



**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 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 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 goal of this application is to enable the candidate, Dr. Etienne Tourigny, to conduct a research project that is not only in line with, but also amplifies ongoing research conducted by the **Atmospheric Composition Group** at the Barcelona Supercomputing Center – Centro Nacional de Supercomputación's Earth Sciences Department. The candidate will be supervised by Dr. Carlos Pérez García-Pando, who is a **Ramon y Cajal Fellow** at BSC, **AXA Professor** on Sand and Dust Storms, and **Head of the Atmospheric Composition Group** where the candidate will be integrated.

**Overview of the Host Research Team**

The Barcelona Supercomputing Center - Centro Nacional de Supercomputación (**BSC-CNS**) is the national supercomputing facility of Spain. BSC-CNS's mission is to research, 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, the most powerful computer in Spain, with 165,888 cores and 11.15 Pflops peak performance capacity. More than 500 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. Recruitment is based on principles of merit, transparency, competition, and gender balance. The centre was awarded with the badge of Human Resources Excellence in Research (HRS4R). Its 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. In fact, BSC-CNS has been accredited since its first call (2011) as one of the 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.

Within the BSC-CNS, the Earth Sciences department (**ES-BSC**) conducts multi-faceted research in Earth system modelling. Since the designation of Prof Francisco J. Doblas-Reyes as Director of the ES-BSC in 2014, the department has become in a short time a main European actor in the development of climate predictions and climate services. It is



structured around four groups with more than 80 employees, including technical and support staff, and 10 PhD students. The major areas of research covered at the ES-BSC range from air quality, atmospheric emission and mineral dust transport to climate variability and prediction. It is a highly productive scientific entity that has published more than **200 research articles in peer-reviewed journals over the last 5 years, including 7 in prestigious high-impact journals** (i.e. Nature and Science Publishing Groups). For a complete list of the publications of the department see <https://earth.bsc.es/wiki/doku.php?id=publications:publications>. **During the last 5 years, the ES-BSC has been granted around 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 Foundation, 1 project from ERA-NET, 3 from ERA4CS and 1 ERC Consolidator Grant**, which has helped to consolidate a dense international collaborative network counting at least 50 institutes worldwide. During that same period, BSC-ES also participated in 21 RES and 4 PRACE projects. 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).

The fellowship will be hosted by the Atmospheric Composition (**AC**) Group within BSC-ES **led by the Supervisor Dr. Pérez García-Pando**. The AC group aims at better understanding and predicting the spatiotemporal variations of atmospheric pollutants along with their effects upon air quality, weather and climate. The AC group develops the Multiscale Online Non-hydrostatic Atmosphere Chemistry model (MONARCH; previously known as NMMB/BSC-CTM). MONARCH contains advanced chemistry and aerosol packages, and is coupled online with the Non-hydrostatic Multiscale Model (NMMB), which allows for running either global or high-resolution (convection-allowing) regional simulations, and is coupled with an aerosol data assimilation system based on the Local Ensemble Transform Kalman Filter (LETKF).

The group contributes to a variety of forecasting activities. The dust component of MONARCH runs operationally at the first WMO Regional Specialized Meteorological Center for Atmospheric Sand and Dust Forecast (i.e., the Barcelona Dust Forecast Center, [BDFC](#)), and contributes to multi-model ensemble forecasts both at the WMO Sand and Dust Storm Warning Advisory and Assessment System Regional Center (WMO [SDS-WAS](#) RC) for Northern Africa, the Middle East and Europe, and the International Cooperative for Aerosol Prediction ([ICAP](#)). Both WMO Regional Centers are co-hosted by BSC and the Spanish Meteorological Agency (AEMET). The group also develops and maintains the [CALIOPE](#) air quality system ("CALidad del aire Operacional Para España"), which provides high-resolution air quality forecasts over Europe and Spain using the in-house emission model HERMES.

The AC group interacts with the Computational Earth Sciences (CES) group on the optimization of model codes, pre- and post-processing tools, and operational model settings, with the Climate Prediction group on the links between atmospheric aerosols and climate, mainly in the framework of the EC-Earth model and its global chemistry transport component TM5, and with the Earth System Services group to enhance the use of air quality products and services.

The group is now composed of 17 people: 1 Head (Carlos Perez Garcia-Pando), 1 co-leader (Oriol Jorba), 1 associate researcher (María Gonçalves, associate professor at UPC), 9 postdocs (Sara Basart, Marc Guevara, Enza Di Tomaso, Maria Teresa Pay, Matt Dawson, Martina Klose, Vincenzo Obiso, Dene Bowdalo, Jerónimo Escribano), 4 PhD students (Jaime Benavides, Vanessa Nogueira, Cristina Gonzalez Florez and Adolfo Gonzalez), and 1 junior developer (Manuel Porquet). In addition, there are a number of members of the CES Group at BSC directly involved and/or funded with AC-related projects: Francesca Macchia, Miriam Olid, Carles Tena, Francesco Benincasa, and others.

Since 2016 the funding obtained through competitive projects by the AC group has been of **~6.1 MEuro**. This amount comes from the groups' leadership or participation in European H2020 projects, ERA4CS projects, national projects, and private contracts. We highlight the **AXA Chair on Sand and Dust Storms** hosted by the group. This 15-year research programme is not only intended to support the two WMO SDS Regional Centers based at BSC, but also to widen the scope and relevance of the mineral dust research at BSC-ES. Since October 2018, the AC group is developing an **ERC Consolidator Grant ("FRAGMENT")** which focuses on dust mineralogy and its effects on the climate.



The list of projects is detailed below:

