB/BSC-CTM, which is contributing to the Barcelona Dust Forecast Center and the World Meteorological Organization (WMO) Regional Meteorological Center, specialized on Atmospheric Sand and Dust forecasts. He has been evaluator in air quality impacts assessment projects collaborating with private companies (PRySMA Calidad y Medioambiente, S.A., IBERDROLA, Gas Natural, PB Powers, SGS TECNOR, S.A., INYPSA Informes y proyectos, S.A.), as well as with public bodies, such as the Gobierno de Canarias and the Departamento de Medio Ambiente de Cataluña. He is a Spanish representative member of the management committee of COST Actions ES1002 and ES1004, and the scientific committee of the International Technical Meeting on Air Pollution Modeling and its Application (ITM). He is also a member of the International Cooperative for Aerosol Prediction (ICAP) and the Air Quality Modeling Evaluation International Initiative (AQMEII). He maintains regular collaborations about aerosol modeling with the NASA Goddard Institute for Space Studies, National Center for Environmental Prediction, Finnish Meteorological Institute, among others. He has acted as scientific reviewer of the Scientific Commission of the Spanish National Research Program. He is co-author in more than 55 papers (h-index: 13) published in peer-reviewed scientific journals and more than 100 contributions announced to international conferences. Finally, he was the supervisor of 6 PhD theses while currently is the responsible for the scientific guidance of two PhD students working on dust and air quality modeling.

BSC-ES has a great capacity for training of postdoctoral researchers and students, and has made a strong impact on their career development. Former postdocs and Ph.D. students hosted at the BSC-ES, 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 Pérez 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). Furthermore, some of BSC-ES students have already become leading university researchers and professors, such as Prof. René Parra Narváez (Universidad San Francisco de Quito, Ecuador), Prof. Henry Flores Tovar (University of Caracas, Venezuela), Prof. Luis A. García Leyton (Universidad Veracruzana, Mexico), Dr. Pedro Jiménez Guerrero (Universidad de Murcia, Spain), Prof. Leonor Patricia Güereca Hernández (National Autonomous University of Mexico, Mexico), Prof. Carlos Antonio Caballero Valdés (Tecnológico de Monterrey, Mexico), Dr. María Gonçalves Ageitos (UPC and BSC-ES) and Dr. Oriol Jorba Casellas (BSC-ES). More information about publications and scientific projects where the tutor investigator has contributed, as well as PhD theses conducted at BSC-ES are listed below.

• Selected publications of Dr. Oriol Jorba Casellas and rest of the BSC-ES team:

1. Pérez, C., Haustein, K., Janjic, Z., **Jorba, O.**, Huneus, N., Baldasano, J. M., Black, T., Basart, S., Nickovic, S., Miller, R. L., Perlwitz, J. P., Schulz, M., and Thomson, M.: Atmospheric dust modeling from meso to global scales with the online NMMB/BSC-Dust model – Part 1: Model description, annual simulations and evaluation, *Atmos. Chem. Phys.*, 11, 13001-13027, doi:10.5194/acp-11-13001-2011, 2011.
2. Haustein K, Pérez C, Baldasano JM, **Jorba O**, Basart S, Miller RL, Janjic Z, Black T, Nickovic S, Todd MC, Washington R, Müller D, Tesche M, Weinzierl B, Esselborn M, Schladitz A (2012). Atmospheric dust modeling from meso to global scales with the online NMMB/BSC-Dust model - Part 2:

- Experimental campaigns in Northern Africa. *Atmospheric Chemistry and Physics* 12, 2933 - 2958.
3. A Badia; **O Jorba**. Gas-phase evaluation of the online NMMB/BSC-CTM model over Europe for 2010 in the framework of the AQMEII-Phase2 project. *Atmospheric Environment*. Elsevier, 2014.
4. W.R. Sessions; J.S. Reid; A. Benedetti; P.R. Colarco; A. Da Silva; S. Lu; T. Sekiyama; T.Y. Tanaka; J.M. Baldasano; S. Basart; M.E. Brooks; T.F. Eck; M. Iredell; J.A. Hansen; **O.C. Jorba**; H.-M.H. Juang; P. Lynch; J.-J. Morcrette; S. Moorthi; J. Mulcahy; Y. Pradhan; M. Razinger; C.B. Sampson; J. Wang; D.L. Westphal. Development towards a global operational aerosol consensus: Basic climatological characteristics of the International Cooperative for Aerosol Prediction Multi-Model Ensemble (ICAP-MME). *Atmospheric Chemistry and Physics*. 15 - 1, pp. 335 - 362. 2015.
5. Spada, M., **Jorba, O.**, Pérez García-Pando, C., Janjic, Z., and Baldasano, J. M.: Modeling and evaluation of the global sea-salt aerosol distribution: sensitivity to size-resolved and sea-surface temperature dependent emission schemes published in *Atmos. Chem. Phys.*, 13, 11735–11755, 2013, *Atmos. Chem. Phys.*, 13, 11985-11985, doi:10.5194/acp-13-11985-2013, 2013.
6. Simone Marras; James F Kelly; Margarida Moragues; Andreas Müller; Michal A Kopera; Mariano Vazquez; Francis X Giraldo; Guillaume Houzeaux; **Oriol Jorba**. A Review of Element-Based Galerkin Methods for Numerical Weather Prediction: Finite Elements, Spectral Elements, and Discontinuous Galerkin. *Archives of Computational Methods in Engineering*. pp. 1 - 50. Springer, 2015.
7. U Im; R Bianconi; E Solazzo; I Kioutsioukis; A Badia; A Balzarini; R Baro; R Bellasio; D Brunner; C Chemel; others. Article in press: Evaluation of operational online-coupled regional air quality models over Europe and North America in the context of AQMEII phase 2. Part II: Particulate matter. *Atmospheric Environment*, 1-21. 2014.
8. Dominik Brunner; Nicholas Savage; **Oriol Jorba**; Brian Eder; Lea Giordano; Alba Badia; Alessandra Balzarini; Rocío Baro; Roberto Bianconi; Charles Chemel; others. Comparative analysis of meteorological performance of coupled chemistry-meteorology models in the context of AQMEII phase 2. *Atmospheric Environment*. 2014.
9. M Pandolfi; X Querol; A Alastuey; JL Jimenez; **O Jorba**; D Day; A Ortega; MJ Cubison; A Comeron; M Sicard; others. Effects of sources and meteorology on particulate matter in the Western Mediterranean Basin: An overview of the DAURE campaign. *Journal of Geophysical Research: Atmospheres*. 119 - 8, pp. 4978 - 5010. Wiley Online Library, 2014.
10. Alexander Baklanov; K Schlünzen; Peter Suppan; Jose Baldasano; Dominik Brunner; Sebnem Aksoyoglu; Greg Carmichael; John Douros; Johannes Flemming; Renate Forkel; others. Online coupled regional meteorology chemistry models in Europe: current status and prospects. *Atmospheric Chemistry and Physics*. 14 - 1, pp. 317 - 398. Copernicus GmbH, 2014.
11. Mathias Ritter; Mathias D Müller; **Oriol Jorba**; Eberhard Parlow; L-J Sally Liu. Impact of chemical and meteorological boundary and initial conditions on air quality modeling: WRF-Chem sensitivity evaluation for a European domain. *Meteorology and Atmospheric Physics*. 119 - 1-2, pp. 59 - 70. Springer, 2013.
12. **O Jorba**; M Pandolfi; M Spada; JM Baldasano; J Pey; A Alastuey; D Arnold; M Sicard; B Artinano; MA Revuelta; others. Overview of the meteorology and transport patterns during the DAURE field campaign and their impact to PM observations. *Atmospheric Environment*. Elsevier, 2013.
13. Basart, S., Pay, M. T., **Jorba, O.**, Pérez, C., Jiménez-Guerrero, P., Schulz, M., and Baldasano, J. M.: Aerosols in the CALIOPE air quality modelling system: evaluation and analysis of PM levels, optical depths and chemical composition over Europe, *Atmos. Chem. Phys.*, 12, 3363-3392, doi:10.5194/acp-12-3363-2012, 2012.
14. **Jorba; O.**; D. Dabdub; C. Blaszczyk-Boxe; C. Pérez; Z. Janjic; J. Baldasano; M. Spada; A. Badia; and M. Gonçalves. Potential significance of photoexcited NO<sub>2</sub> on global air quality with the NMMB/BSC chemical transport model. *Journal of Geophysical Research*. 117, pp. 1 - 16. 2012.
15. **Jorba; O.**; Pandolfi, M.; Spada, M.; Baldasano, J.M.; Pey, J.; Alastuey, A.; Arnold, D.; Sicard, M.; Artiñano, B.; Revuelta, M.A.; Querol, X. The DAURE field campaign: meteorological overview. *Atmospheric Chemistry and Physics Discussion*. 11, pp. 4953 - 5001. 2011.
16. Gonçalves M., Barrera-Escoda A., Guerreiro D., Baldasano J.M., Cunillera J. (2014) Seasonal to yearly assessment of temperature and precipitation trends in the North Western Mediterranean Basin by dynamical downscaling of climate scenarios at high resolution (1971–2050). *Climatic Change* 122, 243-256.
17. Guevara M, Martínez F., Arévalo G., Gassó S., Baldasano J.M. (2013). An improved system for modelling Spanish emissions: HERMESv2.0. *Atmospheric Environment* 81, 209 - 221.
18. Gonçalves M, Jiménez-Guerrero P, Baldasano JM (2009). Contribution of atmospheric processes affecting the dynamics of air pollution in South-Western Europe during a typical summertime photochemical episode. *Atmospheric Chemistry and Physics*, 9, 849-864
19. Doblas-Reyes, F.J., J. García  
Seasonal climate predictability and forecasting: status and prospects. *WIREs Climate Change*, doi:10.1002/WCC.217.
20. Doblas  
Smith, T.N. Palmer (2009), Addressing model uncertainty in seasonal and annual dynamical ensemble forecasts, *Quarterly Journal of the Royal Meteorological Society*, 135(643), 1538-1559.

