

STARTPAGE

MARIE SKŁODOWSKA-CURIE ACTIONS

Individual Fellowships (IF)

Call: H2020-MCA-IF-2015

PART B

- PASAIR -

**PARTICULATE SOURCE APPORTIONMENT TO
URBAN AIR POLLUTION IN SPAIN WITHIN A
PHOTOCHEMICAL MODEL**

This proposal is to be evaluated as:

[Standard EF]

CONTENTS OF THE PROPOSAL

LIST OF PARTICIPANTS	i
1. SUMMARY	1
2. EXCELLENCE	1
2.1 Quality, innovative aspects and credibility of the research.....	1
2.2 Clarity and quality of transfer of knowledge/training for the development of the researcher in light of the research objectives.....	4
2.3 Quality of the supervision and the hosting arrangements	4
2.4 Researcher capacity to reach and re-enforce a position of professional maturity in research	5
3. IMPACT	6
3.1 Enhancing research- and innovation-related human resources, skills, and working conditions to realise the potential of individuals and to provide new career perspectives	6
3.2 Effectiveness of the proposed measures for communication and results dissemination	7
4. IMPLEMENTATION	8
4.1 Overall coherence and effectiveness of the work plan.....	8
4.2 Appropriateness of the management structure and procedures, including quality management and risk management.....	9
4.3 Appropriateness of the institutional environment	10
4.4 Competences, experience and complementary of the participating organizations and institutional commitment	10
5. CV OF THE EXPERIENCED RESEARCHER	11
6. CAPACITIES OF THE PARTICIPATING ORGANIZATIONS	16
7. ETHICAL ASPECTS	18
8. LETTERS OF COMMITMENTS OF PARTNER ORGANIZATIONS	18
9. LETTERS OF SUPPORT	21

LIST OF PARTICIPANTS

Participant	Legal Entity Short Name	Academic	Non-academic	Country	Dept./ Division	Supervisor	Role of Partner Organization
<u>Beneficiary</u> Barcelona Supercomputing Center/	BSC-CNS	x		Spain	Earth Sciences Department (BSC-ES)	Oriol Jorba	Host Organizational
<u>Partner Organization</u> Centro Superior de Investigaciones Científicas	CSIC	x		Spain	Institute of Environmental Assessment and Water Research (IDAEA)	Xavier Querol	Hosting Secondment
<u>Partner Organization</u> International Institute for Applied Systems Analysis	IIASA	x		Austria	Mitigation of Air Pollution and Greenhouse Gases (MAG)	Markus Amann	Hosting Secondment

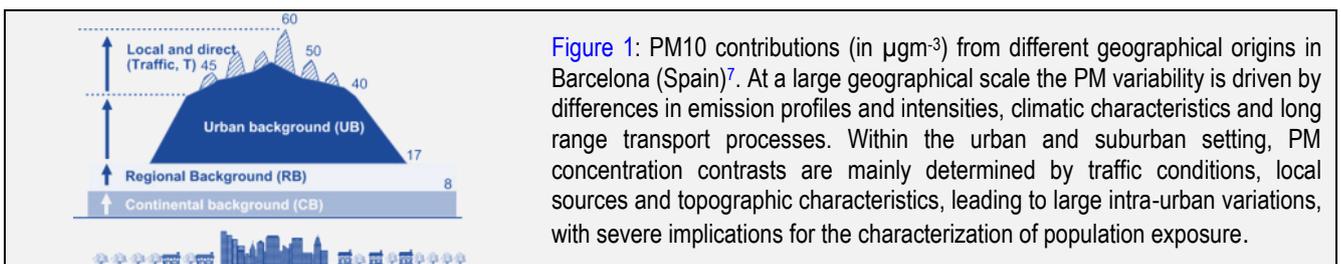
1. SUMMARY

Despite significant emission reductions due to different legislation initiatives in recent years, atmospheric particulate matter (PM) is still a risk factor in European urban areas as it affects human health. Source Apportionment (SA) is the practice of attributing sources to air pollution which helps to define effective policy measures to reduce air pollution. SA is mandatory information to report under the European Air Quality Directive (AQD, 2008/50/EC) over non-attainment zones. However, there is a lack of guidance about SA methodologies to be used by the European Member States. SA can be applied with either a receptor- or source-oriented approach. Source-oriented SA is conducted using chemical transport models (CTM) and provides comprehensive spatial and temporal estimates of the contribution of source classes (activities and regions) to the mixtures of PM components and their precursors. PASAIR's main scientific objective is to advance our understanding of SA within CTM (SA-CTM) for urban PM using a high-resolution air quality modelling system. The main goals are to assess the differences between our SA-CTM and state-of-the-art SA approaches, to evaluate the potential of SA-CTM to define efficient emission scenarios, and to gain insight into the main sources responsible of PM pollution in Spanish urban areas. The novelties of PASAIR are the estimation of a quantitative relationship between fuel type emission activities (e.g. traffic and residential combustion) and PM pollution, as well as the usage of a combination of most used SA approaches to date, together with the main European policy tools to define efficient mitigation plans. The outcomes of PASAIR will systematize differences between SA approaches allowing better information for policymakers in the application of the AQD.

2. EXCELLENCE

2.1 Quality, innovative aspects and credibility of the research

PM has become a major concern for public health in recent years. PM is primary emitted and secondary formed by chemical/physical processes from precursors (NO₂, SO₂, NH₃ and VOC). Despite tightening of the European emission control legislation, Member States (MS) have been facing severe difficulties to attain PM limit values¹. Recent studies on trends analysis demonstrate a clear decrease in PM concentrations in Spain over the last decade, which is due to the positive results of policy implementations, the effects of the financial crisis, and meteorological conditions². However, NO₂ limit values are still exceeded due to road traffic emissions^{3,4}. For the next decade, to meet the World Health Organization (WHO) guidelines in urban areas, *ad hoc* additional local actions to complement national and EU-wide strategies will be required^{5,6}. To define efficient air quality (AQ) plans, SA are essential to determinate the contribution to pollution of main socio-economic activities and surrounding administrative areas together with the transboundary transport of pollution. Figure 1 illustrates the SA concept, target of this project, showing the contributions at different spatial scales to the local PM₁₀ concentrations inside the city of Barcelona.



SA on sources and regions is a mandatory information to be submitted according to the Implementing Provisions on Reporting rules (IPR, 2011/850/EU). However, IPR does not precisely guide/recommend about SA methodologies, nor about the list of priority sources. So far, the SA method widely used among MS is the incremental approach⁸ (known as Lenschow approach) in which observed PM₁₀ at representative stations of regional, urban background, and traffic sites are used to estimate the contribution of different areas and sources (Figure 1). Lenschow approach shows several limitations. First, it assumes that rural levels represent the regional background in the cities, which is not always realistic. Second, it cannot be extrapolated everywhere because some sources may have higher contribution in the background area than in the city (e.g. agriculture).

¹EAA (2014, Report No. 5/2014); ²Querol et al. (2014, Sci. Tot. Environ., 490, 597-969); ³Querol et al. (2004, J. Aero. Sci., 35, 1151-1172); ⁴Kassomenos et al. (2014, Atmos. Environ., 87, 153-163); ⁵Amann (2014, TSA Report #11); ⁶EC (2013, COM/2013/0918 final); ⁷Querol et al. (2008, Atmos. Environ., 8979-8984); ⁸Lenschow et al. (2001, Atmos. Environ., 35, S23-S33)

The application of the SA techniques is an emerging and scientific measure to quantify the impacts of sources in urban AQ with policy implications. The state-of-the-art on SA indicates that there are two main approaches that are used: the *receptor-oriented* SA which derives information about pollution sources and the amount they contribute to observed air pollution levels using fingerprints⁹ and the *source-oriented* SA which quantifies the contributions that different source types and different geographic regions make to pollutant concentrations and depositions¹⁰. Receptor Models¹¹ (SA-RM) are versatile tools thanks to their simplicity in terms of input data and atmospheric processes considered. However, SA-RMs are limited in the domain size, sources and type of pollutant. This is special relevant for the secondary PM species for some of which SA-RM have limitations in tracing origin (e.g. organic carbon and sulphate). On the other hand, source-oriented models (i.e. SA-CTM) provide a more complete analysis of sources contributions in terms of space, time and chemical composition taking into account complementary phenomena like dry/wet deposition and primary/secondary formation. SA-CTM can be conducted by a brute-force method zeroing out sources one by one, but this becomes computationally prohibitive if many emitters are of interest. SA-CTMs have been recently instrumented with algorithms allowing for the estimation of source contribution in just one run^{12,13,14} (e.g. the Particulate Source Apportionment Technology, PSAT-CAMx; and the Integrated Source Apportionment Method, ISAM-CMAQ). However, they still require high computational and storage resources, as well as skilled professionals to analyse the results. SA-RM and SA-CTM provide similar, but often complimentary, type of information about contributors that can be used to establish synergies^{15,16,17}.

In the EU framework of air pollution policy assessment, the European Monitoring and Evaluation Programme (EMEP) Meteorological Synthesizing Center-West (MSC-W) CTM¹⁸ provides source-receptor matrices that estimate the contribution of the emissions in any country to concentration of pollutant in any other country to support the Convention on Long Range Transboundary Air Pollution (CLRTAP). On the other hand, the GAINS Integrated Assessment Model¹⁹, employed in the revision of the EU Thematic Strategy on Air Pollution (TSA) has been extended to estimate SA to PM_{2.5} at EU monitoring stations in the MS for the assessment of the proposal for Clean Air Policy Package^{6,20}. The SA technique implemented in GAINS²¹ uses a complex station-based modelling approach and relies on a combination of bottom-up emission model, simplified atmospheric chemistry and EMEP receptor matrices. Due to implications in the EU legislation, it is important to investigate the abilities of GAINS model to identify key sources and region contribution to urban PM. Hence, PASAIR provides a suitable scenario to test the performance of GAINS for SA and to define efficient mitigation measures for Spain.