1. FORCeS: Constrained aerosol forcing for improved climate projections. H2020-LC-CLA-2018-2019-2020. Budget: 7.998.287 (200 KEuro for BSC). Period: 10/2019 - 09/2023. PI at BSC: Carlos Perez Garcia-Pando
2. AXA Chair on Sand and Dust Storms. Budget: 1.587.906,57 Euro. Awarded by the AXA Research Fund. Funding Period: 10/01/2016 – 30/09/2031. Chair Holder: Carlos Perez Garcia-Pando
3. FRontiers in dust minerAloGical coMposition and its Effects upoN climaTe (FRAGMENT). European Research Council Consolidator Grant. H2020 Program. Budget: 2.000.000,00 Euro (1.349.037,50 for BSC and the rest for partners CSIC and TUDA). Funding Period: 01/10/2018 – 30/09/2023. PI: Carlos Perez Garcia-Pando
4. SOLving WAter Issues for ConcenTrated Solar Power PlanTs (SOLWATT). H2020 Program, Call Identifier H2020-LCE-2016-2017. Budget: 304.022,50 Euro (from a total of 10.812.502,00 Euro). Funding Period: 01/05/2018 – 30/04/2022. PI at BSC: Carlos Perez Garcia-Pando
5. Public policies, urban Organization and Logistics as Levers for EXPOsure (POLL-EXPO). Awarded by PRIMEQUAL: Programme de Recherche Interorganisme pour une meilleure qualité de l'air - Ministère de la Transition Ecologique et Solidaire, France. Budget: 19.128,38 Euro (Total: 274.160 €). Funding Period: 01/06/2018-31/05/2021. PI at BSC: Carlos Perez Garcia-Pando
6. QuaNtifying the present and fUTure atmospheric deliveRy of bloavailable iroN to The ocean (NUTRIENT). Convocatorias 2017 Proyectos EXCELENCIA y Proyectos RETOS. AGENCIA ESTATAL DE INVESTIGACIÓN. Budget: 72.600,00 Euro. Funding Period: 01/01/2018 - 31/12/2020. Pi: Carlos Perez Garcia-Pando. Co-PI: Maria Gonçalves
7. ACTRIS PPP - Aerosols, Clouds and Trace gases Preparatory Phase Project. H2020 Program. Call H2020-INFRADEV-2016-2. Budget: 21.250,00 Euro (total of 3.999.996,25 Euro). Funding Period: 01/01/2017 – 31/12/2019. PI at BSC: Carlos Perez Garcia-Pando
8. Photochemical modelling to attribute emission sources and source regions to high particulate matter concentration in urban areas in Spain (PAISA). Convocatorias 2016 Proyectos EXCELENCIA y Proyectos RETOS. AGENCIA ESTATAL DE INVESTIGACIÓN. Budget: 118.580,00 Euro. Funding Period: 30/12/2016 – 29/12/2019. Project PI: María Teresa Pay.
9. CAMS 81 - Global and Regional emissions. Awarded by ECMWF – Copernicus Atmosphere Monitoring Service. Budget: 109.687,50 Euro. Funding Period: 01/09/2017 – 31/08/2020. PI at BSC: Marc Guevara.
10. CAMS 50 - Regional Production. Awarded by ECMWF – Copernicus Atmosphere Monitoring Service. Budget: 91.465,79 Euro. Funding Period: 01/10/2018 – 30/06/2021. PI at BSC: Oriol Jorba.
11. CAMS 84 – 2<sup>nd</sup> phase: Global and regional a posteriori validation, including focus on the Arctic and Mediterranean areas. Awarded by ECMWF – Copernicus Atmosphere Monitoring Service. Budget: 165.090,81 Euro. Funding Period: 01/10/2018 – 31/12/2021. PI at BSC: Sara Basart.
12. Dust Storms Assessment for the development of user-oriented Climate Services in Northern Africa, Middle East and Europe (DustClim). Awarded by European ERA4CS Joint Call for Transnational Collaborative Research Projects 2016 (H2020 Program). Budget: 319.125,00 Euro. Funding Period: 01/09/2017 – 31/08/2020. Project PI: Sara Basart.



13. International Network to Encourage the Use of Monitoring and Forecasting Dust Products (InDust). COST Action CA16202. Budget: 210.695,82 Euro. Funding Period: 01/12/2017 – 30/11/2021. Chair: Sara Basart.

The list of contracts is detailed below:

1. K-dust Phase 1. Dust forecast System for Kuwait. Budget: 140.999,00 Euro. Awarded by the Kuwait Institute for Scientific Research. Funding Period: 01/04/2018 – 31/03/2019. PI: Carlos Perez Garcia-Pando
2. Encomienda de Servicios, Resolución No 86/2018 De encargo al Barcelona Supercomputing Center para la realización de actividades de desarrollo y mejora de los productos y servicios suministrados por los Centros Regionales de Tormentas de Polvo y Arena de la Organización Meteorológica Mundial (OMM). Expediente: 201800005089. Budget: 500.196,00 Euro. Awarded by Agencia Estatal de Meteorología. Funding Period: 01/07/2018 – 09/09/2021. PI: Carlos Perez Garcia-Pando
3. Convenio BSC-SEDEMA: Sistema de pronóstico de la calidad del aire para la Ciudad de México y su área metropolitana. Awarded by Secretaría de Medio Ambiente de Ciudad de México (SEDEMA). Budget: 177.860,72 Euro. Funding Period: 03/07/2017 – 31/12/2017. Project PI: Marc Guevara.
4. Convenio BSC-SEDEMA2: Sistema de pronóstico de la calidad del aire para la Ciudad de México y su área metropolitana. Awarded by Secretaría de Medio Ambiente de Ciudad de México (SEDEMA). Budget: 87.583,12 Euro. Funding Period: 29/05/2017 – 30/11/2017. Project PI: Marc Guevara.
5. Early Warning System for Burkina Faso. Awarded by the World Meteorological Organization. Budget: 17.272,70. Funding Period: 24/07/2018 – 30/06/2019. PI at BSC: Sara Basart.

Supercomputing resources obtained through competitive projects

1. High-resolution regional dust reanalysis based on ensemble data assimilation techniques (eDUST). PRACE access of 21 Million cpu hours in Marenostrum Supercomputer. Period: 01/03/2017 – 30/05/2018
2. eFRontiers in dust minerAloGical coMposition and its Effects upoN climaTe, phase 1 (eFRAGMENT1). PRACE access of 34 Million cpu hours in Marenostrum Supercomputer. Period: 01/10/2018 – 30/09/2018.

Personal Grants or fellowships

1. Ramon y Cajal Fellowship for Carlos Perez Garcia-Pando (01/12/2016 - 07/01/2022)
2. DUST.ES – Postdoc Beatriu de Pinós Fellowship. Fellow: Martina Klose. Supervisor: Carlos Pérez García-Pando. Period: 01/11/2017 – 30/10/2018.
3. DUST.ES phase 2 - Marie Curie Fellowship. Fellow: Martina Klose. Supervisor: Carlos Pérez García-Pando. Period: 01/11/2018 – 30/10/2020.
4. ACRONNIM – Marie Curie Fellowship. Fellow: Matt Dawson. Supervisor: Oriol Jorba. Period: 01/11/2017 – 30/10/2019.
5. ALPACA – STARS Postdoctoral Fellowship. Fellow: Jeronimo Escribano. Supervisor: Carlos Pérez García-Pando

Personal Grants or fellowships obtained by externals seconded by the AC group



1. DUST GLASS - Marie Curie Fellowship. Fellow: Antonis Gkikas. National Observatory of Athens. Supervisors: Vassilis Amiridis (main) and Carlos Pérez García-Pando (secondment). Period: 01/11/2017 – 30/10/2019.
2. Marie Curie Fellowship. Fellow: Leonardo Micheli. Universidad de Jaen. Supervisors: Eduardo Fernández (main) and Carlos Pérez García-Pando (secondment). Period: 01/12/2018 – 30/11/2020.