21. Rodrigues, L.R.L., J. García-Serrano and F.J. Doblas-Reyes (2014). Seasonal forecast quality of the West African monsoon rainfall regimes by multiple forecast systems. *Journal of Geophysical Research*, 119, 7908-793.
22. Guemas, V., J. García-Serrano, A. Mariotti, F.J. Doblas-Reyes and L.-P. Caron (2014). Prospects for decadal climate prediction in the Mediterranean region. *Quarterly Journal of the Royal Meteorological Society*, doi:10.1002/qj.2379.
23. Meehl, G.A., L. Goddard, G. Boer, R. Burgman, G. Branstator, C. Cassou, S. Corti, G. Danabasoglu, F.J. Doblas-Reyes, E. Hawkins, A. Karspeck, M. Kimoto, A. Kumar, D. Matei, J. Mignot, R. Msadek, H. Pohlmann, M. Rienecker, T. Rosati, E. Schneider, D. Smith, R. Sutton, H. Teng, G.J. van Oldenborgh, G. Vecchi and S. Yeager (2014). Decadal climate prediction: An update from the trenches. *Bulletin of the American Meteorological Society*, 95, 243-267, doi:10.1175/BAMS-85-6-853.
24. Pay MT, Martínez F, Guevara M, Baldasano JM (2014). Air quality forecasts on a kilometer-scale grid over complex Spanish terrains. *Geoscientific Model Development* 7, 1979–1999.
25. Palmer T.N., F.J. Doblas-Reyes, A. Weisheimer, M.J. Rodwell (2008), Toward seamless prediction: Calibration of climate change projections using seasonal forecasts, *Bulletin of the American Meteorological Society*, 89(4), 459-470.

● Selected projects of Dr. Oriol Jorba Casellas (as principal investigator or co-investigator) and the BSC-ES:

1. **IS-ENES1** (InfraStructure for the European Network for Earth System modeling - phase 1) is an EU FP7 project. This is an infrastructure project that aims to further integrate the European climate modeling community, to help the definition of a common future strategy, to ease the development of full ESMs, to foster the execution and utilization of HPC simulations, and to support the dissemination of model results and the interaction with the climate change impact community. It also fosters link with the EU large research infrastructures such as PRACE.
2. **IS-ENES2** (InfraStructure for the European Network for Earth System modeling - phase 2) is an EU FP7 project. This is the second phase project of the distributed e-infrastructure of models, model data and metadata of the European Network for Earth System Modeling (ENES). It furthers understanding of climate variability and change, and provides support for HPC simulations and related educational activities. This enables improvement of the prediction of climate variability and change, on which EU mitigation and adaptation policies rely on.
3. **MACC-II** (Monitoring Atmospheric Composition and Climate - Interim Implementation) is an EU FP7 project, in collaboration with AEMET, which combines state-of-the-art atmospheric modeling with Earth observation data to provide information services covering European air quality, global atmospheric composition, climate forcing, the ozone layer, solar energy, and emissions and surface fluxes. This project aims to establish the core global and regional atmospheric environmental services to be delivered as a component of the European Global and regional Earth system (atmosphere) Monitoring using Satellite and in-situ (GEMS) initiative.
4. **ACTRIS** (Aerosols, Clouds, and Trace gases Research InfraStructure network) is an EU FP7 project. It aims to integrate European ground-based stations equipped with advanced atmospheric instrumentation for aerosols, clouds, and short-lived gas-phase species. ACTRIS will have the essential role to support building of new knowledge as well as policy issues on climate change, air quality, and long-range transport of pollutants.
5. **FIELD\_AC** (Fluxes, Interactions and Environment at the Land-ocean boundary - Downscaling, Assimilation and Coupling) is an EU FP7 project. Its main objective was to provide higher accuracy and reliability of meteo-oceanographic predictions that encompass a wide range of physical and ecological variables with the ultimate aim of predicting the water quality status near coastal cities, tourist beaches or rich aquaculture and fishery areas. It formulated more comprehensive land discharge conditions, improved local parameterisations and provided new strategies for the studied field cases (Liverpool Bay, German Bight, Catalan coast and Venice gulf). This project bridged the gap from shelf predictions to local (river mouth or harbour/beach scales) simulations required at the coastal zone.
6. **APPRAISAL** (Air Pollution Policies for Assessment of Integrated Strategies At regional and Local scales) is an EU FP7 project. The project aims to address and assess the impact of local and regional air quality plans and their public health implications and it encompasses 15 group with outstanding expertise in this area. This project will perform an overall review of the methodologies from simple ones (e.g. scenario analysis) to more comprehensive ones (e.g., cost-benefit analysis), design an integrated assessment modeling framework and communicate to key stakeholders scientific knowledge on emission abatement assessment.
7. **"Effects of Mediterranean desert dust outbreaks on radiation, atmospheric dynamics and forecasting accuracy of a numerical mesoscale model" (MDRAF)**: The main tasks of the MDRAF project are the description of the Mediterranean desert dust outbreaks' vertical structure as well as the investigation of their impacts on the Earth-Atmosphere system's radiation budget and on atmospheric dynamics, at short-term temporal scales. The spatiotemporal characteristics of the Mediterranean desert dust outbreaks' 3D structure, over the period 2000-2013, are analyzed through the development

and implementation of an objective and dynamic algorithm which operates using as inputs satellite retrievals provided by different databases. Based on the satellite algorithm's outputs, 20 intense Mediterranean desert dust outbreaks have been selected according to their spatial coverage and intensity. For these cases, the induced dust radiative effects are analyzed through short term simulations of the NMMB/BSC-Dust model. More specifically, the dust outbreaks' impacts on the radiation fields and on atmospheric dynamics are described thoroughly. Finally, is assessed the forecasting ability of a regional model (NMMB/BSC-Dust) when dust radiative effects are included in the numerical simulations.