SA-RM have been applied in Spain to quantify the contribution of specific sector to PM^{11,22}. However, there are no studies providing information on PM formation from predefined geographical areas and/or socio-economic sectors at high spatial and temporal resolution over main urban areas in Spain that establishes a precise link between PM exceedances and responsible. In addition, distinguishing emissions not only by source sector but also by major fuel type (e.g. diesel and gas) allows identifying the role of different combustion processes in the AQ problem. This will be interesting for residential combustion and transport, because they are main sources of NO_x and PM in urbanized regions.

To meet the identified research opportunities, PASAIR will explore the use of SA-CTM to obtain a precise contribution of sources to urban PM. The main application will be the simulation of sources and regions contributing to PM in Spanish urban areas by means of the implementation of a SA-CTM within the CALIOPE air quality modelling system for Spain (www.bsc.es/caliope)^{23,24,25} and thanks to the level of detail of its HERMESv2.0 emission model^{26,27}. Specifically, a set of four synergic objectives, with their corresponding methodology and approaches, has been designed:

O1. Study the contribution of activity sector and geographical areas to urban PM pollution in Spain, focusing on fuel technologies. The goal is to analyze the contribution of source classes (activity sector and areas) to PM in Spanish urban areas, establishing a link between PM exceedances and key sources. The CALIOPE system for SA will be enhanced in two of its modules. First, the Community Multiscale Air Quality (CMAQ) will be augmented with a source apportionment algorithm, named Integrated Source Apportionment Method (ISAM), forced by the WRF-ARW meteorological model. Second, the

⁹Belis et al. (2014, Report EUR 26080 EN, doi: 10.2788/9307); ¹⁰Cohan and Napelenok (2011, Atmosph., 2, 407-425); ¹¹Viana et al. (2008, Sci. Tot. Environ., 490, 597-969); ¹²Wagstrom et al. (2008, Atmos. Environ., 42, 5650-5659); ¹³Kranenburg et al. (2013, Geosci. Model Dev., 6, 721-733); ¹⁴Kwok et al. (2013, Atmos. Environ., 80, 398-407); ¹⁵Hu et al. (2014, Atmos. Chem. Phys., 14, 5415-5431); ¹⁶Bove et al. (2014, Atmos. Environ., 94, 274-286); ¹⁷Ivey et al. (2015, Geosci. Model Dev., 8, 2153-2165); ¹⁸Simpson et al. (2012, Atmos. Chem. Phys., 12, 7825-7865); ¹⁹Amann et al. (2011, Environ. Modell. Softw., 26, 1489-1501); ²⁰Kiesewetter et al. (2014, TSA Report #12); ²¹Kiesewetter et al. (2015, Atmos. Chem. Phys., 15, 1539-1553); ²²Amato et al. (2009, Atmos. Environ., 43, 2770-80); ²³Baldasano et al. (2011, Sci. Tot. Environ., 409, 2163-2178); ²⁴Pay et al. (2012, Atmos. Environ., 46, 376-366); ²⁵Pay et al. (2014, Geos. Mod. Dev., 7, 1979-1999); ²⁶Guevara et al. (2013, Atmo. Environ., 81, 209-221); ²⁷Guevara et al. (2014, Atmo. Environ., 98, 134-145)

HERMESv2.0 emission model will be expanded to provide emissions by socio-economic categories and fuel type. CALIOPE for SA will be run for a reference year at the HPC facilities at the BSC. Model Performance Evaluation will be performed by comparing air quality simulations against observation from the EBAS database (<http://ebas.nilu.no>). It is a necessary step before performing any SA-CTM analysis to quantify the model uncertainty. MPE will be performed using the Delta tool (<http://aqm.jrc.ec.europa.eu/DELTA/>). SA information will be managed and synthesized over main urban areas in Spain in an annual basis and in selected PM episodes using temporal series and maps.

O2. Enhance the synergies between SA approaches to provide robust high resolution SA information in urban areas in Spain. The goal is to develop a robust and comprehensive SA database in Spanish urban areas taking advantage of the capabilities of SA techniques. First, the project will analyse the differences between the most used state-of-the-art SA method in Spain and the CTM-SA, specifically we will focus on the incremental approach and the receptors models. We will test the differences in terms of topographical characteristics of the urban areas (e.g. coastal, valley, plain, etc.) and the influence of dominant sources in the cities. Second, the project will establish synergies that provide more robust and complete source contribution to PM in Spain. Up-to-date methodologies to combine SA from CTM and receptor will be reviewed. This is relevant for the secondary PM species for some of which SA-RM have limitations in tracing origin (e.g. organic carbon and sulphate). The SA-RM database will be provided by the IDAEA-CSIC from previous studies. This action will reinforce the collaboration with Prof. Xavier Querol, IDAEA-CSIC, Spain.

O3. Evaluate the potential of SA approaches to define efficient emissions reduction scenarios. The goal is to analyse the performance of the combined SA database compared with the GAINS SA in the estimation of major sources to PM in Spanish urban areas. The comparison will evaluate the performance of both databases in terms of merits and deficiencies. The GAINS SA database for activity sources and regions is published in the TSA Report #12²⁰. The comparison will also identify further areas of investigation to gain a more reliable basis for abatement plans and programmes. In a second step the project will search for PM mitigation measures that meet policy targets in urban areas in Spain. The SA database distinguishing activities by major fuel type will allow to establish concrete efficiency measures for heating and road traffic according to different technologies. This action will provide the opportunity to collaborate with Dr. Markus Amann, IIASA, Austria.

This proposal is expected to contribute significantly to the related research fields by addressing the research opportunities previously detailed in the state-of-the-art. The originality and innovation of this research can be detailed by grouping the contributions according to the objectives of this project:

O1 Innovation. The first contribution will be the development of a SA toolbox to simultaneously simulate the PM source contribution from regions and economic activities in urban areas in Spain; in fact this is an issue not addressed up to this time. From a methodological point of view, the project will tackle the barely-addressed question of quantifying the contribution of source classes to main urban cities in Spain within an air quality system running at high resolution. To this aim, the CALIOPE air quality system will be enhanced with the ISAM-CMAQ and with a more flexible version of the HERMES model that allow splitting emissions in sectors and fuel type. CALIOPE applicability has been tested by the fellow in AQ forecast and assessment ([Pay et al., 2010; 2011; 2012a, 2012b; 2014; Baldasano et al., 2011, Section 5](#)).

O2 Innovation. The first contribution will be the comparison of an unprecedented set of SA databases for Spain. Together, the goals and practise of this fellowship are lined up such to fully support the Forum for Air Quality Modelling (FAIRMODE) Working Group 3 on Source Apportionment (<http://fairmode.jrc.ec.europa.eu/wg3.html>). The methodology proposed here may address the remaining gap in the application of SA techniques in the framework of the AQD. The second contribution will be the set of methodologies to combine of the different SA techniques to enhance the synergies between different SA approaches and shed light on the origin of the exceedances of PM in Spain. This fellowship could offer a favourable scope for substantial progress of managing AQ at urban scale.

O3 Innovation. The first contribution will be the assessment of the ability of current EU policy tools (e.g. GAINS) to define efficient abatement strategies at urban scale to complement national and EU strategies. The second contribution will be a database of available and innovative measures to improve air quality in urban areas in Spain based on main contribution identified. These contributions are in line with the project LIFE AIRUSE (<http://airuse.eu/es/>) focused on testing and developing of air pollution mitigation measures in Southern EU. The contribution of activities by fuel type has not been addressed yet and it allow establish measures by technologies. Thus, our outcomes will be of interest for the AQ community, as recognized by the coordinator of the AIRUSE project, and supervisor in the IDAEA-CSIC secondment institution.

2.2 Clarity and quality of transfer of knowledge/training for the development of the researcher in light of the research objectives

The project is structured in such a way as to offer a unique opportunity to strengthen and widen the competences of the applicant, where she will have to build a bridge between her experiences in developing and improving AQ models and their practical requirements to increasing the knowledge on AQ dynamics in Spain by SA techniques.

Development and improvement of AQ models. During her PhD, the fellow developed profound skills on air quality chemistry and air quality modelling at regional and urban scale. Her work contributed to implement an air quality forecast system at high spatial and temporal resolution over Spain, the CALIOPE system. These works have allowed her to be involved in the evaluation of the CALIOPE system in different intercomparison at European scale (e.g. EURODELTA and the Task Force for Measurement and Modelling under the UNECE on trends analysis).

Air quality assessment in Spain using air quality models. After her PhD, the fellow moved her scientific training on air quality models from the development into an assessment approach. During her first two years as post-doctoral research, she acquired an in-depth knowledge of the relationship between AQ and synoptic circulation patterns to explain in what extend air pollution dynamic can be explained by meteorological situations. During her last years as post-doctoral researcher, she focused on determinate the role of source classes in air pollution episodes, so she studied the potential of the SA algorithms implemented in CTM, and she moved to the USEPA to learn how to run and interpreted them; now, the applicant is used to handle them in different configurations. This experience has allow her to be involved as a scientific expert in the FAIRMODE WG3 on Source Apportionment to harmonize the use of SA techniques in EU. However, she lacks the convenient skills and experience on definition of emission abatement scenarios. This fellowships will provide her that expertise. Below, a two-way transfer of knowledge is described in light of the research objectives:

O1 Training. Learn on the use of advance emission models from Marc Guevara (BSC-ES member and co-chair of the FAIRMODE WG2) and the use of cutting-edge High Performance Computing and Big Data technologies from Dr. Oriol Jorba. The fellow will transfer her experience in the application and exploitation of SA within CTM.

O2 Training. Learn on the interpretation of the incremental approach and SA-RM from Prof. Xavier Querol, as well as their uncertainties. The fellow will provide her knowledge on the interpretation of SA-CTM and its uncertainties, and her experience in management of air quality data bases and AQ intercomparison exercises.