Peer-reviewed publications of the AC group in the past five years (with AC members highlighted in **bold**):

## 2018

**Pérez García-Pando, C., Jorba, O.,** and Zhang, Y., (2018) Chapter 3.1.8. Comparison of Model Representations of Interactions of Chemical Species with Cloud for global models and regional/urban models. In WMO Report entitled: Training Materials and Best Practices for Chemical Weather/Air Quality Forecasting (CW-AQF) Using 3-D Numerical Models (to be published soon as a WMO Technical Report).

Mason, S.J., Thomson, M.C. (authors), Heat Action Group, Knowlton, K., Nissan, H., Muñoz, A.G., **Perez Garcia-Pando, C.,** and Shaman, J., (contributors) Chapter 7: Weather Forecasts: Up to One Week in Advance. In “Climate Information for Public Health Action” edited by Edited by Madeleine C. Thomson, Simon J. Mason. Publisher: Routledge. 244 pp. <https://www.routledge.com/Climate-Information-for-Public-Health-Action/Thomson-Mason/p/book/9781138069640>

Benedetti, A., J. S. Reid, P. Knippertz, J.H. Marsham, F. Di Giuseppe, S. Rémy, **S. Basart**, O. Boucher, I.M. Brooks, L. Menut, L. Mona, P. Laj, G. Pappalardo, A. Wiedensohler, A. Baklanov, M. Brooks, P.R. Colarco, E. Cuevas, A. da Silva, **J. Escribano**, J. Flemming, N. Huneus, **O. Jorba**, S. Kazadzis, S. Kinne, T. Popp, P.K. Quinn, T. T. Sekiyama, T. Tanaka and E. Terradellas (2018). Status and future of numerical atmospheric aerosol prediction with a focus on data requirements. Atmospheric Chemistry and Physics, 18, 10615-10643, doi:10.5194/acp-18-10615-2018

**Gkikas, A.,** V. Obiso, **C. Pérez García-Pando, O. Jorba,** N. Hatzianastassiou, L. Vendrell, **S. Basart**, S. Solomos, S. Gassó, and J.M. Baldasano (2018). Direct radiative effects during intense Mediterranean desert dust outbreaks Atmospheric Chemistry and Physics, 18, 8757-8787, doi:10.5194/acp-18-8757-2018.

Konsta, D., I. Biniotoglou, **A. Gkikas**, S. Solomos, E. Marinou, E. Proestakis, **S. Basart, C. Pérez García-Pando,** H. El-Askary and V. Amiridis. (2018). Evaluation of the BSC-DREAM8b regional dust model using the 3D LIVAS-CALIPSO product. Atmospheric Environment, 195, 46-62, doi:10.1016/j.atmosenv.2018.09.047.

Obiso, V. and **O. Jorba** (2018). Aerosol-radiation interaction in atmospheric models: Idealized sensitivity study of simulated short-wave direct radiative effects to particle microphysical properties. Journal of Aerosol Science, 115, 46-61, doi:10.1016/j.jaerosci.2017.10.004.

Otero, N., J. Sillmann, K.A. Mar, H.W. Rust, S. Solberg, C. Andersson, M. Engardt, R. Bergström, B. Bessagnet, A. Colette, F. Couvidat, C. Cuvelier, S. Tsyro, H. Fagerli, M. Schaap, A. Manders, M. Mircea, G. Briganti, A. Cappelletti, M. Adani, M. D'Isidoro, **M.T. Pay**, M. Theobald, M.G. Vivanco, P. Wind, N. Ojha, V. Raffort and T. Butler (2018). A multi-model comparison of meteorological drivers of surface ozone over Europe. Atmospheric Chemistry and Physics, 18, 12269-12288, doi:10.5194/acp-18-12269-2018.

Rincon, A., **O. Jorba**, M. Frutos, L. Alvarez, F.P. Barrios and J.A. Gonzalez (2018). Bias correction of global irradiance modelled with weather and research forecasting model over Paraguay. Solar Energy, 170, 201-211, doi:10.1016/j.solener.2018.05.061.

Scanza, R.A., D.S. Hamilton, **C. Perez Garcia-Pando,** C. Buck, A. Baker and N.M. Mahowald (2018) Atmospheric processing of iron in mineral and combustion aerosols: development of an intermediate-complexity mechanism suitable for Earth system models. Atmospheric Chemistry and Physics, 18, 14175-14196, doi:10.5194/acp-18-14175-2018.

Trombetti, M., P. Thunis, B. Bessagnet, A. Clappier, F. Couvidant, **M. Guevara**, J. Kuenen and S. Lopez-Aparicio (2018). Spatial inter-comparison of top-down emission inventories in European urban areas. Atmospheric Environment, 173, 142-156, doi: 10.1016/j.atmosenv.2017.10.032.





Vivanco, M.G., M.R. Theobald, H. García-Gómez, J.L. Garrido, M. Prank, W. Aas, M. Adani, U. Alyuz, C. Andersson, R. Bellasio, B. Bessagnet, R. Bianconi, J. Bieser, J. Brandt, G. Briganti, A. Cappelletti, G. Curci, J. H. Christensen, A. Colette, F. Couvidat, C. Cuvelier, M. D'Isidoro, J. Flemming, A. Fraser, C. Geels, K. M. Hansen, C. Hogrefe, U. Im, **O. Jorba**, N. Kitwiroon, A. Manders, M. Mircea, N. Otero, M.-T. Pay, L. Pozzoli, E. Solazzo, S. Tsyro, A. Unal, P. Wind and S. Galmarini (2018). Modeled deposition of nitrogen and sulfur in Europe estimated by 14 air quality model systems: evaluation, effects of changes in emissions and implications for habitat protection. *Atmospheric Chemistry and Physics*, 18, 10199-10218, doi: 10.5194/acp-18-10199-2018.

## 2017

Ansmann, A., F. Rittmeister, R. Engelmann, **S. Basart**, **O. Jorba**, C. Spyrou, S. Remy, A. Skupin, H. Baars, P. Seifert, F. Senf, and T. Kanitz (2017). Profiling of Saharan dust from the Caribbean to western Africa – Part 2: Shipborne lidar measurements versus forecasts *Atmospheric Chemistry and Physics*, 17, 14987-15006, <https://doi.org/10.5194/acp-17-14987-2017>.