8. **"Improvement of the Dust REgional Atmospheric Model (DREAM) for prediction of Saharan dust events in the Mediterranean and the Canary Islands" (CGL2006-11879/CLI):** The main task of this project, was the development of a mineral dust module, able to represent the components of the dust life cycle, and its implementation into the NMMB atmospheric global/regional model. The meteorological driver NMMB has been developed in the National Centers for Environmental Prediction (NCEP).
9. **"Coupling of a Fully Online Chemical Mechanism Within the Atmospheric Global-Regional UMO/DREAM Model" (CGL2008- 02818/CLI):** The main objective of this project was the implementation of a gas-phase chemistry module into the NMMB/BSC-Dust atmospheric global/regional model. Through this implementation, the NMMB/BSC-CTM model was able to simulate the most relevant gas-phase chemistry of the troposphere and the life cycle of mineral dust within a common framework.
10. **"Coupling of a fully online multi-component aerosol module within the atmospheric global-regional NMMB model" (CGL2010-19652):** The main achievement of this project was the development and implementation of a global multi-component aerosol module into the NMMB/BSC-CTM. Special interest is given to the main aerosol species, namely dust, sea-salt, black carbon, organic carbon and sulphate while secondary aerosols are not considered in the present version of the model.
11. **"Aerosol forecasting and assessment of radiative forcing on weather and climate applications with the online NMMB/BSC-CTM model" (CGL2013-46736):** This project aims at addressing the aerosol-radiation interactions (ARI) and their relevant impacts on atmospheric dynamics. For this purpose, the online coupling between aerosols and radiation has been developed and implemented into the NMMB/BSC-CTM model.
12. **Severo-Ochoa Program (SEV-2011-00067):** In this project a high-resolution configuration of the model at a global scale is under development. The system will be coupled with an ocean model for climate projections and a data assimilation system able to produce mineral dust analysis. An exascale application of the model is designed to prepare the system for future exascale supercomputers. Improvement on the parallelization of the system for future supercomputer architectures is conducted applying COMPSs and ompSs technologies developed at BSC.
13. **SPECS** (Seasonal-to-decadal climate Prediction for the improvement of European Climate Services) is an EU FP7 project (lasting 51 months) supported by 19 European institutions and a Brazilian institution. 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).
14. **EUPORIAS** (EUropean Provision Of Regional Impact Assessment on a Seasonal-to-decadal timescale) is an EU FP7 project (lasting 48 months). The main aim is to develop and deliver a reliable and trusted impact prediction system for two or three semi-operational prototypes. These will provide working examples of end-to-end climate-to-impacts-to-decision-making services operating on seasonal to decadal time scales. This project is shared by 24 European institutions and it will also assess and document key knowledge gaps and vulnerabilities of important sectors (e.g. water, energy, transport, etc.) along with the needs of specific users in these sectors.
15. **EUCLEIA** (EUropean CLimate and weather Events: Interpretation and Attribution) is an EU FP7 project. 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.
16. **CLIM-RUN** (Climate Local Information in the Mediterranean region Responding to User Needs) is an EU FP7 project. This project aims at developing a protocol for applying new methodologies and improved modeling and downscaling tools for the provision of adequate climate information at regional to local scale that is relevant to and usable by different sectors of society (policymakers, industry, cities, etc.). 16 institutions plan to develop a Mediterranean-wide network of climate services that would eventually confluence to a pan-European network.

**1. Author:** Michelle Spada

**Title:** Development and evaluation of an atmospheric aerosol module implemented within the NMMB/BSC-CTM

**Reading date:** 23/11/2015

**Thesis supervisors:** Dr. Oriol Jorba Casellas (BSC-ES) and Prof. José M. Baldasano Recio (BSC-ES/UPC)

**Doctoral Program:** Environmental Engineering (UPC)

**2. Author:** Albert Soret Miravet

**Title:** Air quality management: assessing the impacts of on-road transport strategies and industrial emissions in urban areas

**Reading date:** 18/12/2014

**Thesis supervisor:** Prof. José M. Baldasano Recio (BSC-ES/UPC)

**Doctoral Program:** Environmental Engineering (UPC)

**3. Author:** Marc Guevara Vilardell

**Title:** Development of a high-resolution emission model for air quality modelling in Spain

**Reading date:** 17/12/2014

**Thesis supervisor:** Prof. José M. Baldasano Recio (BSC-ES/UPC)

**Doctoral Program:** Environmental Engineering (UPC)

**4. Author:** 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:** 12/12/2014

**Thesis supervisors:** Dr. Oriol Jorba Casellas (BSC-ES) and Prof. Santiago Gassó Domingo (BSC-ES/UPC)

**Doctoral Program:** Environmental Engineering (UPC)

**5. Author:** 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:** 28/06/2013

**Thesis supervisors:** Prof. José M. Baldasano Recio (BSC-ES/UPC) and Dr. Oriol Jorba Casellas (BSC-ES)

**Doctoral Program:** Environmental Engineering (UPC)

**6. Author:** Simone Marras

**Title:** Variational Multiscale Stabilization of Finite and Spectral Elements for Dry and Moist Atmospheric Problems

**Reading date:** 10/12/2012

**Thesis supervisors:** Dr. Oriol Jorba Casellas (BSC-ES) and Dr. Mariano Vázquez (CASE-BSC)

**Doctoral Program:** Environmental Engineering (UPC)

**7. Author:** 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:** 31/01/2012

**Thesis supervisors:** Dr. Carlos Pérez García-Pando (IRI, Columbia University, New York, USA) and Prof. José M. Baldasano Recio (BSC-ES/UPC)