O3 Training. Learn skills and get experience on definition of emission abatement scenarios with policy implications. The fellow will provide her profound knowledge on air quality dynamic and its main sources in Spain.

2.3 Quality of the supervision and the hosting arrangements

Exposure to the highly AQ research environment at both the host institution (BSC-ES) and the secondment institutions (IDAEA-CSIC and IIASA, see [Section 8](#)) will allow the applicant to mature and diversify her research interests and intellectual curiosity. Particularly at BSC-ES, where most of the fellowship will take place, the mentoring will include not only a through training in advance emission models and the use of cutting-edge HPC and big data technologies, but have a strong component oriented towards gaining experience in competitive fund- and computing time-raising, and organization of scientific meetings. The qualification and experience of the supervisors is described as follows:

Dr. Oriol Jorba, leader of the Atmospheric Composition group of the BSC-ES since 2008. He has participated in projects funded by the European Commission on air quality, specifically in aerosols, (APPRAISAL, EARLINET, FIELD-AC, ACTRIS1, ACTRIS2) and in the application of atmospheric modeling in HPC (IS-ENES, IS-ENES2, RETHINK big). He has lead the research project on the development of the multiscale chemical weather forecasting system NMMB/BSC-CTM which is the official model used by the Barcelona Dust Forecast Center, the World Meteorological Organization (WMO) Regional Meteorological Center specialized on Atmospheric Sand and Dust. He has been assessor in air quality impact assessment projects for companies. He is a Spanish representative member of the management committee of COST Actions ES1002 and ES1004, and the scientific committee of the International Technical Meeting on Air Pollution Modelling and its Application (ITM). He is also a member of the International Cooperative for Aerosol Prediction (ICAP) and the Air Quality Modelling Evaluation International Initiative (AQMEII). He maintains regular collaborations on aerosol modelling with the NASA Goddard Institute for Space Studies, National Center for Environmental Prediction, Finish Meteorological Institute, among others. He has acted as scientific

reviewer of the Scientific Commission of the Spanish National Research Program. His research interests include high resolution mesoscale meteorology and air quality, development of online meteorology-chemistry models, atmospheric chemistry and environmental impact assessment. He has co-authored more than 50 papers in international scientific journals, over 100 communications in international conferences and directed 6 PhD thesis, of which three at the same time.

Prof. Xavier Querol, Research Professor at the Department of Geoscience of the Institute of Environmental Assessment and Water Research (IDAEA) of the Spanish Research Council (CSIC). He has participated in and/or led several projects funded by the European Commission (EC), Spanish Ministries of Education and Sciences, Environment and several regional governments and companies. Active researcher in the assessment and remediation Aznacollar mining accident, in the environmental and health assessment of industrial areas in Huelva and Gibraltar and the design of air quality plans of the ceramic industrial estate of Catelló and L'Alacantí. He acts as assessor of the Ministry of the Environment on the National Air Quality Program, and the Generalitat de Catalonia on the Metropolitan Barcelona's air quality plan. He has served on the advisory committee of the Clean Air for Europe program of DG Environment of the EC, UNECE and WHO, as a member of various groups of expert to assess the AQD. Vice-Chairman of the Scientific Bureau of the European Monitoring and Evaluation Programme (EMEP) under the Convention on Long Range Transboundary Air Pollution (CLRTAP). His research interests include environmental geochemistry, mostly on AQ. He is co-author of around 420 scientific papers on environmental sciences and included in the list of Highly Cited Researchers (<http://highlycited.com/>).

Dr. Markus Amann, Director of the Mitigation of Air Pollution & Greenhouse Gases (MAG) Program and co-leader of IIASA's Greenhouse Gas Initiative. He also serves as the head of the Centre for Integrated Assessment Modelling (CIAM) of the EMEP under the CLRTAP. He is extremely well regarded in the field, being lead author for the Working Group III report of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). Under Dr. Amann's leadership, the GAINS integrated assessment model for air pollution has been developed and implemented for Europe and Southeast Asia. He directs the policy applications of the GAINS model for negotiations on European emission control accords, such as the 1994 Second Sulfur Protocol of the Convention on Long-range Transboundary Air Pollution, the 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone of the Convention, as well as the Acidification Strategy (1997) and the Directive on National Emission Ceilings (1999) of the European Union. His research interests include the interface between science and policy and methods for the integrated assessment of environmental issues. He is co-author of more than 60 scientific papers (46 h-index, 120 i10-index, and 10100 citations)

- Hosting arrangements

The fellow will have access to the supercomputing facilities of the BSC. The sole facility and expense to allow the applicant to work will be the purchase of a desktop computer, which will be provided at the start of the project. Software tools are already present in the host institution if required, however most are expected to be free and open-source or already exist as in-house codes such as HERMES. BSC has a well-furnished library and subscription to on-line journals. The applicant will be transferred to the BSC and work within the BSC-ES department. This will permit direct contact with colleagues and the supervisor. BSC's support services will prepare a standard Fellowship Agreement based on the Horizon 2020 contractual rules of the European Union and the Spanish fiscal and social security laws. The financial issues related to the fellowship will be handled by the financial services which has experience in these matters based on handling a large number of previous EU contracts. Thus BSC has the entire infrastructure needed for managing a Marie Curie fellow (see [Sections 4.2, 4.3 and 4.4.](#)).

2.4 Researcher capacity to reach and re-enforce a position of professional maturity in research

The applicant has fully demonstrated her proficiency and capability to deal successfully with a wide range of scientific challenges, achieving with quality all the required steps to continue her career development. The fact that she has already revealed a high degree of responsibility guarantees the accurate implementation of the project. This fellowship will provide her with the final expertise needed to become a completely independent scientist able to lead a research group.

Starting with her PhD, the applicant has shown a strong ability for independent research. Building on the expertise of her PhD advisors in air quality and on her participation in different projects, she completed a thesis where a variety of aspects on air quality modelling over Spain (development, improvement and forecasting) was considered. She led the set-up and the evaluation of the CALIOPE air quality system, which is an operation forecast tool working at high spatial and temporal resolution over Europe and Spain, recently awarded with the prize of innovative applications for environment (MYGEOSS).

The applicant then confirmed her independence aptitude soon after her PhD, when she moved from the improvement and development of air quality models to the air quality assessment using CALIOPE. During her experience at the Laboratoire of Météorologie Dynamique (Ecole Polytechnique) and at the US Environmental Protection Agency (US EPA), via her personal fellowship, the applicant has been very productive, publishing papers and contribution to conferences contributing to spread her research activity. She also evidenced her independence by co-directing two PhD thesis on air quality assessment over Spain. In her current position at the BSC-ES, the candidate has manifested ample capability to develop and lead the task undertaken by her institution in the FAIRMODE community and the EURODELTA project.

The applicant has worked in 6 leading research institutes for extended periods, published 17 scientific paper (15 publications within the Q1, an 8 h-index and 190 citations, according to SCOPUS, 5 publication as first author) with long lists of co-authors, and participated in 9 national and 6 (3 no funding) international projects. Her CV and the publication and conference participation listed therein show how those interactions have been extremely fruitful and have always resulted in publications in major journals. These experiences have permitted the applicant to create and maintain a rich network of international collaborations and led the co-direction of 2 PhD thesis on air quality.

3. IMPACT

3.1 Enhancing research- and innovation-related human resources, skills, and working conditions to realise the potential of individuals and to provide new career perspectives

The integration in the BSC will contribute substantially to enhance the applicant skills and career profile. Her scientific curriculum will be reinforced and will place her in excellent position to access grants for the career support from Spanish government (e.g. Ramón y Cajal) and European Union (e.g. ERC Starting Grant). The BSC is dedicated to providing high-quality postdoctoral training to future scientific leaders. It draws upon its experience in developing specific technical and scientific skills, as well as the complementary skills required for efficient research execution and communication (Section 3.2). Researchers work with human resources, education department and supervisors to develop and execute an individual Career Plan, which draws upon the experience of the BSC and the needs of the researcher. The training objectives in the plan are monitored and updated regularly in meetings undertaken with the supervisors, discussing research progress and identifying potential difficulties and ways of overcoming them. The training plan includes:

Critical appraisal and continued exposure to new technological and scientific developments. This includes learning the state-of-the-art, attending conferences, developing literature search and management skills. The BSC has extensive subscription to relevant online journals.

Developing the art of grantsmanship and professional writing. Proficiency in writing clear grand application is essential to securing independent research position, preparation of cover letters, CV, etc. At the BSC the applicant will take part in writing and reviewing grant applications and attending sessions on proposal preparation and writing, and finding sources of funding.

Developing management, leadership and interpersonal skills. The proposal is an opportunity for the applicant to develop project management skills needed to become an accomplished and multidisciplinary researcher. By doing so, managing a scientific problem from end to end, she will also create a stream of responsibilities associated with the dependencies created first in the host institution (BSC) and downstream in the secondments (IDAEA-CSIC, IIASA) from the outcomes of the project, an important part of the training as an independent researcher. At BSC, the fellow will be involved in advising master and PhD students in the fields of air quality modelling for the assessment and managing the pollution in Spain (already supervising two PhD students). These experiences will strength the ability to take decisions and to adapt her background to realistic requirements, essential characteristics of a mature researcher. At BSC, the fellow will lead a new research line as a junior scientist name “air quality modelling group”

Translation of research to industry. The identification of technology transfer will be developed through the BSC’s collaboration with several technological companies that expose the applicant to the needs and nature of spin-off companies, and five knowledge in the commercialisation of research finding. This exposure will aid identifying future research directions of commercial value and prepare the researcher for potential collaboration with industry (see Section 9).

Developing scientific communication skills. Measures to improve the communication and results dissemination is detailed in Section 3.2.