Badia, A., **O. Jorba**, A. Voulgarakis, D. Dabdub, **C. Pérez García-Pando**, A. Hilboll, M. Gonçalves and Z. Janjic (2017). Description and evaluation of the Multiscale Online Nonhydrostatic Atmosphere Chemistry model (NMMB-MONARCH) version 1.0: gas-phase chemistry at global scale. *Geoscientific Model Development*, 10, 609-638, doi:10.5194/gmd-10-609-2017.

Barnaba, F., A. Bolignano, L. Di Liberto, M. Morelli, F. Lucarelli, S. Nava, C. Perrino, S. Canepari, **S. Basart**, F. Costabile, D. Dionisi, S. Ciampichetti, R. Sozzi and G. P. Gobbi (2017). Desert dust contribution to PM<sub>10</sub> loads in Italy: Methods and recommendations addressing the relevant European Commission Guidelines in support to the Air Quality Directive 2008/50. *Atmospheric Environment*, 161, 288-305, doi:10.1016/j.atmosenv.2017.04.038.

Cuevas, E., A.J. Gómez-Peláez, S. Rodríguez, E. Terradellas, **S. Basart**, R.D. García, O.E. García and S. Alonso-Pérez (2017). The pulsating nature of large-scale Saharan dust transport as a result of interplays between mid-latitude Rossby waves and the North African Dipole Intensity, *Atmospheric Environment*, 167, 586-602, doi:10.1016/j.atmosenv.2017.08.059.

**Di Tomaso, E.**, N.A.J. Schutgens, O. Jorba, and C. Pérez García-Pando (2017). Assimilation of MODIS Dark Target and Deep Blue observations in the dust aerosol component of NMMB-MONARCH version 1.0. *Geosci. Model Dev.*, 10, 1107-1129, <https://doi.org/10.5194/gmd-10-1107-2017>.

**Guevara, M.**, C. Tena, A. Soret, K. Serradell, D. Guzmán, A. Retama, P. Camacho, M. Jaimes-Palomera and A. Mediavilla (2017). An emission processing system for air quality modelling in the Mexico City metropolitan area: Evaluation and comparison of the MOBILE6.2-Mexico and MOVES-Mexico traffic emissions. *Science of The Total Environment*, 584-585, 882-900, doi:10.1016/j.scitotenv.2017.01.135.

**Guevara, M.**, López-Aparicio, S., Cuvelier, C., Tarrason, L., Clappier, A., Thunis, P. (2017). A benchmarking tool to screen and compare bottom-up and top-down atmospheric emission inventories. *Air Quality, Atmosphere & Health*, 10, 627-642, doi:10.1007/s11869-016-0456-6.

Lopez-Aparicio, S., **M. Guevara**, P. Thunis, C. Cuvelier and L. Tarrason (2017). Assessment of discrepancies between bottom-up and regional emission inventories in Norwegian urban areas. *Atmospheric Environment*, 154, 285-296, doi:10.1016/j.atmosenv.2017.02.004. (FAIRMODE)

Marti, A., A. Folch, **O. Jorba** and Z. Janjic (2017). Volcanic ash modeling with the on-line NMMB/BSC-ASHv1.0 model: model description, case simulation and evaluation. *Atmospheric Chemistry and Physics*, 17, 4005-4030, doi:10.5194/acp-2016-881. Open Access

Obiso, V. and **O. Jorba** (2017). Aerosol-radiation interaction in atmospheric models: Idealized sensitivity study of simulated short-wave direct radiative effects to particle microphysical properties. *Journal of Aerosol Science*, 115, 46-61, doi:10.1016/j.jaerosci.2017.10.004.

Obiso, V., M. Pandolfi, M. Ealo and **O. Jorba** (2017). Impact of aerosol microphysical properties on mass scattering cross sections. *Journal of Aerosol Science*, 112, 68-82, doi:10.1016/j.jaerosci.2017.03.001.



Tsekeri, A., A. Lopatin, V. Amiridis, E. Marinou, J. Igloffstein, N. Siomos, S. Solomos, P. Kokkalis, R. Engelmann, H. Baars, M. Gratsea, P. I. Raptis, I. Binietoglou, N. Mihalopoulos, N. Kalivitis, G. Kouvarakis, N. Bartsotas, G. Kallos, **S. Basart**, D. Schuettmeyer, U. Wandering, A. Ansmann, A. P. Chaikovsky, and O. Dubovik (2017). GARRLiC and LIRIC: strengths and limitations for the characterization of dust and marine particles along with their mixtures Atmospheric Measurement Techniques, 10, 4995-5016, <https://doi.org/10.5194/amt-10-4995-2017>. Open Access

Vivanco, M., B. Bessagnet, C. Cuvelier, M.R. Theobald, S. Tsyro, G. Pirovano, A. Aulinger, J. Bieser, G. Calori, G. Ciarelli, A. Manders, M. Mircea, S. Aksoyoglu, G. Briganti, A. Cappelletti, A. Colette, F. Couvidat, M. D'Isidoro, R. Kranenburg, F. Meleux, L. Menut, **M.T. Pay**, L. Rouil, C. Silibello, P. Thunis and A. Ung (2017). Joint analysis of deposition fluxes and atmospheric concentrations of inorganic nitrogen and sulphur compounds predicted by six chemistry transport models in the frame of the EURODELTAIII project. Atmospheric Environment, 151, 152-175, doi:10.1016/j.atmosenv.2016.11.042.

## 2016

**Basart, S.**, L. Vendrell, J.M. Baldasano, 2016. High-resolution dust modelling over complex terrains in West Asia. *Aeolian Research*, 23, 37-50, doi:10.1016/j.aeolia.2016.09.005

**Basart, S.**, F. Dulac, J. M. Baldasano, P. Nabat, M. Mallet, F. Solmon, B. Laurent, J. Vincent, L. Menut, L. El Amraoui, B. Sic, J.-P. Chaboureaud, J.-F. Léon, K. Schepanski, J.-B. Renard, F. Ravetta, J. Pelon, C. Di Biagio, P. Formenti, I. Chiapello, J.-L. Roujean, X. Ceamanos, D. Carrer, M. Sicard, H. Delbarre, G. Roberts, W. Junkermann, J.-L. Attié, 2016. Extensive Comparison Between a Set of European Dust Regional Models and Observations in the Western Mediterranean for the Summer 2012 Pre-ChArMEx/TRAQA Campaign. *Air Pollution Modeling and its Application XXIV*, Part of the series Springer Proceedings in Complexity, 79-83, doi:10.1007/978-3-319-24478-5\_13.