**Doctoral Program:** Environmental Engineering (UPC)

**8. Author:** 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:** 30/01/2012

**Thesis supervisors:** Dr. Carlos Pérez García-Pando (IRI, Columbia University, New York, USA) and Dr. Emilio Cuevas Agulló (AEMET)

**Doctoral Program:** Environmental Engineering (UPC)

**9. Author:** María Teresa Pay Pérez

**Title:** Regional and urban evaluation of an air quality modelling system in the European and Spanish domains

**Reading date:** 22/11/2011

**Thesis supervisors:** Prof. José M. Baldasano Recio (BSC-ES/UPC) and Dr. Pedro Jiménez Guerrero (UM)

**Doctoral Program:** Environmental Engineering (UPC)

**10. Author:** Maria Gonçalves Ageitos

**Title:** Assessing variations in urban air quality when introducing on-road traffic management strategies by means of high-resolution modelling. Application to Barcelona and Madrid urban areas

**Reading date:** 09/03/2009

**Thesis supervisors:** Prof. José M. Baldasano Recio (BSC-ES/UPC) and Dr. Pedro Jiménez Guerrero (UM)

**Doctoral Program:** Environmental Engineering (UPC)

**11. Author:** Carlos Antonio Caballero Valdés

**Title:** Metodología genérica de evaluación ambiental estratégica (EAE), mediante el uso de indicadores ambientales (IA), y análisis multicriterio (AMC), con aplicación al Plan Director Sectorial Energético de las Islas Baleares (PDSEIB)

**Reading date:** 17/09/2007

**Thesis supervisor:** Prof. Santiago Gassó Domingo (BSC-ES/UPC)

**Doctoral Program:** Environmental Engineering (UPC)

**12. Author:** Leonor Patricia Güereca Hernández

**Title:** Desarrollo de una metodología para la valoración en el análisis del ciclo de vida aplicada a la gestión integral de residuos municipales

**Reading date:** 14/12/2006

**Thesis supervisor:** Prof. Santiago Gassó Domingo (BSC-ES/UPC)

**Doctoral Program:** Environmental Engineering (UPC)

**13. Author:** Susana Saiz Colmenar

**Title:** Evaluación de la estrategia energética de la industria española intensiva en consumo energético a partir del análisis histórico de un complejo químico y aplicación a otros tipos de industrias

**Reading date:** 08/06/2006

**Thesis supervisors:** Prof. José M. Baldasano Recio (BSC-ES/UPC)

**Doctoral Program:** Environmental Engineering (UPC)

**14. Author:** Carlos Pérez García-Pando

**Title:** Local to regional atmospheric modeling and lidar methods in the Mediterranean

**Reading date:** 15/12/2005

**Thesis supervisor:** Prof. José M. Baldasano Recio (BSC-ES/UPC)

**Doctoral Program:** Environmental Engineering (UPC)

**15. Author:** Gustavo Arévalo Roa

**Title:** Inventario de emisiones atmosféricas en la Comunidad Valenciana para uso en modelización fotoquímica y de material particulado

**Reading date:** 25/11/2005

**Thesis supervisor:** Prof. José M. Baldasano Recio (BSC-ES/UPC)

**Doctoral Program:** Environmental Engineering (UPC)

**16. Author:** Nelson Vera Mella

**Title:** Determinación de atlas climáticos de radiación solar a partir de imágenes de satélite. Aplicación a la Península Ibérica

**Reading date:** 22/09/2005

**Thesis supervisor:** Prof. José M. Baldasano Recio (BSC-ES/UPC)

**Doctoral Program:** Environmental Engineering (UPC)

**17. Author:** Pedro Jiménez Guerrero

**Title:** Air quality modeling in very complex terrains: ozone dynamics in the Northeastern Iberian Peninsula

**Reading date:** 09/03/2005

**Thesis supervisor:** Prof. José M. Baldasano Recio (BSC-ES/UPC)

**Doctoral Program:** Environmental Engineering (UPC)

**18. Author:** Oriol Jorba Casellas

**Title:** Simulación de los campos de viento de la zona geográfica de Catalunya con alta resolución espacial para las situaciones meteorológicas típicas

**Reading date:** 08/03/2005

**Thesis supervisor:** Prof. José M. Baldasano Recio (BSC-ES/UPC)

**Doctoral Program:** Environmental Engineering (UPC)