3.2 Effectiveness of the proposed measures for communication and results dissemination

The conversion of gained knowledge into training and educational products which are then communicated through different channels offers a significant opportunity for transferring the knowledge across multiple scales. This project is committed to both expand the basis for learning about SA approaches (implementation, interpretation and exploitation) and apply the new knowledge in activities of scientific disclosure, communication and education. These outreach activities will be offered in a communication language that can be understood by non-specialist, thereby improving the public's understanding of source attribution to air pollution in urban areas. To ensure the success of these activities the proposal has planned to publish and announce during the progress of the projects' phases, results that could be of potential interest to researchers and scientist, enterprises or general public, (Table 1, Section4). The BSC will support the researcher on communication and dissemination through the communication department, Earth Sciences Service Group, and the Training department. Such commitment is integrated via the following activities:

Public engagement (PE) is crucial to aim general public showing the payback of EU investment in R&D. The fellow will have the support of the communications department. The following activities are foreseen:

PE1	<u>Adapted talks</u> to national/regional/local governments and SME on the use of SA techniques to report under the AQD and main results for urban areas in Spain. The project will visit the Spanish Ministry of Agriculture, Food and Environment (MAGRAMA) and the Catalan Government who in a first contact have expressed their interest on the project's results (Section 9). Barcelona Harbour Authority and IDIADA automotive company has indicated an intention of interested in the project results (Section 9). Interaction with governments and enterprises can help to design mitigation strategies providing potential technological concepts and solutions.
PE2	Participation in MareNostrum <u>open day events</u> which are aimed at high school, graduate students and general public. Moreover, active participation in the professional tours for companies, e.g. (automotive or gas companies). All together there are more than 5000 visitors per year
PE3	<u>Academic collaborations</u> with the Technical University of Catalonia, (PhD program of Environmental Engineering) and the University of Barcelona (the applicant is associate professor in the School of Biology), and promising options for participating in Master programs and seminars is foreseen. The project will contribute to create teaching materials to enable the widest possible outreach and uptake of the results derived from the fellowship by students.
PE4	Inclusion of project information, progress and results in several <u>dissemination activities of BSC</u> , e.g. website, presentation, leaflets, brochures address to networks and citizens platforms concerned on air quality.
PE5	<u>Technical report</u> with the relevant results for the stakeholders. This will be an opportunity to better position the project as a technical source of information for the private sector, since similar technical reports are usually used in the communication strategy of private enterprises as part of their Corporates Social Responsibility (CSR).

Scientific dissemination is important to present project's achievements to the scientific community allowing the applicant to establish personal and scientific relations with researchers outside the host institution. The following activities are foreseen:

S1, S2, S3, S4	Four <u>seminars</u> will be hosted at the BSC to present the progress of the project to the local scientific staff, visitors, and BSC collaborators. This seminars will be announced by the BSC communication department
C1, C2, C3, C4, C5, C6	Participation in international and European <u>conferences</u> to engage the target community: FAIRMODE technical meeting (C1, C4), the Community Model and Analysis System conference (C2, C5), the European Geosciences Union (C4) and the International Technical Meeting on Air Pollution Modelling and its Application (ITM) (C6). The marked presence and coordinating role of the supervisors in different European initiatives, projects and committees (i.e. EMEP, UNECE) will ensure the international projection of the fellowship's outcomes
J1, J2, J3	The submission for <u>publication</u> in the most relevant scientific journals has been planned for each scientific contribution: Atmospheric Chemistry and Physics (J1), Atmospheric Environment (J2), Environmental Science and Policy (J3).
V1, V4	<u>Research talks</u> at other leading institutions in her field in the US. The purpose is to present and discuss the applicant's results to an aimed research community, and will allow the applicant to establish personal and scientific relations with researchers outside the host institution. It is planned two visits to Dr. Sergey Napelenok (USEPA, US) collaborator on source apportionment development and its applications.

- Exploitation of results and intellectual property

As CALIOPE is a set of models where two of them are open source (WRF and CMAQ). The augmented version of CALIOPE for SA include an open source software which is the CMAQ-ISAM. The development of HERMES for SA will be published in open source journals. The results generated in this project will be available to the scientific community and published in open source journals. Since 2014, CALIOPE system accounts with more than 10.000 users in its website. It is expected that the updated version of the CALIOPE that allows SA studies increase the number of new users (e.g. SME, administrations, and epidemiologists) as well as its application in other projects (e.g. testing future emission scenarios). The project will create a unique data repository as well as a set tools and methodologies that contribute to build capability of Spanish research groups on SA techniques and encourage visits to the host institution (BSC). A database on efficient mitigation strategies to improve air quality in Spain will be created. The first secondment institution, IDAEA-CSIC being a selected expert on planning air quality in Spain will take advantage of the technological development derived from the fellowship to guide Spanish governments in future national and regional air quality plans.

4. IMPLEMENTATION

4.1 Overall coherence and effectiveness of the work plan

As envisaged from its conception (Section 2.1, 2.2. and 2.3), the research project has been designed with the aim of tailoring the applicant’s background, the supervisor’ expertise and the facilities at the hosting institutions, in order to ensure its successful completion. The work plan reflects this idea, where the scientific program can be tackled from head-to-tail and in autonomy. Note that the expected date is indicated in terms of the corresponding project month, thereafter pm. The schedule of activities to be undertaken to achieve the objectives described in Section 2.1 is presented in Table 1. The work plan of the fellowship is organized so that the objectives of the project can be achieved in 24-months. To this end, the development of the projects objectives is divided in three work packages (WP) and a list of major tasks as follows:

Work Package	Task
WP1. Develop a SA tool to assess sources contribution to PM pollution in Spanish	Task 1.1. Modelling air quality for particulate SA in Spain at high resolution Task 1.2. Quantifying the contribution of source classes of PM
WP2. SA intercomparison over urban areas in Spain	Task 2.1. Test the ability of the SA incremental approach Task 2.2. Assess the differences between state-of-the-art SA approaches used in Europe Task 2.3 Development a combined SA strategy to PM
WP3. SA approaches to define efficient emissions reduction scenarios	Task 3.1. Comparison with the GAINS SA database. Task 3.2. Database of mitigation measures for PM that meet policy target in urban areas in Spain

Table 1. Gantt chart for the implementation plan. M: Milestones, D: deliverables, PM: Progress Monitoring events, C: conferences, S: Seminars, J: Journals, V: Visits, SE: Secondments, R: Risk, TR: Technical Report

Month	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Work package	WP1									WP2									WP3					
Task 1.1	Task 1.1									Task 2.1									Task 3.1					
Task 1.2	Task 1.2									Task 2.2									Task 3.2					
Task 2.1	Task 2.1									Task 2.2									Task 3.2					
Task 2.2	Task 2.2									Task 2.3									Task 3.2					
Task 2.3	Task 2.3									Task 3.1									Task 3.2					
Task 3.1	Task 3.1									Task 3.2									Task 3.2					
Task 3.2	Task 3.2									Task 3.2									Task 3.2					
Milestone	M1			M2			M3			M4														
Deliverable										D1.2			D2.2			D2.3			D3.2					
Conference	C1			C2			C3			C4			C5			C6								
Seminar										S1			S2			S3			S4					
Dissemination										J1			J2			J3								
Visits										V1			V2											
Secondment										SE1			SE1			SE2			SE2					
PE	PE																		PE5					

The milestones (M), to track the project progress, and the deliverables (D), to track the project achievements, is listed as follows:

Milestone (M)/Deliverable (D)	Description
M1	Set-up of the air quality system for source apportionment
M2	Strategy for SA the analysis of SA by sectors and regions in urban areas in Spain
M3	Strategy for SA intercomparison
M4	Strategy for SA intercomparison with GAINS and database on mitigation measurements
D1.2	Report on achievements and setbacks of SA in Spain
D2.2	Report on intercomparison of SA techniques
D2.3	Report on the methodology developed to combine SA dabases
D3.2	Report on efficient mitigation measures to meet PM policy target in urban areas in Spain

Two secondments (SE) have been designed for this purpose. The objective of these secondments is bringing together expertise in the interpretation of SA results for PM in Spain (at IDAEA-CSIC) and the implication in the European air pollution policy assessment (at IIASA). Note that SA databased generated by the secondments will be available for this fellowship, hence giving free access to the background related to research performed during the secondment.

SE1. IDAEA-CSIC [pm13-15]. The stay at IDAEA is placed firstly in the chronogram to take fully advantage of its experience in working with SA results. The secondment starts at the time [Task 2.1](#) is finished, which will help to discuss the results, and [Task 2.2](#) is starting, which will help to guide to oncoming analysis. The preliminary results from the latter will be presented in EGU [C3, pm14] and FAIRMODE technical meeting [C4, pm16]. The due deliverable D2.2 [pm23] will be on the table for discussion.

SE2. IIASA [pm19-21]. Taking advantage of the expertise of the host supervisor in the European air pollution assessment, this secondment will start by firmly defining the strategy for SA intercomparison with GAINS and the definition of the mitigations measures database for urban areas in Spain, foreseen for [Task 3.1](#) and [Task 3.2](#), respectively; this is part of the milestone M4 [pm19]. The result from [Task 3.1](#) will be presented in the ITM [C6, pm22]. The due deliverable D3.2 [pm23] will be on the table for discussion.

4.2 Appropriateness of the management structure and procedures, including quality management and risk management

A Project Manager will support the researcher in all the legal, financial and administrative arrangements needed and work in close contact with Education, Human Resources and Communications departments for all training arrangements and dissemination and outreach activities. Finances of the project will be managed according MSC funding rules signed at the grant agreement and will follow the already established processes in the centre. Moreover, the financial management strategy will try to minimize the cost of the research visits to the US by planning them according to the dates of the corresponding conferences in the US (C1, C4) and therefore, pay only two round-trip trans-Atlantic flights in this action.

The applicant will work in close contact with the supervisor of this project and present progress and results to the supervisor and scientific staff on a regular basis, through reports and presentations. This will allow the evaluation of her progress against the work plan ([Table 1](#)) and seek assistance in a timely and periodic manner if the necessity arises. The progress monitoring events (PM1, PM2, PM3 and PM4) will be performed two months before the deliverables (D1.2, D2.2, D2.3 and D3.2) of this project ([Table 1](#)). This will provide enough time to make the appropriate decisions. Regular meetings will take place involving the rest of the BSC-ES's groups to ensure an adequate integration of this activity into the rest of the research carried out in the Department. FAIRMODE would be contacted and invited to be part of an advisory board to make sure the work keeps in line with the FAIRMODE objectives. The major risk and corresponding contingency plan is show as follows:

Risk	Probability	Impact	Contingency plan
Low computational resources to generate database in Task 1.1	Medium-low	High	Application to extra-resources to the Spanish Network of Supercomputing
Problem to perform secondment SE1	Low	Medium	Applicant will contact other European research group with experience in receptor modelling
Problem to perform secondment SE2	Medium-low	Medium	Applicant will contact EMEP as a replacement of IIASA
Low technical support Task 1.1	Low	High	BSC technical support department has redundant position

4.3 Appropriateness of the institutional environment

The host (BSC) and secondment institutions (IDAEA-CSIC, IIASA) are international leaders for air quality and foster high-level education in understanding the processes which determine air pollution (emission, atmospheric transport, chemistry and deposition) and its effects on society. Hence, the proposal fits extremely well with their goals, as briefly described below, ensuring the successful accomplishment of the project. The three institutions are recognized world-class centres that attract talent, but at the same time top-level knowledge providers. The institutional environments and provided facilities, thus, will fruitfully benefit the derived results with proper outreach activities.

BSC. The Atmospheric Composition group focuses on understanding the physic-chemical processes in the atmosphere that contribute to a decrease of air pollution, and analyses a precise estimation of the air quality through high-resolution modelling, especially the relationship between emissions, atmospheric transport, chemistry and deposition. The formulation of the research includes special effort to satisfy society needs. It is worth noting that BSC-ES develops and operates the CALIOPE system (www.bsc.es/caliope), which provides high-resolution short-term air quality forecasts for Europe, with a special focus over Spain and its main urban areas using the in-house HERMES emission model.

IDAEA-CSIC. The Group of Atmospheric Pollution carries out science based assessment for improving air quality. Its main mission is to have a better understanding on atmospheric pollutants and processes at local, regional and continental scales, the development of AQ plans and studies on exposure to air pollution for health studies and urban planning ([Section 8](#)).

IIASA. The Mitigation of Air Pollution and Greenhouse Gases Program (MAG) has a recognized expertise in the European air quality policy assessment. With an interdisciplinary team of researchers, MAG builds innovative methodologies that bring together relevant insights from recent research on geo-physical and economic aspects of pollution control. MAG develops advanced analytical tools to identify pollution control strategies that put least burden to the economy while maximizing a wide range of environmental benefits. Together with a network of collaborators, MAG uses these tools to inform international negotiations and national planners in different regions of the world ([Section 8](#)).

4.4 Competences, experience and complementary of the participating organizations and institutional commitment

The elevated level of experience of the applicant ([2.4](#)) and supervisors ([2.3](#)), together with the high level of excellence at the hosting institutions as well as their match on the project ([4.3](#)), provide the necessary background for the successful implementation of the proposed research ([4.1](#)) and the continuity of the fellow career development ([3.1](#)). The scientific challenges in the framework of the fellowship ([2.1](#)) will ensure the two-way transfer of derived, new knowledge reinforcing the skills of all participants. Likewise, the completion of this project will increase their visibility and competitiveness within the research job market in a domain of science attracting significant governmental funds and being at the core of technological and innovative policy in European countries. Finally, the exciting scenario that will bring this fellowship, in addition to be mutually beneficial, could establish a solid base for long-term collaborations among the researchers and lead to pioneering activities in air quality management at urban scale.

BSC considers this action as strategic. The Atmospheric Composition group at BSC-ES has proven its capacity developing and applying air quality model to improve the knowledge on atmospheric processes and their effect upon weather, climate and air quality using cutting-edge HPC and big data technologies to efficiency, portability and user-friendliness of the Earth system models. By engaging someone like Dr. Pay, with a deep knowledge in modelling air quality dynamic in Spain, the BSC-ES could become a reference air quality group for source apportionment applications in Europe.

5. CV OF THE EXPERIENCED RESEARCHER

Personal Information

Maria Teresa Pay, 20/04/1982, DNI: 48447085T. Research unique ID (OrcID): 0000-0001-7985-9253

Education

20/12/2011: Thesis/Dissertation '*Regional and urban evaluation of an air quality model in the European and Spanish domains*'. Advisors: Dr. José M^a Baldasano and Dr. Pedro Jiménez-Guerrero. Technical University of Catalonia, Spain. Mark: Cum Laude by unanimity. Extraordinary PhD Award.

03/11/2008: Diploma of Advanced Studies in Environmental Engineering. Technical University of Catalonia, Spain.

31/07/2006: B.S. in Chemical Engineering. University of Murcia, Spain.

Employment record (participation in projects / Postdoctoral full-time experience: 44 months)

03/2015-present: Post-doctoral Grant BP-A2 00015 "Analysis of Source Apportionment for Particulate matter in Spain by high-resolution modelling". Agència de Gestió d'Ajuts Universitaris i de Recerca. Earth Sciences Department, Barcelona Supercomputing Center, Barcelona, Spain. Funding: 40.604,62 €

03/2013-03/2015: Post-doctoral Grant BP-A 00427 "Dynamic assessment of atmospheric pollution in the Iberian Peninsula by High-resolution modelling". Agència de Gestió d'Ajuts Universitaris i de Recerca. Laboratoire de Météorologie Dynamique at the l'École Polytechnique, Palaiseau, France. Funding: 70.528 €

02/2012-03/2013: Post-doctoral Contract in CSD2007-00050 National Project "Supercomputing and eScience". Earth Sciences Department, Barcelona Supercomputing Center, Barcelona, Spain. Funding: 5.000.000 €

07/2011-02/2012: Pre-doctoral Contract in CSD2007-00050 National Project "Supercomputing and eScience". Earth Sciences Department, Barcelona Supercomputing Center, Barcelona, Spain. Funding: 5.000.000 €

07/2007-07/2011: Pre-doctoral contract in CGL22006-08903/CLI National Project "High-resolution modelling of atmospheric pollution by anthropogenic and natural particulate matter in the Iberian Peninsula". Earth Sciences Department, Barcelona Supercomputing Center, Barcelona, Spain. Funding: 109.868 €

09/2006-07/2007: Pre-doctoral Fellowship "Strategic plan for NOx and PM reduction in the Barcelona metropolitan area". Earth Sciences Department, Barcelona Supercomputing Center, Barcelona, Spain.

Participation in projects (Total: 10, Research National: 4, Research European: 3, Companies: 3)

1. Title: "EURODELTA III intercomparaison exercice". UNECE (United Nations Economic Commission for Europe) Task Force on Measurement and Modelling (TFMM). PI: Bertrand Bessaget (INERIS, France). Period: 2013-2015
2. Title: "EURODELTA/TFMM trend modelling". UNECE (United Nations Economic Commission for Europe) Task Force on Measurement and Modelling (TFMM). PI: Augustin Colette (INERIS, France). Period: 01/2015-present.
3. Title: "BSC-CNS Severo Ochoa Center of Excellence". SEV-2011-00067. Spanish Ministry of Science and Innovation. PI: Mateo Valero (BSC, Spain). Period: 01/2012-12/2015. Funding: 4.000.000 €
4. Title: "APPRAISAL: Air Pollution Policies foR Assesement of Integrated Strategies At regional and Local scales". FP7-ENV-2012-one-stage. PI: Maria Luisa Volta (University of Brescia, Italy). Period: 01/06/2012-31/05/2015. Funding: 999.989 €
5. Title: "Dynamic characterization of pollution events over main Spanish cities and power generation areas under typical atmospheric circulation patterns". BINV-HbwCjtBC Iberdrola foundation. PI: **Maria Teresa Pay** (BSC, Spain). Period: 01/03/2013-29/02/2014. Funding: 20.000 €
6. Title: "Development of the air quality forecast system for Andalucía CALidad del aire OPERativo para ANDalucía". NET838690/1. EGMASA S.A. - Agencia de Medio Ambiente y Agua de Andalucía. PI: José M. Baldasano (BSC, Spain). Period: 01/07/2009-31/08/2014. Funding: 216.500 €

7. Title: “Ensamblaje y puesta en operación del sistema de pronóstico de la calidad del aire para la Península Ibérica”. PT2009-0029. Spain-Portugal Integrated Actions, Spanish Ministry of Science and Innovation. PI: José M^a Baldasano Recio/Carlos Borrego (BSC, Spain / University of Aveiro, Portugal). Period: 01/01/2009-31/12/2011. Funding: 7.000 €
8. Title: “Supercomputing and e-Science”. CSD- REFERENCIA 2007 – 00050. Ministry of Economy and Competition, Spain. PI: Mateo Valero (BSC, Spain). Period: 01/01/2007 - 31/12/2011. Funding: 5.000.000 €
9. Title: “Development of the air quality forecast system for the Canary Islands CALIdad del aire OPerativo para las Islas CANarias”. CALIOPE_CAN. Consejería de Medio Ambiente y Ordenación Territorial. Gobierno de Canarias. PI: J. M. Baldasano (BSC, Spain). Period: 22/01/2008-31/12/2010. Funding: 198.750 €
10. Title: “CALIOPE: an operational air quality system for Spain”. (157/PC08/3-12.0, 357/2007/2-12.1, 441/2006/3-12.1). Ministry of Environment, Spain. PI: J. M. Baldasano (BSC, Spain). Period: 01/01/2006-01/07/2010. Funding: 1.189.285 €

Stays in foreign centres (Total: 5, Pre-doc: 2, Post-doc: 3)

1. **Center:** l'École Polytechnique, Palaiseau, France. Laboratoire de Météorologie Dynamique / **Period:** Mar 2013-Mar 2015 (2 years) / **Project:** “Dynamic assessment of atmospheric pollution in the Iberian Peninsula by High-resolution modelling” / **Advisor:** Dr. Laurent Menut / **Funding:** AGAUR, Spain (grant BP-A 00427).
2. **Center:** United State Environmental Protection Agency (USEPA), Research Triangle Park, North Carolina, USA. Atmospheric Modeling and Analysis Division / **Period:** Mar-Apr 2014 (4 weeks) / **Project:** “Application and testing the source apportionment tool implemented in the CMAQ chemical transport model” / **Advisor:** S. Napelenok / **Funding:** AGAUR, Spain (grant BP-A 00427).
3. **Center:** French National Institute for Industrial Environment and Risks (INERIS). DRC/DECI/MOCA. **Period:** August 2014 (1 week) / **Project:** “EURODELTA model intercomparison” / **Advisor:** B. Bessagnet / **Funding:** INERIS, France. / **Funding:** AGAUR, Spain (grant BP-A 00427) and INERIS.
4. **Center:** Department of Environment. University of Aveiro, Portugal / **Period:** Feb-May 2011 (13 weeks) / **Project:** “Studying of bias-correction techniques for improving air quality forecast models” / **Advisor:** C. Borrego / **Funding:** Spanish Ministry of Science and Education, Spain (Researcher Formation grant - FPI)
5. **Center:** University of California, Irvine, California, USA / **Period:** Sep-Dec 2009 (13 weeks) / **Project:** “Evaluation of regional air quality modeling system” / **Advisor:** D. Dabdub / **Funding:** Spanish Ministry of Science and Education, Spain (Researcher Formation grant - FPI)

Peer-reviewed publications (Total: 15 in the Q1, an 8 h-index and 190 citations, according to SCOPUS. 5; 1st author: 5)

1. Pay MT, Piot M, Jorba O, Basart S, Gassó S, Jiménez-Guerrero P, Gonçalves M, Dabdub D, Baldasano JM, 2010. A full year evaluation of the CALIOPE-EU air quality system in Europe for 2004: a model study. *Atmos Environ*, 44, 3322-3342.
2. Pay MT, Jiménez-Guerrero P, Baldasano JM, 2011. Implementation of resuspension from paved roads for the improvement of CALIOPE air quality system in Spain. *Atmos Environ*, 45, 802-807.
3. Baldasano JM, Pay MT, Jorba O, Gassó S, Jiménez-Guerrero P, 2011. An annual assessment of air quality with the CALIOPE modeling system over Spain. *Sci Total Environ*, 409, 2163-2178.
4. Jiménez-Guerrero P., Jorba O, Pay MT, Montávez JP, Jerez S, Gomez-Navarro JJ, Baldasano JM, 2011. Comparison of two different sea-salt aerosol schemes as implemented in air quality models applied to the Mediterranean basin. *Atmos Chem Phys*, 11, 4833-4850.
5. Borrego C, Monteiro A, Pay MT, Ribeiro I, Miranda AI, Basart S, Baldasano JM, 2011. How bias-correction can improve air quality forecast over Portugal. *Atmos Environ*, 45, 6629-6664.
6. Sicardi V, Ortiz J, Rincón A, Jorba O, Pay MT, Gassó S, Baldasano JM, 2012. Assessment of Kalman filter bias-adjustment technique to improve the simulation of ground-level ozone over Spain. *Sci Total Environ*, 416, 329-342.
7. Pay MT, Jiménez-Guerrero P, Jorba O, Basart S, Pandolfi M, Querol X, Baldasano JM, 2012. Spatio-temporal variability of levels and speciation of particulate matter across Spain in the CALIOPE modeling system. *Atmos Environ*, 46, 376-396.
8. Basart S, Pay MT, Jorba O, Pérez C, Jiménez-Guerrero P, Schulz M, Baldasano JM, 2012. Aerosol 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.
9. Pay MT, Jiménez-Guerrero P, Baldasano JM, 2012. Assessing sensitivity regimes of secondary inorganic aerosol formation in Europe with the CALIOPE-EU modeling system. *Atmos Environ*, 51, 146-164.

10. Monteiro A, Carvalho A, Ribeiro I, Scotto M, Barbosa S, Alonso A, Baldasano JM, Pay MT, Miranda, AI, Borrego C, 2012. Trends in ozone concentrations in the Iberian Peninsula by quantile regression and clustering. *Atmos Environ*, 56, 184-193.
11. Aguilera, I., Basagaña, X., Pay, M.T., Agis, D., Bouso, L., Foraster, M., Rivera, M., Baldasano, J.M., Künzli, N., 2013. Evaluation of the CALIOPE air quality forecasting system for epidemiological research: the example of NO₂ in the province of Girona (Spain). *Atmos Environ.*, 72, 134-141.
12. Guevara, M., Pay, M.T., Martínez, F., Soret, A., Denier van der Gon, H.A.C., Baldasano, J.M., 2014. Inter-comparison between HERMESv2.0 and TNO-MACC-II emission data using the CALIOPE air quality system (Spain). *Atmos. Environ.*, 98, 134-145.
13. Pay, M.T., Martínez, F., Guevara, M., Baldasano, J.M., 2014. Air quality forecasts at kilometer scale grid over Spanish complex terrains. *Geosci. Model Dev.*, 7, 1979–1999.
14. Valverde, V., Pay, M.T., Baldasano, J.M., 2014. Circulation-type classification derived on a climatic basis to study air quality dynamics over the Iberian Peninsula. *International Journal of Climatology*, doi: 10.1002/joc.4179.
15. Schaap, M., Cuvelier, K., Hendriks, C., Bessagnet, B., Baldasano, J.M., Colette, A., Thunis, P., Karam, D., Fagerli, H., Graff, A., Kranenburg, R., Nyiri, A., Pay, M.T., Rouil, L., Schulz, M., Simpson, D., Stern, D., Terrenoire, E., Wind, P., 2015. Performance of European Chemistry Transport Models as function of horizontal resolution. *Atmos. Environ.*, 112, 90-105.

Other publications (Total: 5, Technical report: 2, Book's chapters: 3)

1. Cuvelier, C., Thunis, P., Karam, D., Schaap, M., Hendriks, C., Kranenburg, R., Fagerli, H., Nyiri, A., Simpson, D., Wind, P., Bessagnet, B., Colette, A., Terrenoire, E., Rouil, L., Stern, R., Graff, A., Baldasano, J.M., Pay, M.T., 2013. ScaleDep: Performance of European chemistry-transport models as function of horizontal spatial resolution. EMEP - Technical Report 1/2013, 63 pp.
2. Bessagnet, B., 2014. The EURODELTA III exercise –Model evaluation with observations issued from the 2009 EMEP intensive period and standard measurements in Feb/Mar 2009. TFMM & MSC – W Technical Report 1/2014, 153 pp. Available at: http://emep.int/publ/reports/2014/MSCW_technical_1_2014.pdf
3. Piot, M., Pay, M.T., Jorba, O., Jiménez-Guerrero, P., López, E., Gassó, S., Baldasano, J.M., 2010. Annual Dynamics and Statistical Evaluation of an Air Quality Forecasting System (CALIOPE) with High Resolution for Europe. *Air Pollution Modeling and its Application XX*. Ed. Down G. Steyn and S.T. Rao. Springer: 241-245. ISBN: 978-90-481-3810-4, January 2010, 737 pp.
4. Borrego, C., Monteiro, A., Ribeiro, I, Miranda, A.I., Pay, M.T., Basart, S., Baldasano, J.M., 2011. How different air quality forecasting systems (should) operate over Portugal?. *Proceedings of the 14th International Conference on Harmonization within Atmospheric Dispersion Modelling for Regulatory Purposes*, 47-51. EID: 2-s2.0-84899741738
5. Pay, M.T., Jiménez-Guerrero, P., and Baldasano, J.M., 2013. Assessing sensitivity regimes of secondary inorganic aerosol formation in Europe with the CALIOPE-EU modelling system. *NATO Science for Peace and Security Series C: Environmental Security*, 137, 523-527. DOI: 10.1007/978-94-007-5577-2_88.

Articles in preparation (Total: 5, submitter: 1, in preparation: 4)

1. Pay, M.T., Valverde, V., Kwok, R., Napelenok, S., Baker, K., 2015. Photochemical modeling to attributing source and source regions to ozone exceedances in Spain. Under preparation.
2. Bessagnet, B., and ERODELTA team, 2015. The EURODELTA III exercise – Model evaluation with observation issued from the 2006, 2007, 2008 and 2009 for PM₁₀, PM_{2.5}, O₃, NO₂ and SO₂. Under preparation.
3. Valverde, V., Pay, M.T., Baldasano, J.M., 2015. A model-based analysis of NO₂ and SO₂ dynamics from coal-fired power plants under representative synoptic circulation types over the Iberian Peninsula. Submitted to *Sci. Tot. Environ.*
4. Valverde, V., and Pay, M.T., 2015. Ozone attributed to Madrid and Barcelona on-road transport emissions: characterization of plume dynamics over the Iberian Peninsula. Under preparation.
5. Pay, M.T. and Guevara, M., 2015. Spatial representativeness of an air quality monitoring network using a 1-km resolution modeling system: application to Andalusia. Under preparation

Fellowship and awards (Total: 4, pre-doc: 1, post-doc: 3)

1. 2007-2011: Competitive PhD fellowship from the Spanish Ministry of Science and Innovation for the Formation of Researchers

2. 2014: Special Doctoral Award from the Technical University of Catalonia (<http://doctorat.upc.edu/tesis/premios-extraordinarios/convocatoria-2014-1>)
3. 2012-2015: Post-doctoral fellowship under the Beatriu de Pinós programme (2011 BP-A 00427, success rate: 9%)
4. 2015-2016: Post-doctoral fellowship under the Beatriu de Pinós programme (2011 BP-A2 00015)

Supervision of PhD student (Total: 2)

1. 2012-2015: **PhD candidate:** Victor Valverde / **PhD title:** Characterization of atmospheric pollution dynamics in Spain by means of air quality modelling / **University:** Technical University of Catalonia (Spain)
2. 2014-present: **PhD candidate:** Lorenzo Fileni / **PhD title:** Analysis of particulate matter origins in Spain by means of chemical transport model and source apportionment methodology / **University:** Technical University of Catalonia (Spain)

Selected oral contributions to congresses

1. Pay, M.T., Jiménez-Guerrero, Baldasano, J.M., 2012. Assessing sensitivity regimes of secondary inorganic aerosol formation in Europe with the CALIOPE-EU modelling system. In: 32nd NATO/SPS International Technical Meeting on Air Pollution Modeling and Its Application. Utrecht, The Netherlands. May 7-11.
2. Pay M.T., S. Gassó, J.M. Baldasano, 2012. Evaluation of the CMAQ5.0 in the framework of the CALIOPE air quality forecasting system. In: 24th ACCENT/GLOREAM Workshop, Barcelona (Spain) 17-19 October.
3. Pay, M.T., Baldasano, J.M., Gassó, S., 2012. Evaluation of the CMAQ5.0 in the framework of the CALIOPE air quality forecasting system over Europe. In: 11th Annual CMAS Conference. October 15-17, 2012 Chapel Hill, NC (USA).
4. Pay, M.T., Jiménez-Guerrero, Baldasano, J.M., 2012. Assessing sensitivity regimes of secondary inorganic aerosol formation in Europe with the CALIOPE-EU modelling system. In: 32nd NATO/SPS International Technical Meeting on Air Pollution Modeling and Its Application. Utrecht, The Netherlands. May 7-11.
5. Pay M.T., S. Gassó, J.M. Baldasano, 2012. Evaluation of the CMAQ5.0 in the framework of the CALIOPE air quality forecasting system. In: 24th ACCENT/GLOREAM Workshop, Barcelona (Spain) 17-19 October.
6. Pay, M.T., Baldasano, J.M., Gassó, S., 2012. Evaluation of the CMAQ5.0 in the framework of the CALIOPE air quality forecasting system over Europe. In: 11th Annual CMAS Conference. October 15-17, 2012 Chapel Hill, NC (USA).
7. Pay, M.T., Arévalo, G., Baldasano, J.M., 2013. Evaluating the impact of increasing horizontal resolution on air quality modelling system over big metropolitan areas in Spain. In: 12th Annual CMAS Conference. Chapel Hill, NC (USA), October 28-30, 2013.
8. Bessagnet, B., Colette, A., Thunis, P., Rouil, L., Meleux, F., Ung, A., Cuvelier, C., Tsyro, S., Stern, R., Manders, A., Kranenburg, R., Aulinger, A., Bieser, J., Mircea, M., Ciarelli, G., Aksoyoglu, S., Pay, M.T., et al., 2013. Eurodelta3 – Status and link with HTAP. In: Meeting of the Task Force on Hemispheric Transport of Air Pollution (HTAP), San Francisco (USA), December 5-6.
9. Pay, M.T., Valverde, V., Baldasano, J.M., Kwok, R., Napelenok, S., Baker, K., 2014. Photochemical modelling to attributing source and source regions to ozone exceedances in Spain. In: 13th Annual CMAS Conference. Chapel Hill, NC (USA), October 27-29.
10. Pay, M.T., Baldasano, J.M., Arévalo, G., Sicardi, V., Serradell, K., 2014. CALIOPE forecast evaluated by DELTA. In: FAIRMODE Technical Meeting. Kjeller, (Norway), April 28-29.
11. Pay, M.T., Valverde, V., Baldasano, J.M., 2015. Evaluating the global contribution from MACC when modelling an ozone episode over Spain. In: MACC-III Policy Users Workshop, Wien, Austria, March, 3-4.
12. Colette, K. Cuvelier, S. Aksoyoglu, B. Bessagnet, J. Bieser, G. Ciarelli, H. Fagerli, M. Garcia, L. Gonzales, M. Mircea, M.T. Pay, V. Raffort, L. Rouil, Y. Roustan, M. Schaap, R. Stern, P. Thunis, S. Tsyro, L. White, P. Wind, 2015. Eurodelta 3 – Trend Analysis. In: 16th annual TFMM meeting. Krakow, Poland, 5-8, May 2015.
13. Bessagnet, B., Colette, A., Terrenoire, E., Rouil, L., Stern, R., Graff, A., Baldasano, J.M., Pay, M.T., and EURODELTA team, 2015. Main results of the Eurodelta 3 exercise Phase I on criteria pollutants. In: 16th annual TFMM meeting. Krakow, Poland, 5-8, May 2015.

Organization of Scientific Meetings (Total: 1, International: 1)

1. ACCENT/GLOREAM workshop on tropospheric chemical transport modelling, Barcelona, 17-19 October (<http://www.bsc.es/gloream>)

Commissions of Trust

2013-2015: Reviewer for Journal of Environmental Science & Policy (Elsevier), Science of the Total Environment, Air & Waste Management Association, Geoscientific Model Development, Atmospheric Chemistry and Physics

Membership

1. Scientific expert participant in the Forum for air quality modelling in Europe (FAIRMODE) with emphasis on model application under the European Air Quality Directive which is a joint response initiative of the European Environment Agency and the European Commission Joint Research Centre.
2. European models intercomparison exercises (EURODELTA)
3. Scientific expert participant in the Task Force on Measurement and Modelling (TFMM) under the European Monitoring and Evaluation Programme (EMEP) of the UNECE (United Nations - Economic Commission for Europe)

Teaching experience (Total: 4, Graduate studies: 1, Master: 2, short courses: 1)

1. Seminar: "Regional and urban evaluation of an air quality modelling system in the European and Spanish domains". Environmental Engineering Programme, Technical University of Catalonia, Spain. 01/2011.
2. Training course: "Introduction to air quality simulation with CMAQ" at the Marmara Clean Center, Istanbul. Participants: technical people of the Environmental Ministry of Turkey. Duration: 4 days (32 hours). Contract for Consulting Services for the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). 01/2013.
3. Seminar: "The origin of the air pollution". Microbiological pollution. Master of Advanced Microbiology. School of Biology. University of Barcelona, Spain. 03/2015.
4. Assistant Professor at the Statistical Department, School of Biology. University of Barcelona, Spain. 09/2015-present.

Outreach activities

02/2015. Open seminar to student engagement: "The Atmospheric Composition Group at the Earth Science Department of the Barcelona Supercomputing Center". Technical University of Catalonia, Spain.

10/12/2013: Invited speaker at the "Information day about air pollution in Barcelona". Organized by Catalan Association of Scientific Communication (ACCC). Institute of Catalan Studies.
<http://www.lavanquardia.com/natural/20131210/54395351593/jornada-informativa-contaminacion-en-barcelona.html>

6. CAPACITIES OF THE PARTICIPATING ORGANIZATIONS

Beneficiary - BSC	
General Description	The Barcelona Supercomputing Center (BSC, Spain) is a public consortia between the Ministry of Education and Science (Spanish Government), Generalitat de Catalunya (local Catalan Government) and Technical University of Catalonia (UPC) established in 2005 to serve as the national supercomputing facility. BSC strives to be a first-class research centre in supercomputing and in scientific fields that demand high performance computing resources such as Life and Earth Sciences and Engineering. The centre currently has over 350 staff from 41 countries. The applicant will be enrolled at the Earth Sciences Department (BSC-ES) which aims at applying the latest advances of in high performance computing (HPC) and big data on Earth system modelling. The achievement of this goal aims at putting the department at the forefront of the emerging problem of environmental forecasting.
Role and Commitment of key persons (supervisor)	Dr. Oriol Jorba is the head of the Atmospheric Composition group at the BSC-ES. He is an expert in the development of air quality modelling systems to provide air quality forecasts and perform advanced research on atmospheric chemistry. He was involved in the deployment of the CALIOPE air quality forecasting system and he is coordinating the development of the NMMB/BSC-CTM an online multi-scale non-hydrostatic chemical weather prediction system that can be run either globally or regionally.
Key Research Facilities, Infrastructure and Equipment	BSC manages supercomputing facilities, notably Marenostrum. Until 2014, it was a 10.000 cores computer. The current Marenostrum BSC is one of the 5 largest computers in Europe, with more than 1 PFlop. Additionally, BSC manages Minotauro, a Sandy Bridge's cluster with nVidia GPUs, providing more than 100 TFlops
Independent research premises?	Yes, all key research facilities, infrastructure and equipment will be available for the ER.
Previous Involvement in Research and Training Programmes	BSC has been playing a relevant national and international role in computer sciences, life sciences and earth sciences, as reflected through the participation of BSC in 91 national projects, 100 private-founded projects, and more than 100 European projects. BSC has a successful record of 57 national fellowships among early-stage and senior postdoctoral fellowships. Senior researchers at BSC have been able to provide BSC researcher with exceptional training support and conditions for their scientific growth in many different ways, from technical to more managerial skills.
Current involvement in Research and Training Programmes	<u>National Research Projects:</u> Currently BSC is participating in 21 national projects (5.844.162 €), 20 private-funded project (6.310.956 €) and 71 European project (32.987.136 €), 6 coordinated by BSC. <u>Collaboration with universities:</u> BSC collaborates in PhD programmes: Computer Architecture (Excellence Mention MEE2011-0361), Applied Mathematics (Excellence Mention MEE2011-0705). BSC collaborates in Master degrees: Supercomputing (MIRI), Biomedicine (University of Barcelona), Environmental Engineering (UPC). <u>Excellence Programmes and Networks:</u> Training activities are organized under the framework of Severo Ochoa Excellence Programme, PRACE and HiPEAC (https://www.bsc.es/marenostrum-support-services/hpc-trainings). <u>National Research fellowships:</u> BSC is currently awarded with 4 early-stage postdoc (1 Juan de la Cierva and 3 Beatriu de Pinós), 10 senior (3 Ramón y Cajal, 1 I3 and 6 ICREA). Noteworthy BSC-ES is hosting 1 Beatriu de Pinós, and 1 ICREA. <u>European Research Fellowships:</u> the BSC is supporting 4 ITN, 6 Marie-Curie Individual Fellowships, and 1 ERC externally funded. Noteworthy BSC-ES is hosting two Marie-Curie actions started in 2015 (IEF): MDRAF (Ref.: 622662) and DPETNA (Ref.: 655339).
Relevant Publications and/or research/innovation products	<u>Innovation products:</u> - CALIOPE air quality forecast system (www.bsc.es/calioppe) and its application for smart phones (https://play.google.com/store/apps/details?id=es.bsc.earthscience.calioppe&hl=en) - Barcelona Dust Forecast Center, the WMO Regional Meteorological Center specialized on Atmospheric Sand and Dust (http://dust.aemet.es/) <u>Publications:</u> - Pay, M.T., et al., 2014. Air quality forecasts at kilometer scale grid over Spanish complex terrains. Geosci. Model Dev., 7, 1979–1999, - Baldasano JM, et al., 2011. An annual assessment of air quality with the CALIOPE modeling system over Spain. Sci Total Environ, 409, 2163-2178 - Basart S., et al. 2012. 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, 1-30

Partner Organisation – IDAEA-CSIC	
General Description	The Agencia Estatal Consejo Superior de Investigaciones Científicas (CSIC) is the largest multidisciplinary research organisation in Spain. The CSIC experts in air quality belong to Geosciences Department from the Institute of Environmental Assessment and Water Studies (IDAEA). The IDAEA group focuses on the study of particulate and gaseous air pollutants. The Group of Atmospheric Pollution (GAP), led by Prof. Querol, focuses on Science based assessment for improving air quality
Role and Commitment of key persons (supervisor)	Prof. Xavier Querol is the head of the Group of Atmospheric Pollution at IDAEA-CSIC focuses on science based assessment for improving air quality. He has been involved in many national and European projects.
Key Research Facilities, Infrastructure and Equipment	The research team has developed its own scientific methodology for the full chemical characterisation of inorganic aerosols. Furthermore, the team's methodology for the identification of natural contributions to PM10 has been adopted by the EU DG Environment.
Previous and current Involvement in Research and Training Programmes	CSIC has considerable experience in both participating and managing projects and training grants, being the 5th organisation in Europe in project execution and funding in 6th FP. IDAEA attracts high level of funding from industry, the research councils, foundations, government agencies, the EU and other international bodies. The research team provides external expert support to Spanish environmental authorities (Ministry of Environment and Autonomous Councils).
Relevant Publications and/or research/innovation products	- Methodology for the identification of natural contributions to PM10 adopted by the EU DG Environment
Partner Organisation - IIASA	
General Description	The International Institute for Applied System Analysis (IIASA) is a non-governmental research organization which conducts interdisciplinary scientific studies on environmental, economic, technological and social issues in the context of human dimensions of global change. IIASA's missions is to provide insights and guidance to policymakers worldwide by finding solutions to global and universal problems through applied systems analysis in order to improve human and social wellbeing.
Role and Commitment of key persons (supervisor)	Dr. Markus Amann is the director of the Mitigation of Air Pollution and Greenhouse Gases Program (MAG) and head of the Center for Integrated Assessment Modelling of the EMEP under the CLRTAP.
Key Research Facilities, Infrastructure and Equipment	The IIASA has developed the GAINS (Greenhouse Gas and Air Pollution Interactions and Synergies) Integrated Assessment Model, which is a scientific tool to combat air pollution and climate change simultaneously and assists in the search for pollution control strategies that maximize benefits across all scales.
Previous and current Involvement in Research and Training Programmes	IIASA lead the Young Scientists Summer Program (YSSP) that enables young scientists from around the world to pursue their predoctoral research. Postdoctoral fellows work with established IIASA researchers to gain experience in advanced systems analysis as applied to their related fields of study.
Relevant Publications and/or research/innovation products	- GAINS Integrated Assessment Model - Amman M. (ed.) 2004. The final Policy Scenario of the EU Clean Air Policy Package, TSAP Report #11. - Lim, S.S., et al., 2013. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. The lancet 380, 2224-2260.

7. ETHICAL ASPECTS

This project concerns research in applied atmospheric modelling to increase the knowledge about the origin of air pollution. The application of source apportionment techniques within the CALIOPE air quality forecast system to identify main responsible of air pollution in major cities in Spain does not involve any ethical issue of any sort, nor it is expected to have any undesired social implications. Therefore, in this proposal there is not any issue entered in the Ethical Issues Table in Part A, and any text for the Ethics Self-Assessment in Part B.

8. LETTERS OF COMMITMENTS OF PARTNER ORGANIZATIONS

The next letters of commitment for this proposal have been signed by the following researchers:

- Prof. Xavier Querol, head of the Group of Atmospheric Pollution at IDAEA-CSIC, Barcelona, Spain;
http://www.idaea.csic.es/index.php?option=com_ogngrups&view=list_projectes&Itemid=97&cid=40&lang=en
- Dr. Markus Amann, Director of of the Mitigation of Air Pollution and Greenhouse Gases Program at IIASA, Laxenburg, Austria; <http://www.iiasa.ac.at/web/home/research/researchPrograms/Program-Overview.en.html>



MINISTERIO
DE ECONOMÍA Y
COMPETITIVIDAD



Instituto de Diagnóstico Ambiental y Estudios
del Agua (IDAEA-CSIC)

Xavier QUEROL

Institute of Environmental Assessment and Water Research (IDÆA)

Consejo Superior de Investigaciones Científicas (CSIC)

C/ Jordi Girona, 18 - 26.

08034 Barcelona, Spain

Tel: +34 696583432

email: xavier.querol@idaea.csic.es

Subject: Letter of commitment for Dr. Maria Teresa Pay's MSCA application

Barcelona, September 4 2015

To whom it may concern,

This letter is to support the scientific objectives and the work organization of the Marie Skłodowska-Curie Action (MSCA) IF-EF entitled "Particulate source apportionment to urban air pollution in Spain within a photochemical model (PASAIR)" submitted by BSC/Dr. Maria Teresa Pay. The PASAIR project will undertake investigating the application and combination of different SA techniques to shed light on the origin of the exceedances of PM in Spain looking for define least cost and efficient local actions to complement national and EU policy legislation, which is in line with the LIFE project AIRUSE (<http://airuse.es/es>) that I coordinate, which is focused on testing and developing of air pollution mitigation measures in Southern Europe.

I express my personal commitment to advise Dr. Maria Teresa Pay in her work and to host her for 3 months at the Institute of Environmental Assessment and Water Research of the Spanish Research Council (IDAEA-CSIC) as part of her research project. Dr. Maria Teresa Pay has already made and is still making significant and extremely important contributions to the field of air quality research and I am pretty confident in her ability to achieve this project.

Xavier Querol

Markus AMANN
International Institute for Applied System Analysis (IIASA)
Schlossplatz 1
2361 Laxenburg
Austria
Tel: +43 2236 807432
email: amann@iiasa.ac.at

9th September 2015

Letter of commitment for PASAIR (MSCA-IF-EF 2015)

To whom it may concern,

This letter is to express my personal commitment and institutional support to the MSCA-IF-EF proposal entitled "Particulate source apportionment to urban air pollution in Spain within a photochemical model (PASAIR)" and submitted by the Barcelona Supercomputing Center (BSC), Barcelona, Spain. This is also to confirm my agreement to host Dr. Maria Teresa Pay at IIASA for a 3-month stay as part of the project.

I fully support the current proposal (PASAIR) based on very innovative approaches, in particular the use of source apportionment methodologies implemented within photochemical transport model running at high resolution over urban areas to estimate the contribution of source activities and geographical areas to particulate matter. The proposed analyses could advance knowledge about main responsible of PM pollution in Spanish urban areas and help to define least cost and effective mitigation plans. PASAIR tackles the scientifically challenging topic of quantifying the contribution of sources to air pollution ranked as gaps in the current rules for Directive 2008/50/EC about the reporting on ambient air quality. The host institution (BSC) tightly fits with the activities to be done and the Mitigation of Air Pollution and Greenhouse Gases (MAG) Program at IIASA strongly encourages the project to be granted.

Yours sincerely,



Dr. Markus Amann
Program Director
Mitigation of Air Pollution and Greenhouse Gases Program (MAG)

9. LETTERS OF SUPPORT

The next letters in support of the proposal have been signed by managers of different institutions:

- Isabel Hernandez, Subdirecció General de Prevenció i Control de la Contaminació Atmosfèrica, Generalitat de Catalunya, Spain; http://sac.gencat.cat/sacgencat/AppJava/organisme_fitxa.jsp?codi=6480

- Maj-Britt Larka Abellán, Subdirectora General de Calidad del aire y medioambiente industrial, Spanish Ministry of Agriculture, Food and Environment, Spain; <http://www.magrama.gob.es/en/#>

- José-Manuel Barrios, Manager, Innovator at the IDIADA Automotive Technology SA, Tarragona, Spain; <http://www.applusidiada.com/en/>

- Jordi Vila, head of Environment at the Barcelona Port, