



DOCUMENT ANNEX DE LA SOL·LICITUD DE LA CONVOCATÒRIA DE BEQUES PER A ESTADES DE RECERCA A L'ESTRANGER (BE-DGR 2012)

Aquest document només és vàlid per a annexar-lo, en format PDF, al formulari de sol·licitud de la convocatòria de **beques per a estades de recerca a l'estranger (BE-DGR 2012)**.

Beques per a estades de recerca a l'estranger (BE-DGR 2012)

Dades de la persona sol·licitant

Nom	Primer cognom	Segon cognom
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1. Currículum de la persona candidata (màxim 8 fulls)

- 1.1 Formació acadèmica
- 1.2 Experiència professional, incloses les beques i altres ajuts rebuts
- 1.3 Participació en projectes, convenis i contractes de recerca
- 1.4 Publicacions i resultats científics (per a revistes, si escau, indiqueu índex d'impacte, quartil i àrea)
- 1.5 Estades a l'estranger
- 1.6 Participació en congressos i conferències
- 1.7 Patents, premis i altres mèrits acadèmics i/o científics rellevants

1.1 Academic background

2007 - 2012

Ph.D. in Engineering Environmental (Degree of European Doctor), Barcelona Supercomputing Center (BSC) - Technical University of Catalonia (UPC).

- Dissertation title: "Desert dust characterization in Northern Africa, Middle East and Europe through regional dust modelling, and satellite-borne and ground-based observations".
- Directors: Dr. Carlos Pérez and Dr. Emilio Cuevas
- Tutor: Dr. José M^a Baldasano
- Qualification: Excellent, Cum Laude, January 2012.

2008

M.Sc. in Meteorology, Barcelona University, Barcelona, Spain.

- Thesis Title: "Aerosol characterization based on its optical properties in the North Eastern sub-tropical Atlantic region".



2007

- Supervisor: Dr. Jeroni Lorente

Diploma of Advanced Studies (DEA) in Environmental Engineering, Technical University of Catalonia, Barcelona, Spain.

- Thesis title: "Mineral dust model validation through ground-based and satellite observations in North Africa and Europe".

2005

Postgraduate in Meteorology and Climatology, Barcelona University, Barcelona, Spain
University-Degree in Physics, University, Barcelona, Spain.

1.2 Professional experience

- *2012 – present: Junior Researcher*, Earth Sciences Department Barcelona Supercomputing Center-Centro Nacional de Supercomputación (BSC-CNS), Barcelona, Spain.
 - Maintenance of daily dust forecast of the *NMMB/BSC-Dust* and BSC-DREAM8b model.
 - Evaluation and development of the *NMMB/BSC-Dust* model (Consolider SysEC).
 - Collaboration in the implementation of primary aerosol in the *NMMB/BSC-CTM* model (CGL2010-19652).
- *2008 – 2012: Graduate Research Assistant*, Earth Sciences Department, Barcelona Supercomputing Center-Centro Nacional de Supercomputación (BSC-CNS), Barcelona, Spain.
 - *June 2010*: Scientist expert. Technical assistance for the Dust Transport Modelling, Turkish State Meteorological Service, Ankara. Technical Assistance and Information Exchange instrument (TALEX) project managed by the European Commission for the dust transport modelling.
 - *November 2010*: Scientist expert. Training Course on Atmospheric Sand and Dust, Barcelona. It was jointly organised by AEMET, BSC, EUMETSAT and WMO.
- *2005 – 2007: Graduate Research Assistant*, Izaña Atmospheric Research Center-Meteorological State Agency of Spain (CIAI-AEMET), Santa Cruz de Tenerife, Spain.
- *2002 - 2005: Air Quality Technical Expert*, Generalitat de Catalunya, Barcelona, Spain.

1.3 Participation in projects, agreements and research contracts

1. The Spanish Ministry of the Environment and Rural and Marine Affairs (Ministerio de Medio Ambiente y medio Rural y Marino, Gobierno de España, Plan Nacional I+D+I) project called: "MEJORA DEL MODELO REGIONAL ATMOSFERICO DE POLVO MINERAL (DREAM) PARA LA PREDICCIÓN DE EVENTOS DE POLVO SAHARIANO EN EL MEDITERRANEO Y LAS ISLAS CANARIAS" with reference CGL2006-11879.
2. The Spanish Ministry of the Environment and Rural and Marine Affairs (Ministerio de Medio Ambiente y medio Rural y Marino, Gobierno de España, Plan Nacional I+D+I) project called: CALIOPE with reference 157/PC08/3-12.0.

3. The World Meteorological Organization (WMO; www.wmo.int) initiative called Dust Storm Warning Advisory and Assessment System (SDS-WAS; <http://sds-was.aemet.es/>) Programme.
4. The Spanish Ministry of the Environment and Rural and Marine Affairs (Ministerio de Medio Ambiente y medio Rural y Marino, Gobierno de España, Plan Nacional I+D+I) project called: "ACOPLAMIENTO ONLINE DE UN MODULO COMPLETO DE AEROSOLES MULTICOMPONENTE AL MODELO ATMOSFERICO GLOBAL REGIONAL NMMB" with reference CGL2010-19652.
5. The Spanish Ministry of Science and Innovation (Ministerio de Ciencia e Innovación) project called: "Aerosol deposition and ocean plankton dynamics (ADEPT)" with reference CTM2011-23458.
6. The Monitoring Atmospheric Composition & Climate (MACC) Project (MACC O-INT Work-Package 3.1): "Meningitis linked to mineral dust transport in the Sahel".
7. Integrated Action between Spain and Portugal founded by the Spanish Ministry of Science and Innovation called: "Ensamblaje y puesta en operación del sistema de pronóstico de la calidad del aire para la Península Ibérica" with reference PT2009-0029.
8. The Barcelona Supercomputing Center – Centro Nacional de Supercomputación (BSC-CNS) and the Spanish Ministry of Science and Innovation project called "Para la incorporación de investigadores en el sistema español de la ciencia (Consolider SysEC)".

1.4 Publications and scientific results

1. Amiridis, V., Kafatos, M., Pérez, C., Kazadzis, S., Gerasopoulos, E., Mamouri, R. E., Papayannis, A., Kokkalis, P., Giannakaki, E., **Basart, S.**, Daglis, I., and Zerefos, C.: The potential of the synergistic use of passive and active remote sensing measurements for the validation of a regional dust model, *Ann. Geophys.*, 27, 3155-3164, doi:10.5194/angeo-27-3155-2009, 2009.
Impact Factor (2010 JCR Science Edition): 1.620 / Quartil: Q2 / Area: Environmental Sciences
2. **Basart, S.**, Pérez, C., Cuevas, E., Baldasano, J. M., Gobbi, G. P.: Mineral dust characterization for North of Africa, Northeastern Atlantic, Mediterranean Basin and Middle East from direct-sun AERONET observations. *Atmos. Chem. Phys.*, 9, 8265–8282, doi:10.5194/acp-9-8265-2009, 2009.
Impact Factor (2010 JCR Science Edition): 5.309 / Quartil: Q1 / Area: Meteorology and Atmospheric Sciences.
3. Pérez, C., Baldasano J.M., P. Jiménez-Guerrero, O. Jorba, K. Haustein, E. Cuevas, **S. Basart**, S. Nickovic, "Dust modeling and forecasting at the Barcelona Supercomputing Center: activities and developments. WMO/GEO Expert Meeting on an International Sand and Dust Storm Warning System". Barcelona, Spain, 7-9 Nov. IOP Conf. Ser.: Earth Environ. Sci. 7 012013 doi: 10.1088/1755-1307/7/1/012013, 2009.
4. Pay, M. T., Piot, M., Jorba, O., Gassó, S., Gonçalves, M., **Basart, S.**, Dabdub, D., Jiménez-Guerrero, P., and Baldasano, J. M.: A Full Year Evaluation of the CALIOPE-EU Air Quality Modeling System over Europe for 2004, *Atmos. Environ.*, 44, 3322-3342, doi:10.1016/j.atmosenv.2010.05.040, 2010.
Impact Factor (2010 JCR Science Edition): 3.226 / Quartil: Q1 / Area: Environmental Sciences

5. Papanastasiou, D. K., Poupkou, A., Katragkou, E., Amiridis, V., Melas, D., Mihalopoulos, N., **Basart, S.**, Pérez, C. and Baldasano, J. M.: S. An Assessment of the Efficiency of Dust Regional Modelling to Predict Saharan Dust Transport Episodes, *Advances in Meteorology*, 2010(154368), doi:10.1155/2010/154368, 2010.
6. Borrego, C., Monteiro, A., Pay, M. T., Ribeiro, I., Miranda, A.I., **Basart, S.**, and Baldasano, J. M.: How bias-correction can improve air quality forecast over Portugal, *Atmos. Environ.*, 45, 6629-664, doi: 10.1016/j.atmosenv.2011.09.006, 2011.
Impact Factor (2010 JCR Science Edition): 3.226 / Quartil: Q1 / Area: Environmental Sciences
7. Guirado, C., Cuevas, E., Cachorro, V., Mimouni, M., Zeudmi, L., Toledano, C., Alonso-Pérez, S., **Basart, S.**, Blarel, L., Goloub, P., and Baldasano, J.M.: Preliminary characterization of columnar aerosol properties (AOD-AE) at the Saharan Tamanrasset (Algeria) station, *Opt. Pura Apl.*, 44(4), 635-639, 2011.
8. Pay, M.T., Jiménez-Guerrero, P., Jorba, O., **Basart, S.**, Querol, X., Pandolfi, M., and Baldasano, J.M.: Spatio-temporal variability of concentrations and speciation of particulate matter across Spain in the CALIOPE modeling system. *Atmos. Environ.*, In Press, Accepted Manuscript, doi:10.1016/j.atmosenv.2011.09.049, 2011.
Impact Factor (2010 JCR Science Edition): 3.226 / Quartil: Q1 / Area: Environmental Sciences
9. Pérez, C., Haustein, K., Janjic, Z., Jorba, O., Huneus, N., Baldasano, J.M., Black, T., **Basart, S.**, Nickovic, S., Miller, R.L., Perlwitz, J., 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/acpd-11-13001-2011, 2011.
Impact Factor (2010 JCR Science Edition): 5.309 / Quartil: Q1 / Area: Meteorology and Atmospheric Sciences.
10. **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: validation 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.
Impact Factor (2010 JCR Science Edition): 3.336 / Quartil: Q1 / Area: Meteorology and Atmospheric Sciences.
11. **Basart, S.**, Pérez, C., Nickovic, S., Cuevas, E., Schulz, M. and Baldasano, J. M.: Development and evaluation of BSC-DREAM8b dust regional model over Northern Africa, the Mediterranean and the Middle East regions, *Tellus B*, 64, 18539, doi: http://dx.doi.org/10.3402/tellusb.v64i0.18539, 2012.
Impact Factor (2010 JCR Science Edition): 3.587 / Quartil: Q1 / Area: Meteorology and Atmospheric Sciences.
12. Folch, A., Costa, A., and **Basart, S.**: Validation of the FALL3D ash dispersion model using observations of the 2010 Eyjafjallajökull volcanic ash clouds, *Atmos. Environ.*, 48, 165-183, doi: http://dx.doi.org/10.1016/j.atmosenv.2011.06.072, 2012.
Impact Factor (2010 JCR Science Edition): 3.226 / Quartil: Q1 / Area: Environmental Sciences
13. Haustein, K., Pérez, C., Baldasano, J.M., Jorba, O., **Basart, S.**, Miller, R.L., Janjic, Z., Black, T., Nickovic, S., Todd, M. and Washington, R.: Atmospheric dust modeling from meso to global

scales with the online NMMB/BSC-Dust model: 2. Regional experiments in North Africa, *Atmos. Chem. Phys.*, 12, 933–2958, doi: doi:10.5194/acp-12-2933-2012, 2012.

Impact Factor (2010 JCR Science Edition): 5.309 / Quartil: Q1 / Area: Meteorology and Atmospheric Sciences.

14. Kokkalis, P., Mamouri, R.E., Todua, M., Didebulidze, G.G., Papayannis, A., Amiridis, V., **Basart, S.**, Pérez, C., and Baldasano, J.M.: Ground, satellite and simulation-based analysis of a strong dust event over Abastumani, Georgia during May 2009, *International Journal of Remote Sensing*, 33 (16), 4886-4901, doi:10.1080/01431161.2011.644593, 2012.

Impact Factor (2010 JCR Science Edition): 1.182 / Quartil: Q2 / Area: Remote Sensing

15. Gallisai, R., Peters, F., **Basart, S.** and Baldasano, J.M.: Mediterranean basin-wide correlations between Saharan dust deposition and ocean chlorophyll concentration, *Biogeosciences*, *submitted*.

Impact Factor (2010 JCR Science Edition): 3.587 / Quartil: Q1 / Area: Ecology

16. Tchepel, O., Ferreira, J., Fernandes, A.P., **Basart, S.**, Baldasano, J.M. and Borrego, C.: Analysis of long-range transport of aerosols for Portugal using 3D Chemical Transport Model and satellite measurements, *Atmos. Environ.*, *submitted*.

Impact Factor (2010 JCR Science Edition): 3.226 / Quartil: Q1 / Area: Environmental Sciences

1.5 Research stays abroad

July-September 2009

Graduate Research Assistant: Laboratoire des Sciences du Climat et de l'Environnement (LSCE/IPSL) Gif-sur-Yvette, France. Advisor: Dr. Michael Schulz

- Implementation of a new desert dust observational dataset for evaluation purposes in the AEROCOM project (<http://aerocom.met.no/Welcome.html>).
- Evaluation of dust regional model

1.6 Attendance to congresses and conferences

1. Baldasano, J.M., C. Pérez, O. Jorba, P. Jiménez-Guerrero, E. Cuevas, **S. Basart**, J.J. Bustos, S. Alonso-Pérez, S. Rodríguez, C. Marrero, M. Manso, M.A. Martínez, M. Velázquez, M. Palomares, X. Querol, J. Pey, L. Barrie, S. Nickovic, "WMO Sand and Dust Storm Warning System (SDS-WS) for Europe, Africa and Middle East: a GEO-oriented System". In the International Conference on "Secure and Sustainable Living: Social and Economic Benefits of Weather, Climate and Water Services", Madrid, Spain, 19-22 March, 2007.
2. Rodríguez, S., E. Cuevas, I. Toledo, **S. Basart**, P. Goloub, "An assessment of the AERONET aerosols size distribution by comparison with in-situ measurements at Izaña Global Atmospheric Watch Observatory: An analysis from clean-air to high Saharan dust concentration conditions". IUGG XXIV General Assembly, Perugia, Italy, 2-3 July, 2007.
3. Baldasano J.M., E. Cuevas, C. Pérez, O. Jorba, P. Jiménez-Guerrero, **S. Basart**, S. Alonso-Pérez, M.A. Martínez, X. Querol, J. Pey, L. Barrie, S. Nickovic, "WMO Sand and Dust Storm Warning System (SDS-WS) for Europe, Africa and Middle East: a GEO-oriented System". 7th EMS Annual Meeting / 8th ECAM, Madrid, Spain, 1-5 October, 2007.

4. Cuevas, E., J.M. Baldasano, C. Pérez, X. Querol, **S. Basart**, M.Á. Martínez, O. Jorba, P. Jiménez, L. Barrie, S. Nickovic, "WMO Sand and Dust Storm Warning System (SDS-WS) for Europe, Africa and Middle East: a GEO-oriented System". In WMO/GEO Expert Meeting on an International Sand and Dust Storm Warning System, Barcelona, Spain, 7-9 November, 2007.
5. Pérez, C., J.M. Baldasano, P. Jiménez-Guerrero, O. Jorba, K. Haustein, E. Cuevas, **S. Basart**, S. Nickovic, "Dust modeling and forecasting at the Barcelona Supercomputing Center: activities and developments". In WMO/GEO Expert Meeting on an International Sand and Dust Storm Warning System, Barcelona, Spain, 7-9 November, 2007.
6. **Basart, S.**, C. Pérez, E. Cuevas, J.M. Baldasano, "Aerosol retrospective analysis over North of Africa, North-eastern Atlantic Ocean, Mediterranean and Middle East from AERONET sites". 10th IGAC conference 2008, Annecy, France, 7-12 November, 2008.
7. **Basart, S.**, C. Pérez, E. Cuevas, J.M. Baldasano, "Aerosol retrospective analysis for North of Africa, Northeastern Atlantic, Mediterranean and Middle East from AERONET sites". Third International Dust Workshop, Leipzig, Germany, 15-17 September, 2008.
8. **Basart, S.**, C. Pérez, E. Cuevas, J.M. Baldasano, "Evaluation of a regional mineral dust model over Northern Africa, Southern Europe and Middle East with AERONET data". European Geosciences Union EGU 2009 Conference, Vienna, Austria, 20-24 April, 2009.
9. **Basart, S.**, C. Pérez, E., J.M. Baldasano, "Verification of a Sand and Dust Storm (SDS) forecast model for North Africa, Europe and Middle East with AERONET data". Atmospheric Science Conference, Barcelona, Spain, 7-11 September, 2009.
10. Balis, D., Giannakaki, E., Amiridis, V., Pérez, C., **Basart, S.**, "Saharan dust observations over Thessaloniki using backscatter/Raman lidar and BSC/DREAM model". International Symposium on Tropospheric Profiling: Needs and Technologies, Delft, the Netherlands, 18-23 October, 2009.
11. C. Pérez, K. Haustein, O. Jorba, Z. Janjic, **S. Basart**, J.M. Baldasano, "Atmospheric mineral dust modeling from meso to global scales with the NMMB/BSC-DUST". AAAR, 28th Annual Conference, Minneapolis, USA, 26-30 October, 2009.
12. Cuevas E., J.M. Baldasano, M. Schulz, S. Nickovic, C. Pérez, **S. Basart**, K. Serradell, D. Carrio, E. Terradellas, L. Barrie. "The Regional Sand and Dust Storm Warning Advisory and Assessment System Regional Center for Northern Africa, Europe and Middle East". WMO-CAS XV, Incheon, Republic of Korea, 16-17 November, 2009.
13. Baldasano J.M., M. Piot; O. Jorba; M. Goncalves; M.T. Pay; **S. Basart**; P. Jiménez and S. Gassó. "CALIOPE: an Operational Air Quality Forecasting System for Europe and Spain". Mesoscale Modelling For Air Pollution Applications: Achievements And Challenges (COST 728 Final Workshop), Organisers: COST 728, WMO/GURME and MEGAPOLI, Geneva, Switzerland, 25-26 February, 2010.
14. Piot M., M. T. Pay, O. Jorba, **S. Basart**, S. Gassó, X. Querol, M. Pandolfi, A. Alastuey, D. Dabdub, J. M. Baldasano. "Evaluating the CALIOPE air quality modelling system: gas-phase chemistry and chemical composition of particulate matter over Iberian Peninsula for 2004 at high horizontal". Segones Jornades de Meteorologia i Climatologia de la Mediterrània Occidental, Valencia, Spain, 11-12, March 2010.
15. Pay, M.T., M. Piot, O. Jorba, **S. Basart**, S. Gassó, D. Dabdub, P. Jiménez-Guerrero, J.M. Baldasano. "Chemical Composition of Particulate Matter in Spain: Modeling Evaluation of the CALIOPE System for 2004". European Geosciences Union EGU 2010 Conference, Vienna, Austria, 2-7 May, 2010.

16. **Basart S.**, M.T. Pay, M. Piot, C. Pérez, E. Cuevas, O. Jorba, J.M. Baldasano. "Aerosol Optical Depth over Europe: Evaluation of the CALIOPE air quality modelling system with direct-sun AERONET observations". European Geosciences Union EGU 2010 Conference, Vienna, Austria, 2-7 May, 2010.
17. Piot M., M.T. Pay, O. Jorba, **S. Basart**, S. Gassó, X. Querol, M. Pandolfi, J.M. Baldasano and the DAURE team. "Preliminary Modelling Results of the Chemical Composition of Particulate Matter in NE Spain for the DAURE Campaign". European Geosciences Union EGU 2010 Conference, Vienna, Austria, 2-7 May, 2010.
18. Guirado C., E. Cuevas, V. Cachorro, M. Mimouni, L. Zeudmi, C. Toledano, S. Alonso, **S. Basart**, L. Blarel, P. Goloub, J.M. Baldasano. "Preliminary characterization of columnar aerosols properties (AOD-AE) at the Saharan Tamanrasset (Algeria) station". 37th Annual European Meeting Atmospheric Studies Optical Methods, Valladolid, Spain, 23-27 August, 2010.
19. Cuevas E., J.M. Baldasano, C. Pérez, C. Camino, E. Terradellas, **S. Basart**, K. Serradell. "Service chain analysis in support to health community O-INT_3.1 Core requirements to support forecast of meningitis". Second MACC Assembly, Toulouse, France, 18-22 October, 2010.
20. Baldasano, J. M., M. T. Pay, O. Jorba, J. Ortiz, M. Gonçalves, **S. Basart**, S. Gassó, P. Jiménez-Guerrero. "Evaluation of the Spanish operational air quality forecasting system: diagnostic and near real time". International Workshop on Air Quality Forecasting Research, Québec, Canada, 16-18 November, 2010.
21. Terradellas, E., J.M. Baldasano, **S. Basart**, F. Benincasa. "WMO SDS-WAS. Regional Center for Northern Africa, Middle East and Europe". 9th EARLINET-ASOS Workshop, Evora, Portugal, 7-9 February, 2011.
22. Folch, A., **S. Basart**, A. Costa. "Modeling and forecasting the Eyjafjallajökull volcanic ash cloud using the FALL3D ash dispersion model", European Geosciences Union EGU 2011 Conference, Vienna, Austria, 3-8 April, 2011.
23. **Basart, S.**, M.T. Pay, C. Pérez, O. Jorba, J.M. Baldasano. "Aerosol surface levels, chemical composition and optical depth over Europe in the CALIOPE air quality modelling system". European Geosciences Union EGU 2011 Conference, Vienna, Austria, 3-8 April, 2011.
24. Haustein K., C. Pérez, J.M. Baldasano, **S. Basart**, R.L. Miller, Z. Janjic, T. Black, S. Nickovic, M. Todd, R. Washington, Y. Govaerts. "A model for prediction of mineral dust from meso to global scales: Regional experiments for North Africa", European Geosciences Union EGU 2011 Conference, Vienna, Austria, 3-8 April, 2011.
25. Borrego, C., A. Monteiro, I. Ribeiro, A.I. Miranda, M. T. Pay, **S. Basart**, J. M. Baldasano. "How different air quality forecasting system (should) operate over Portugal?", 14th Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes, Kos, Greece, 2-6 October, 2011.
26. **Basart, S.**, Baldasano, J.M., Terradellas, E., Benincasa, F. and Jorba, O. "Dust modelling and forecasting in the BSC: Activities and developments", 4th International Cooperative Aerosol Prediction (ICAP) Workshop, Frascati, Italy, 14-17 May, 2012.
27. Terradellas, E., Camino, C., Alonso-Perez, S., **Basart, S.**, Baldasano, J.M. and Cuevas, E. "Distribución espacial y temporal de polvo mineral atmosférico en el Norte de África y Oriente Medio estimada a partir de observaciones de visibilidad horizontal.", XXXII Jornadas Científicas de la Asociación Meteorológica Española, Madrid, Spain, 28-30 May, 2012.
28. Tsekeri, A., Amiridis, V., Kokkalis, P., **Basart, S.**, Chaikovsky, A., Dubovik, O., Mamouri, R.E., Baldasano J. M. and Papayannis, A. "Evaluation of dust modelling using a synergetic



algorithm of lidar and sunphotometer data”, International Laser Radar Conference (ILRC), Porto Heli, Greece, 25-29 June, 2012.

29. Marinou, E., Amiridis, V., Tsekeri, A., **Basart, S.**, Baldasano J. M., Kazadzis, S. and Papayannis, A. “Comparison of Averaged extinction profiles from CALIPSO and BSC-DREAM8b dust model over Greece”, International Laser Radar Conference (ILRC), Porto Heli, Greece, 25-29 June, 2012.

1.7 Patents, awards and other academic and/or scientific relevant merits

- Postgraduate fellowship funded by Meteorological State Agency of Spain (AEMET) in Izana Atmospheric Research Center - Meteorological State Agency of Spain (CIAI): 2005 – 2007.
- Annual scholarship for graduate studies, Barcelona Supercomputing Center – Centro Nacional de Supercomputación (BSC - CNS): 2008 – 2012.
- Mobility fellowship for PhD. Students funded by the Spanish Ministry of Science and Innovation: 2009





2. Historial científic del grup d'acollida del centre receptor (màxim 5 fulls)

2.1 Breu descripció del departament o grup d'acollida del centre receptor

2.2 Breu descripció de la idoneïtat del departament o grup d'acollida en relació al projecte de recerca que es vol desenvolupar

2.2 Principals publicacions i resultats científics obtinguts en els darrers cinc anys

2.1 Brief description of the host research group

Description of the organisation:

The Laboratoire de Météorologie Dynamique (LMD; <http://www.lmd.jussieu.fr>) is a joint research unit of the Centre National de la Recherche Scientifique (CNRS) and three universities: École Polytechnique, École Normale Supérieure and the University Pierre et Marie Curie. It is also part of the Institut Pierre Simon Laplace (IPSL), a federative of six environmental science research institutes based in Paris, France. LMD studies the climate, pollution and planetary atmospheres by associating theoretical approaches, numerical modelling and the development of measurement instruments.

The diversity of activities of LMD is part of a strong thematic unity that describes: it is the atmospheric phenomena and their dynamics are studied in three sites of the laboratory, by combination of theoretical approaches, observations and numerical modelling. The work that proposes to carry out LMD in the coming years will focus on two main areas: the study of climate change and anthropogenic effects and the study of dynamical and physical processes in the envelopes and fluids the surface.

Studies of climate change and human impacts:

- Study of climate change in progress
 - Troposphere water vapour and clouds
 - Stratosphere
 - Continental surfaces
- Climate Change and Meteorology
 - Sensitive time in the mid-latitude
 - Precipitation in the tropics
 - Opening on issues concerning the socio-economic
- Bifurcations and abrupt climate change
 - Paleoclimate change
 - Bifurcation in the climate system
 - Methanization

Studies of dynamic and physical processes in the envelopes and fluids to the surface:

- Dynamic



- Dynamics and moisture
- Orographic flows
- Gravity waves
- Coupling and oceanic applications
- Numerical scheme
- Cloud physics and atmospheric transport free
 - Upper troposphere and lower stratosphere cirrus
 - Clouds, convection and water vapour
 - Transportation of large-scale tropospheric
- Boundary layer, surface pollution
 - Continental boundary layer: structures and flows (energy, CO₂, H₂O, dust)
 - Coupling land surface boundary layer
 - Large-scale transport of pollution and health impact
 - Approaches and tools
- Climate and meteorology of the planets
 - Neighbouring planets to Earth
 - Other telluric atmospheres of solar system
 - Development of general circulation model for other planets

Principal personnel involved:

Dr. Olivier Boucher is a research director of the Centre National de la Recherche Scientifique (CNRS) at the Laboratoire de Météorologie Dynamique (LMD). His research interests include aerosol-radiation-cloud interactions, monitoring of atmospheric aerosols, climate effects of black carbon, Earth System modelling, biogeochemical feedbacks, climate effects of aviation, and geo-engineering among other things. He has a long history of working for the IPCC as a lead author for the “Special Report on Aviation and the Global Atmosphere” (1999), a lead author for the Third Assessment Report (2001), a contributing author for the Fourth Assessment Report (2007), a member of the Task Group on New Emission Scenarios and a participant to several expert meetings, and now a Coordinating Lead Author for Chapter 7 (Clouds and Aerosols). Dr. Boucher joined LMD in 2011. Prior to joining LMD, he was a science strategic head in the Met Office Hadley Centre and was leading the aerosol team in the Laboratoire d'Optique Atmosphérique where he became a CNRS Directeur de Recherche. He completed his PhD on aerosol-cloud-radiation interactions at the University Pierre and Marie Curie in Paris in 1995.

He authored and co-authored more than 115 peer-reviewed articles and participate as investigator for several satellite mission on Earth's observations (POLDER-2, PARASOL, and CALIPSO), as Coordinator of and/or participant to several national, European, and international projects (e.g., PHOENICS, DAEDALUS, PROMOTE, CAPACITY, EUCAARI, COMBINE, GEMS, MACC) and as expert for many institutes such as the European Commission, European Space Agency (ESA), CNES (France), CNRS (France), ANR (France), FNRS (Belgium), NERC (Great-Britain), RFP



(Cyprus), Norwegian Research Council, EUROCONTROL, scientific journals and private companies (e.g. SNECMA, Resolute Communications, Air France).

Current projects:

MACC-II (<http://www.gmes-atmosphere.eu/>)

EuTRACE project (www.eutrace.org)

WMO SDS-WAS (<http://sds-was.aemet.es/>)

COMBINE FP7 (www.combine-project.eu)

AEROCOM (<http://aerocom.met.no/>)

Model developments:

MACC-ECMWF (<http://www.ecmwf.int/products/forecasts/>)

INCA-LMDz (<http://lmdz.lmd.jussieu.fr/>)

2.2 Brief description of the suitability of the host group regarding the research project to be developed

The Laboratoire de Météorologie Dynamique has developed the LMDz global climate model which is includes various variants for the Earth and other planets (Mars, Titan, Venus, Exoplanets). The Earth version of LMDz is the atmospheric component of the IPSL "Integrated Climate Model", the development of which is part of the significant international effort to study the evolution and future of the Earth's climate. There is also a constant effort done regarding the evaluation of the capabilities of the model. It is possible with LMDz to simulate satellite observations (e.g. RTTOV, ISCCP and CALIPSO) and the model can be used in semi-operational mode: with zoomed versions guided in real time or not, transport of pollutants and retro-transport, etc.

This research group presents high experience and background about the modelling of aerosols dynamic at global and regional scales. The group takes part some international research projects such as GEMS, AEROCOM and SDS-WAS which focus in a comprehensive data analysis and modelling system for monitoring the global distribution of atmospheric constituents important for climate, air quality and UV with a focus on Europe.

The high experience of the host group in terms of air quality modelling (emissions, meteorology, and physical and chemical processes) and atmospheric dynamics contribute to guide the development of the present project.



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3. Activitat de recerca que es vol desenvolupar durant l'estada de recerca (màxim 10 fulls)

3.1 Breu descripció de l'activitat de recerca que es vol desenvolupar durant l'estada de recerca i dels seus antecedents (en el cas de la Modalitat A, els antecedents s'han de posar en relació a la tesi doctoral que s'està duent a terme)

3.2 Objectius, metodologia, pla de treball i bibliografia/referències de l'activitat de recerca

3.3 Impacte previst dels resultats de l'activitat de recerca (en el cas de la Modalitat A, l'impacte previst dels resultats s'ha de posar en relació a la tesi doctoral que s'està duent a terme)

3.1 Brief description of the present research activity

Atmospheric aerosols or particulate matter (PM) are highly variable in space and time due to the variety of their sources and their fast removal from the atmosphere (from days to weeks). Aerosols have a significant, yet uncertain effect on climate from regional to global scales (IPCC, 2007) and contribute to adverse human health effects (WHO, 2005) including increased morbidity and mortality arising from altered respiratory and cardiovascular function (Pope et al., 2009; Díaz et al., 2012).

The European Union directive 2008/50 on ambient air quality and cleaner air (European Commission, 2008) introduced daily and annual PM₁₀ limit values. The objectives proposed by the EU are usually less well attained in southern Europe than in northern countries (Yttry and Aas, 2006). Both anthropogenic and natural emissions, as well as orographic and climatic factors contribute to the occurrence of those enhanced levels. Particularly in Spain, the contributions by transported natural African dust episodes in the calculation of the annual average of PM₁₀ have a relevant impact on the annual limit value (e.g. Rodríguez et al., 2001, Escudero et al., 2007; Querol et al., 2009).

The most common approach to quantifying dust contribution on ground-level is the development of chemical speciation studies, many of which have been carried out in different regions of Southern Europe (e.g. Rodríguez, 2002; Querol et al., 2009). The main disadvantages of chemical speciation are the high cost and the length of the process given that these studies entail long sampling periods, chemical analyses and data interpretation. Thus, these analyses are limited to specific campaigns. For this reason new methodologies to discriminate dust contributions from the rest of the observational dataset have been introduced in the last years (e.g. Escudero et al., 2007). Air quality regional models are useful to understand the dynamics and transport of pollutants (particularly considering the potential in terms of spatial and temporal coverage) and as well as administer and regulate air quality.

In recent years a number of experimental and operational air quality forecast systems have been developed around the world. Nowadays, in Europe, 23 modelling systems routinely simulate the air quality over Europe, 7 systems also operate in forecasting mode (Menut and Bessagnet, 2010). In this sense, Pay et al. (2012) and Basart et al. (2012) highlighted the necessity to include in the modelling systems the desert dust contributions in hourly and daily basis in order to improve the prediction of the PM mass over southern Europe and to achieve the standards set in European Directives for modelling applications.

At present, a number of experimental and operational dust forecast systems have been developed in recent years, such as the global models Navy Aerosol Analysis and Prediction System (NAAPS; Westphal et al., 2009), INteractive Chemistry and Aerosol model (INCA/LMDz; Hauglustaine et al.,

2004) and the aerosol model at the European Centre for Medium-range Weather Forecasts (MACC-ECMWF; Morcrette et al., 2009); and some European regional models as BSC-DREAM8b (Nickovic et al., 2001; Pérez et al., 2006a,b), CHIMERE-Dust (Menut, 2008; Schmechtig et al., 2011), and NMMB/BSC-Dust (Pérez et al.; 2011a; Haustein et al.; 2012). These models are participating in the Regional Center for Northern Africa, Middle East and Europe (NA-ME-E; <http://sdswas.aemet.es/>) of the Sand and Dust Storm Warning Advisory and Assessment (SDS-WAS) programme seeks to achieve comprehensive, coordinated and sustained observations and modelling capabilities of the sand and dust storms, in order to improve its monitoring state, increase the understanding of its formation processes, and enhance prediction capabilities of dust models. The model intercomparison comparing and evaluating the temporal (on annual, seasonal and daily) and spatial variability of desert dust deposition simulated by models, could help to determine the degree of uncertainty in estimates of dust emission and transport from a range of model simulations in order to highlight the sources of uncertainty in these estimates, and point to the key foci for future research to constrain these uncertainties (e.g. Tegen et al., 2003; Kinne et al., 2006, Textor et al., 2006; Huneus et al., 2011).

Otherwise, because dust feedbacks, research on dust has been elevated to be among the core subjects on Earth System studies. In addition to the study of long-term trends of mineral dust transport, the analysis of regional dust climate simulations is of great importance for the improvement of mid-range and long-range dust events forecasting. Moreover, dust regional climate simulations are being used to analyse the link between large dust plumes from the southern Sahara and the Bodélé Depression and meningitis epidemics in the Sahel region (e.g. Thomson et al., 2006; Pérez, 2010; Pérez et al., 2011b) in the dry season (winter), or the ocean fertilization by the iron that is naturally deposited from atmospheric dust intrusions into the oceans (providing nutrients for phytoplankton) (e.g. González-Ramos et al., 2009; Gallisai et al., 2010). These climatological studies may be further explored with new model simulations for long term periods.

Within this framework, the present analysis searches on one hand to identify, characterize and classify the different meteorological conditions responsible for the desert dust intrusions over Europe and North Atlantic regions using the observations of ground-based networks and on the other hand, the ability of models to simulate these episodes. This last will be done through the evaluation of performance of individual models but also from the intercomparison of the NMMB/BSC-Dust and the INCA/LMDz models. Finally, these results will be applied in the preliminary analysis of a climatic simulation of the NMMB/BSC-Dust model. The NMMB/BSC-Dust (Pérez et al. 2011; Haustein et al., 2012) is the new online dust model within the global-regional NCEP/NMMB numerical weather prediction model under development at Barcelona Supercomputing Center – Centro Nacional de Supercomputación (BSC-CNS; <http://www.bsc.es/>). Based on previous experience with the well-established regional dust model and forecast system BSC-DREAM8b (Nickovic et al., 2001, Pérez et al., 2006ab), the NMMB/BSC-Dust model now includes further developments for dust sources and emission and deposition schemes. The most relevant characteristics of NMMB/BSC-Dust are the on-line coupling of the dust model into the meteorological driver, the wide range of applications from meso to global scales, and the inclusion of dust radiative effects allowing feedbacks between aerosols and meteorology. It is the first step towards the development of the NMMB/BSC-CTM model (<http://www.bsc.es/earth-sciences/nmmbbsc-project>).

3.2 Objectives, methodology, working plan and bibliography of this research activity

3.2.1 Objectives

The main objective is to deepen in the knowledge of dynamics (transport, diffusion and advection) of African dust outbreaks over Europe (focusing in the Iberian Peninsula and in particular to Catalonia) by means of mineral dust model simulations (NMMB/BSC-Dust and INCA/LMDz); and to analyse regional dust climate simulations.

This research project is structured to achieve the following objectives:

1. Dynamic characterization of African dust intrusions over Europe and North Atlantic regions.
2. Climatic trends of the long range African dust transport to Europe and North Atlantic regions.

During the development of this research project, I intend to cooperate and transfer knowledge with the host group with wide experience in aerosol modelling at global scales, model evaluation and dust forecasting with data assimilation.

3.2.2 Methodology

For obtaining the objectives set in this proposal it becomes necessary to develop the following work plan:

Activity 1. Dynamic characterization of desert dust intrusions over Europe and North Atlantic regions

Satellites and ground-based observations give a picture of dust storm activity and dust transport at global scale. In the Mediterranean basin, transport of desert dust aerosol occurs at different levels, mainly within and above the planetary boundary layer (e.g. Pappalardo et al., 2003; Pérez et al., 2004; Barkan et al., 2005; Mona et al., 2006; Sicard et al., 2011; Córdoba-Jabonero et al., 2011) with maximum altitudes registered during summertime (Pappalardo et al., 2003; Pérez et al., 2004; Barkan et al., 2005; Mona et al., 2006; Sicard et al., 2011; Córdoba-Jabonero et al., 2011). While in spring maximum dust impact is found over Eastern-Central Mediterranean (Formenti et al., 2001; Balis et al., 2006; Pace et al., 2006), in summer-fall, there is a shift to the Central-Western Mediterranean (Toledano et al., 2007; Papayannis et al., 2008). In winter, minimum incidence of long range dust transport is observed (Moulin et al., 1998; Rodríguez et al., 2001; Israelevich et al., 2002; Papayannis et al., 2008) agreeing with a minimum emission activity in the source regions and maximum of precipitation. In this season, a residual dust activity is found on the Western part of the Mediterranean basin, while the beginning of a “new dust cycle” is also detected in the South-Eastern Mediterranean.

This picture of dust transport is obtained from observations of a single station or for a relative short period. In this sense, dust models are essential to complement dust-related observations, understand the dust processes and predict the impact of dust on surface level PM concentrations. Furthermore, an exhaustive comparison of different models with each other and against observations can reveal weaknesses of individual models and provide an assessment of uncertainties in simulating the dust

cycle (Kinne et al., 2003; Uno et al., 2006; Textor et al., 2006, Todd et al., 2008, Huneus et al., 2011).

In the present analysis, a long-term simulation of the NMMB/BSC-Dust and INCA/LMDz models (2000-2010) are used to establish the main transport paths of desert dust over Europe and North Atlantic regions from North African deserts. This analysis includes not only surface concentration but load column and vertical distribution of desert dust over Europe by means of the use of model simulations.

Task 1.1. Analysis of observations to characterize dust episodes over Europe from North African deserts

- Identification of episodes of dust transport to Europe by analyzing available data for the period 2000-2010:
 - AERONET (<http://aeronet.gsfc.nasa.gov/index.html>)
 - EARLINET (www.earlinerteos.org)
 - EMEP (<http://www.emep.int/>)
- Characterization of the meteorological conditions responsible for the dust episodes and their classification into groups with common circulation patterns.

Task 1.2. Model intercomparison of the simulated values: NMMB/BSC-Dust vs. INCA/LMDz

- To perform a simulation with the NMMB/BSC-Dust and INCA/LMDz models for 2000-2010.
- Establishing the main differences in the emissions scheme, description of desert dust sources/deposition and transport scheme implemented in each model configuration.
- Model intercomparison in terms of meteorological (wind, temperature and pressure) and dust fields (3D).

Task 1.3. Integrated analysis and synthesis of the obtained results

- Analysing the dust simulated fields (3D) of the long range transport over Europe and the associated synoptic situation.
- Identification of the main North African desert dust sources and establishing the circulation pattern associate with the main transport paths of desert dust over Europe.

Activity 2. Climatic trends of the long range dust transport to Europe and North Atlantic regions from North African deserts

Airborne African dust has a complex relationship with climate. It has a significant impact on the Earth radiative budget (IPCC, 2007), but the African dust export is in turn strongly controlled by climate variability. In-situ measurements of mineral dust concentration at Barbados since the 1960's (Prospero and Nees, 1986) clearly show, on a year-to-year basis, the association of dry conditions in northern Africa with enhanced long-range transport of Saharan dust in summer. Moulin et al. (1997), on the basis of 11 years of METEOSAT observations suggest that the year-to-year variability of Saharan dust transport is more related to the large-scale meteorology, through the North Atlantic Oscillation. The dust regional model analysis of Alonso-Pérez et al. (2011) showed a two-fold increase in winter dust concentrations over the 1980–2006 period with respect to the 1958–1979 period, corresponding to the strengthening and eastward shift of the Azores High.

These fluctuations in dust observed far from the dust source regions can be due to a combination of source, transport and depositional changes. It is difficult to determine the relative importance of each factor. It has also been suggested that changes in dust event frequency may be caused by changes in meteorological patterns and climate (Moulin et al., 1997; Ginoux et al., 2004; Mahowald et al., 2010; Alonso-Perez et al., 2011), changes in the biochemistry cycle linked to iron that is transported with desert dust (Mahowald et al., 2010) and changes in the land surface conditions (Middleton and Goudie, 2001; Moulin and Chiapello, 2004).

There is thus a need for additional large scale and long term information to better understand the interaction of climate variability and dust transport. In addition to the study of long-term trends of mineral dust transport, the analysis of regional dust climate simulations is of great importance for the improvement of mid-range and long-range dust events forecasting.

Task 2.1. Model simulations: NMMB/BSC-Dust

- To perform a simulation with the NMMB/BSC-Dust model for 1960-2010.

Task 2.2. Analysis and synthesis of the obtained simulations

- Statistical analysis of the climatic trends of desert dust transport over Europe and North Atlantic regions.
- Correlating the circulation pattern with the dust concentration fields over Europe and North Atlantic regions by means the NAO index.

3.2.3 Working plan

Tasks	Months			
	1	2	3	4
Activity 1. Dynamic characterization of desert dust intrusions over Europe and North Atlantic regions from North African deserts				
Task 1.1. Analysis of observations to characterize dust episodes over Europe				
Task 1.2. Model intercomparison of the simulated values: NMMB/BSC-Dust vs. INCA/LMDz				
Task 1.3. Integrated analysis and synthesis of the obtained results				
Activity 2. Climatic trends of the long range dust transport to Europe and North Atlantic regions from North African deserts				
Task 2.1. Model simulations: NMMB/BSC-Dust				
Task 2.2. Analysis and synthesis of the obtained simulations				

3.2.4 References

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3.3 Expected impact of these research activity results

The justification of the Project has a bearing on the improvement of life quality, health and protection of ecosystems through a more precise scientific knowledge of the physico-chemical processes in the atmosphere. At the same time, this will help to a better administration of the air quality networks. The current European directive (2008/50/EC) on ambient air quality and cleaner air for Europe and their transposition to the Spanish legislation (RD 102/2011) highlight the necessity of having modelling tools, which provides an estimation of the geographical scope of the episode and to establish restrictive measurements. Air pollution is the environmental factors with the greatest impact on health in Europe and is responsible for the largest burden of environment-related disease.

Furthermore, the results will be incorporated in the model evaluation activities of the WMO SDS-WAS NA-ME-E Regional Center (<http://sdswas.aemet.es/>) which seeks to document differences of dust component modules and to assemble useful data-sets for dust model evaluation purposes.

Therefore, the main benefits derived from the Project are:

1. Provide a desert dust intrusions pattern catalogue (which will be a function of typical meteorological patterns) for Europe.
2. Increase in the knowledge of desert dust outbreaks in Europe.
3. Important scientific and technical improvement in the performance of mineral dust models.

Additionally the results obtaining during this project will be used in the exploitation and diffusion of them in journeys, congresses and publications:

- Organisation of annual diffusion journeys of the results of the research project and its final result after the stay.
- Participation in congresses, symposia, and other scientifically-related activities, as well as the publication of the results of the project in international scientific magazines