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## 2014

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## Selection of AC Group's participations in conferences

### Conference contributions

1. Perlwitz, J.P., Knopf, D.A., Fridlind, A.M., Miller, R.L., **Pérez García-Pando, C.**, DeMott, P.J., (2016) Evaluating Ice Nucleating Particle Concentrations From Prognostic Dust Minerals in an Earth System Model. American Geophysical Union, Fall Meeting 2016, San Francisco, 12 – 16 December, abstract #A13M-03.
2. Scanza, R. Mahowald, N. M., **Pérez García-Pando, C.** (2016) Modeling the atmospheric iron processing of mineral dust and combustion aerosols. American Geophysical Union, Fall Meeting 2016, San Francisco, 12 – 16 December, abstract #A24B-01.
3. **Pérez García-Pando, C.**, Gonçalves, M., Gkikas, A., Jorba, O. (2017) Dust-radiation interactions: from weather to climate. 9th International Cooperative on Aerosol Prediction (ICAP) Meeting, Lille, France, 26 – 28 June 2017.
4. **Pérez García-Pando, C.**, Jorba, O., Di Tomaso, E., Basart, S., Guevara, M., Gonçalves, M., Obiso, V., Pay, M.T., Tena, C. (2017) BSC Modeling Update. 9th International Cooperative on Aerosol Prediction (ICAP) Meeting, Lille, France, 26 – 28 June 2017.
5. Basart, S., Vukovic, A., Vendrell, L., **Pérez García-Pando, C.**, O. Jorba (2017) High-resolution SDS forecast requirements for the Middle East. 5th International Workshop on SDS, 23-25 October 2017, Istanbul.
6. Jorba, O., Di Tomaso, E., Obiso, V., Spada, M., Guevara, M., Basart, S., Schutgens, N., Janjic, Z., **Pérez García-Pando, C.**, (2017) Atmospheric Chemistry with the online multiscale NMMB-MONARCHv1.0 model: global-regional evaluations and data assimilation capability. XXVI GLOREAM Workshop 27-29 November 2017. Institute for Meteorology, Freie Universität Berlin, Germany.
7. Pay, M.T., **Pérez-García Pando, C.**, Guevara, M., Napelenok, S., Querol, X. (2018) A source apportionment assessment of ozone concentrations in peak summer events over Southwestern Europe. XXVI GLOREAM Workshop 27-29 November 2017. Institute for Meteorology, Freie Universität Berlin, Germany.
8. Perlwitz, J. P., Fridlind, A. M., Knopf, D. A., Miller, R. L., **Pérez García-Pando, C.** (2017) How the Emitted Size Distribution and Mixing State of Feldspar Affect Ice Nucleating Particles in a Global Model. American Geophysical Union, Fall Meeting 2017, New Orleans, 11-15 December, abstract #A13A-2040.
9. Wiedinmyer, C., Lihavainen, H., Mahowald, N. M., Alastuey, A., Albani, S., Artaxo, P., Bergametti, G., Batterman, S., Brahney, J., Duce, R. A., Feng, Y., Buck, C., Ginoux, P., Chen, Y., Guieu, C., Cohen, D., Hand, J. L., Harrison, R. M., Herut, B., Ito, A., Losno, R., Gomez, D., Kanakidou, M., Landing, W. M., Laurent, B., Mihalopoulos, N., Mackey, K., Maenhaut, W., Hueglin, C., Milando, C., Miller, R. L., Myriokefatakis, S., Neff, J. C., Pandolfi, M., Paytan, A., **Perez Garcia-Pando, C.**, Prank, M., Prospero, J. M., Tamburo, E., Varrica, D., Wong, M., Zhang, Y. (2017) COARSEMAP: synthesis of observations and models for coarse-mode aerosols. American Geophysical Union, Fall Meeting 2017, New Orleans, 11-15 December, abstract #A21K-2299.
10. Pay, M.T., **Pérez García-Pando, C.**, Guevara, M., Napelenok, S., Querol, X. (2018) Source apportionment assessment of O<sub>3</sub> in peak summer events over southwestern Europe. 11<sup>th</sup> International conference on Air Quality – Science and Application, Barcelona, Spain, 12-16 March 2018.



11. Benavides, J., Snyder, M., Guevara, M., **Pérez García-Pando, C.**, Soret, A., Amato, F., Querol, X., Jorba, O. (2018) CALIOPE-Urban: Coupling R-Line with CMAQ for urban street-scale air quality forecasts over Barcelona. 11th International conference on Air Quality – Science and Application, Barcelona, Spain, 12-16 March 2018.
12. Klose, M., **Pérez García-Pando, C.**, Ghodsi Zadeh, Z., Nikolich, G., Etyemezian, V. (2018) Dust emission from crusted surfaces. 20th EGU General Assembly, EGU2018, Proceedings from the conference held 4-13 April, 2018 in Vienna, Austria, p.9687
13. Gkikas, A., Amiridis, V., Kazadzis, S., **Pérez García-Pando, C.**, Di Tomaso, E., Jorba, O. (2018) Identifying biases of Collection 6 MODIS ocean aerosol optical depth retrievals. 20th EGU General Assembly, EGU2018, Proceedings from the conference held 4-13 April, 2018 in Vienna, Austria, p.11993
14. Pay, M.T., **Pérez-García Pando, C.**, Guevara, M., Jorba, O., Napelenok, S., Querol, X. (2018) Unraveling the origin of high ozone concentrations in southwestern Europe. 36th International Technical Meeting on Air Pollution Modelling and its Application May 14 - 18, 2018 – Ottawa, Canada.
15. Benavides, J., Soret, A., Guevara, M., **Pérez García-Pando, C.**, Snyder, M., Amato, F., Querol, X., Jorba, O. (2018) Impact of a low emission zone on street-level air quality in barcelona city using the caliope-urban model. 36th International Technical Meeting on Air Pollution Modelling and its Application May 14 - 18, 2018 – Ottawa, Canada.
16. Obiso, V., Jorba, O., **Pérez García-Pando, C.**, Pandolfi, M. (2018) Aerosol intensive radiative properties: global evaluation of the NMMB-MONARCH model. 36th International Technical Meeting on Air Pollution Modelling and its Application May 14 - 18, 2018 – Ottawa, Canada.
17. Klose, M., **Pérez García-Pando, C.**, Deroubaix, A., Ginoux, P., Miller, R. (2018) Constraining soil dust emissions from natural and anthropogenic sources. 9th International Workshop on Sand/Duststorms and Associated Dustfall 22-24 May 2018 Tenerife, Spain
18. Gonçalves-Ageitos, M., **Pérez García-Pando, C.**, Jorba, O., Obiso, V., Schulz, M. (2018) North African regional climate sensitivity to mineral dust optical properties. 9th International Workshop on Sand/Duststorms and Associated Dustfall 22-24 May 2018 Tenerife, Spain.
19. Perlwitz, J.P., Knopf, D.A., Fridlind, A.M., Miller, R.L., **Pérez García-Pando, C.** (2018) Uncertainty of ice nucleating particle number to source distribution, size distribution, and mixing state of K-feldspar. 9th International Workshop on Sand/Duststorms and Associated Dustfall 22-24 May 2018 Tenerife, Spain.
20. Di Tomaso, E., Schutgens, N., Jorba, O., **Pérez García-Pando, C.** (2018) Dust assimilation activities at the Barcelona Supercomputing Center. 9th International Workshop on Sand/Duststorms and Associated Dustfall 22-24 May 2018 Tenerife, Spain.
21. Jorba, O., **Pérez-García Pando, C.**, Obiso, V., Di Tomaso, E., Basart, S., Guevara, M., Gonçalves, M., Pay, M.T., Tena, C., Macchia, F., Olid, M., Serradell, K. (2018) BSC Update: MONARCH model. 10th ICAP meeting, Exeter, UK, 6-8 June 2018.
22. Klose, M., **Pérez García-Pando, C.**, Deroubaix, A., Ginoux, P., Miller, R. (2018) Constraining soil dust emissions from natural and anthropogenic sources. ICAR X. International Conference on Aeolian Research. 25 - 29 June 2018 Bordeaux, France.



23. Konsta, D., Tsekeri, A., Binietoglou, I., Gkikas, A., Solomos, S., Lopatin, A., Basart, S., **Pérez García-Pando, C.**, Nicolae, D., Ene, D., Goloub, P., Amiridis, V. (2018) Dust Model Evaluation Using Ground-based and Spaceborne Active Remote Sensing. European Lidar Conference 2018, Thessaloniki, Greece, July 3-5, 2018.
24. Jorba, O., Basart, S., Benavides, J.A., Bowdalo, D., Dawson, M.L., Di Tomaso, E., Gonçalves, M., Guevara, M., Klose, M., Macchia, F., Obiso, V., Olid, M., Pay, M.T., Porquet, M., Serradell, K., Tena, C., **Pérez García-Pando, C.** (2018) Predicción de la calidad del aire multiescala con el modelo MONARCH en el Centro Nacional de Supercomputación. VI Simposio Nacional de Predicción de AEMET. 17-19 septiembre, Madrid.
25. Guevara, M., Tena, C., Porquet, M., Jorba, O., **Pérez García-Pando, C.** (2018) HERMESv3: a stand-alone multiscale atmospheric emission model. Community Modeling and Analysis System (CMAS) Conference, October 22-24, 2018, at the University of North Carolina at Chapel Hill's Friday Center.
26. Mahowald, N.M., Connelly, D.S., Hamilton, D.S., Feng, Y., Hand, J.L., Green, R.O., Lihavainen, H., Miller, R.L., Pérez García-Pando, C., Scanza, R., Wiedinmyer, C., Zhang, Y. (2018) Constraints on elemental composition of fine and coarse aerosols. American Geophysical Union Fall Meeting 2018. 10 – 14 December, Washington DC, USA.
27. Klose, M., **Pérez García-Pando, C.**, Deroubaix, A., Ginoux, P.A., Miller, R.L. (2018) How Much Soil Dust Aerosol is Man-Made? American Geophysical Union Fall Meeting 2018. 10 – 14 December, Washington DC, USA. (M. Klose invited)
28. Xian, P., Reid, J.S., Hyer, E.J., Sampson, C.R., Rubin, J., Ades, M., Asencio, N., Basart, S., Benedetti, A., Bhattacharjee, P., Brooks, M., Colarco, P.R., Da Silva, A., Eck, T., Guth, J., Jorba, O., Kouznetsov, R., Kipling, Z., Sofiev, M., Pérez García-Pando, C., Pradhan, Y., Tanaka, T.Y., Wang, J., Westphal, D.L., Yumimoto K., Zhang, J. (2018) Current State of the global operational aerosol multi-model ensemble: an update from the International Cooperative for Aerosol Prediction (ICAP). American Geophysical Union Fall Meeting 2018. 10 – 14 December, Washington DC, USA.
29. Pu, B., Ginoux, P.A., **Pérez García-Pando, C.** (2018) Retrieving global distribution of threshold of wind erosion from satellite data. American Geophysical Union Fall Meeting 2018. 10 – 14 December, Washington DC, USA.
30. **Pérez García-Pando, C.**, Alastuey, A., Clark, R.N., Ehlmann, B.L., Etyemezian, V., Gonçalves, M., Green, R.O., Jorba, O., Kandler, K., Klose, M., Miller, R.L., Obiso, V., Xavier Querol (2018) FRAGMENT: FRontiers in dust minerAloGical cOMposition and its Effects upoN climaTe. American Geophysical Union Fall Meeting 2018. 10 – 14 December, Washington DC, USA.
31. Green, R.O., Mahowald, N.M., Clark, R.N., Ehlmann, B.L., Ginoux, P.A., Kalashnikova, O.V., Miller, R.L., Okin, G., Painter, T.H., **Pérez García-Pando, C.**, Realmuto, V., Swayze, G.A., Thompson, D.R., Middleton, E., Guanter, L., Dor, E.B., Phillips, B.R. (2018) NASA's Earth Surface Mineral Dust Source Investigation. American Geophysical Union Fall Meeting 2018. 10 – 14 December, Washington DC, USA.
32. Miller, R.L., Bauer, S., Hickman, J.E., **Pérez García-Pando, C.** (2018) Anthropogenic Suppression of Dust Aerosols By Irrigation. American Geophysical Union Fall Meeting 2018. 10 – 14 December, Washington DC, USA.

#### Invited talks

1. Pérez García-Pando, C., (2017) Dust Storms: characteristics, effects and prediction. Kuwait Institute for Scientific Research, Kuwait, 14 February 2017.



2. Pérez García-Pando, C., (2017) Atmospheric Composition research, modeling and services at BSC. ISGlobal Seminar. 13 June 2017.
3. Pérez García-Pando, C. (2017) Progress, challenges and perspectives in modeling dust composition. Goldschmidt Conference, Paris. August 13-18, 2017. (Keynote)
4. Pérez García-Pando, C. (2017) Challenges and Perspectives in Dust Modeling. 5th International Workshop on Sand Dust Storms, 23-25 Oct. 2017, Istanbul.
5. Pérez García-Pando, C. (2018) Atmospheric Dust Modeling: Challenges and Perspectives. Webinar PVQAT Soiling Group TG-12. April 18, online.
6. Pérez García-Pando, C. (2018) Impact of soil dust aerosols upon weather and climate. 2<sup>nd</sup> WMO Workshop on Operational Climate Prediction, 30 May - 1 June 2018, Barcelona, Spain.

#### **Chair in conferences and workshops**

1. Member of the Scientific Committee of the 9th International Workshop on Sand/Duststorms and Associated Dustfall 22-24 May 2018 Tenerife, Spain
2. Chair of session on dust, radiation and clouds at the the 9th International Workshop on Sand/Duststorms and Associated Dustfall 22-24 May 2018 Tenerife, Spain
3. Chair of the special session on dust and air quality at the 11th International conference on Air Quality – Science and Application, Barcelona, Spain, 12-16 March 2018.
4. Chair of session at the 5th International Workshop on Sand Dust Storms, 23-25 Oct. 2017, Istanbul.

The AC Group has developed some useful tools for companies, administration and the general public to manage air pollution and to be informed about air quality. These tools are:

- The CALIOPE system (<http://www.bsc.es/caliope/es>): CALIOPE is a system providing 24h and 48h air quality forecasts for Spain at high spatial and temporal resolutions. CALIOPE comprises a set of models: meteorological model, emission model, and chemical transport model. For emission, CALIOPE uses an “in-house” emission model, named HERMES, mainly based on a bottom-up approach to estimate emissions for Spain. CALIOPE also includes a post-processing based on Kalman filter, a near real-time evaluation system compiling air quality measurements from Spanish local/regional/national monitoring networks, and a platform for dissemination that includes a graphical inter-phase (web page) and app for smart-phones.
- The NMMB-MONARCH (<http://www.bsc.es/earth-sciences/nmmbbsc-project>): NMMB-MONARCH is an online and multi-scale model developed at BSC-ES 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). NMMB-MONARCH is planned to be a powerful and integrated tool and efficient in terms of HPC to provide chemical and weather forecasts and interactions from global to urban scale.
- The SDS-WAS (Sand and Dust Storm Warning Advisory and Assessment System. <http://sds-was.aemet.es/>): SDS-WAS is a World Meteorological Organization (WMO) programme to enhance the ability of countries to deliver timely and quality sand and dust storm forecasts, observations, information, and knowledge to users through an international





partnership of research and operational communities. Currently the group, in collaboration with the Spanish Meteorological Office (AEMET), coordinates the management of the programme.

- The Barcelona Dust Forecast Center (<http://dust.aemet.es/>): the WMO Executive Council (EC-65) designated the consortium formed by the Spanish State Meteorological Agency (AEMET) and BSC as the first Regional Specialized Meteorological Center with activity specialization on Atmospheric Sand and Dust Forecast (RSMC-ASDF): doc EC-65-d04-3(1). The Center operationally generates and distributes predictions for Northern Africa (north of the equator), Middle East, and Europe.

### ***Scientific expertise and integration of the candidate in the Research Team***

Dr. Etienne Tourigny has a strong multidisciplinary background in physics, computer science, atmospheric science and atmosphere/biosphere interactions. His knowledge and experience with the EC-Earth model will allow to expand the AC Group's involvement in the development of the EC-Earth model and its chemical transport component TM5. The candidate's experience in wildfire modeling will enhance the AC Group's activities in the realm of air quality and atmospheric composition by including the effect of wildfires in its air pollution models. The experience attained by the candidate during the last years as a postdoctoral researcher and his Marie Curie Fellowship make him a very desirable candidate for the AC Group. Furthermore, the candidate's past work in the BSC's Climate Prediction group will foster collaboration between the two groups within the BSC.

### ***Experience of the supervisor***

Since October 2016, the AC group is led by Dr. Carlos Pérez García-Pando, who will act as the supervisor for the proposed fellowship. *Dr. Pérez García-Pando* is also [AXA Professor on Sand and Dust Storms](#), Ramon y Cajal Fellow and ERC Consolidator Grantee at BSC. His research focuses on understanding the physical and chemical processes controlling atmospheric aerosols, and evaluating their effects upon climate, ocean biogeochemistry, air quality, and health. His core area of expertise is atmospheric mineral dust. He is also a model developer with a large experience in HPC and operational forecasting.

Between 2009 and 2016 he worked at the NASA Goddard Institute for Space Studies and Columbia University, where he served as PI and co-PI in competitive research projects funded by the U.S. Department of Energy, NASA and NOAA, with collaborators at NOAA/NCEP, NOAA/Geophysical Fluid Dynamics Laboratory, Princeton University and Cornell University. Aside of his significant research achievements related to dust-radiation interactions, dust-mineralogy, and dust effects on health, he led an international multi-institutional initiative to develop a unique unified (regional and global) prediction model for weather, atmospheric aerosols, and chemistry that today provides operational forecasts widely used by the international scientific community, weather services, companies, and air quality managers. He also played a seminal role in the design, creation, and successful implementation of the WMO Regional Centres on Sand and Dust Storm (SDS) prediction in Spain, the only operational dust forecasting service in the region fully recognized by WMO.

Dr. Pérez García-Pando's work resulted in ~60 peer-reviewed papers (h-Index: 31, i10-Index: 52, citations: 3830, source: Google Scholar, 10-01-2018), ~30 chapters in books/proceedings/reports, ~200 contributions to conferences/workshops/seminars (~30 as invited speaker) and the edition of a book of proceedings. He organized an international conference and a workshop on SDS. He has participated in 40 international (US and EU) and national projects (in 9 of them as PD, PI or co-PI). He co-advised 5 PhD students, 6 Master students, and 9 Postdocs. His work was highlighted among others by NASA and the European Centre for Medium-Range Weather Forecasts (ECMWF), and covered by international media such as *The Guardian*.

Dr. Pérez García-Pando was recently awarded with an AXA Chair (Cátedra AXA) to support an ambitious mineral dust research program at BSC. This 15-year program (~115.000 €/year) on sand and dust storms aims to improve our understanding of dust and its variability; quantify dust effects upon weather, climate, atmospheric chemistry, and ocean biogeochemistry; develop and distribute skilful SDS short- and medium-range forecasts and long-range dust predictions and projections; assess SDS impacts upon key sectors of society and economy; and promote capacity building,



technology transfer, dissemination, and public engagement. The AXA Chair is transversal within BSC-ES. Hence, the proposed fellowship will benefit not only from scientific exchange within the AC group, but also from synergies with the other groups at BSC-ES.

Dr. Pérez García-Pando also obtained a national Ramon y Cajal position in 2016, in which he was ranked first by the Earth Sciences panel. He was recently granted an ERC Consolidator Grant (2.000.000 €) which started in October 2018. It was the only ERC Consolidator granted to a Spanish researcher in 2017. Also in 2017, he was awarded by the Royal Academy of Engineering (RAI, in its Spanish acronym) the **Agustín de Betancourt y Molina prize** for young researchers. He received this recognition for his contributions in the field of environmental risks, and in particular, in the field of mineral aerosols. The Agustín de Betancourt y Molina prize recognises researchers and professionals that have carried out original and relevant contributions in any of the engineering fields, taking into account especially those aspects related to technology transfer.

**NASA** has selected two proposals to develop small, space-based instruments that will tackle fundamental questions about our planet and its environment, such as why is the Arctic warming faster than the rest of the planet, or does mineral dust warm or cool the atmosphere? Dr. Pérez García-Pando is part of the 10-member **Science team** of one of these projects, **EMIT (Earth Surface Mineral Dust Source Investigation)**, led by the Robert Green from the Jet Propulsion Laboratory with a budget of ~\$50.000.000. EMIT will mount an advanced imaging spectrometer to the exterior of the International Space Station to determine the mineral composition of dust sources that produce dust aerosols. By measuring in detail which minerals make up the dust, EMIT will help answering whether this type of aerosol warms or cools the atmosphere. The role of Dr. Pérez García-Pando in EMIT will be to help constraining the emitted mineral sizes and fractions that result from the fragmentation of soil aggregates during wind erosion.

### Capacity for training and supervision of the host institute

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.

In addition, ES-BSC provides to all its 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.

Since 2014 eight PhD theses have been completed at ES-BSC, six of them within the AC group:

1. Vincenzo Obiso (AC)

Title: *Assessment of dynamic aerosol-radiation interaction in atmospheric models*

Reading date: 03/2018

2. Lluís Vendrell (AC)

Title: *High-resolution dust modelling based on the non-hydrostatic mesoscale model NMMB/BSC-Dust*

Reading date: 11/2017

3. Luis Rodriguez

Title: *Calibration and combination of seasonal climate predictions in tropical and extratropical regions*

Reading date: 01/2016



4. Danila Volpi

Title: *Benefits and drawbacks of different initialization techniques in global dynamical climate predictions*

Reading date: 03/2015.

5. Michele Spada (AC)

Title: *Development and evaluation of an atmospheric aerosol module implemented within the NMMB/BSC Chemical Transport Model*

Reading date: 11/2015

6. Albert Soret Miravet (AC)

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

Reading date: 12/2014

7. Marc Guevara Vilardell (AC)

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

Reading date: 12/2014

8. Alba Badia i Moragas (AC)

Title: *Implementation, development and evaluation of the gas-phase chemistry within the Global/Regional NMMB/BSC Chemical Transport Model.*

Reading date: 12/2014

Besides, 11 students are currently performing their PhD on the department, from which 4 are within the Atmospheric Composition group. The PhDs students, as well as the postdoctoral researchers benefit both from the highly collaborative working environment in the ES-BSC department, and participate to regular meetings with their supervisors and with other group members to ensure an adequate integration of their research within the department activities, and to maximize the potential collaborations. Likewise, they are encouraged to attend and participate actively in international project meetings and scientific conferences to increase the visibility of their research, and to help them strengthen their international network of collaborators.

#### **Integration of the candidate at BSC-ES and the AC group**

Group meetings are held approximately two-weekly by the Atmospheric Composition group, two-weekly by the AXA Chair, and monthly by the department. Seminars within the group and the department additionally foster interaction and scientific exchange within and between the groups. Furthermore, BSC is committed to the principles of the *European Charter for Researchers* and *The Code of Conduct for the Recruitment of Researchers*, and has been awarded the *Human Resources Excellence in Research* badge in 2015, proofing it a favourable working environment. Work progress will be reviewed by Dr. Pérez García-Pando in bi-weekly meetings and assistance will be provided on this basis as required.

The candidate would greatly benefit from being embedded in Dr. Pérez García-Pando's AXA Chair program and its networks and projects within Spain, Europe, and outside of Europe, and could learn from the AXA Chair and BSC about project management and science communication and dissemination, not only in the scientific community, but also to stakeholders and the general public. BSC's important role in the WMO SDS-WAS Regional Centres raises the prospect of any model improvements developed within the fellowship to be used in future operational forecasting; it will give the candidate the opportunity to network with WMO and partners, and potentially initiate future collaborations.

The combination of BSC being a first-class research institute with international networks, providing operational weather forecasting services, hosting a WMO SDS-WAS Regional Centre, and fostering collaborations in the industrial sector, allows for the spreading of any research achievements to a wider-than-normal audience. Altogether, this will promote the candidate's research in a unique and most efficient way, providing him with the best possibilities to pursue a career in



academia, while at the same time opening up new opportunities for collaborations in the public and private sectors, including weather services.

### **Additional resources provided by the BSC-CNS**

The outstanding high performance computing infrastructures, computational resources, and IT support available at BSC-CNS are more than sufficient to guarantee an optimal work environment for PhD students and postdocs. The BSC-CNS has a highly skilled and well-trained team of technicians who will advise and support the candidate on the use of the available high-performance computing infrastructure. Also, within the ES-BSC, the Computation Earth Science group provides strong support to researchers, develops tools to automate running, post-processing, and detailed analyses of climate model experiments and helps them manage the computing resources efficiently.

BSC will facilitate the fellow immediate access to a personal workstation, laptops, BSC's high-performance computing facilities, library, conference rooms, and other services such as internal training and seminars, language classes, health insurance, and entry permits. Further support will be provided by BSC's Project Management Office (support with financial/administrative matters), Technology Transfer Manager (orientation/help with science exploitation, development of contracts, agreements, and seeking new opportunities), Communications Team (support with outreach activities, organization of events and press releases), Legal assessment (BSC has an agreement with an external office that gives advice on legal issues), and Education and Training (BSC has a dedicated unit and is committed to providing researchers with high-quality training in scientific, technical, and other skills). Office space and supplies within BSC-ES, Edificio Nexus II, Jordi Girona Street 29, Barcelona, will be made available. The combination of outstanding HPC facilities and high-quality user support constitutes an excellent infrastructural basis.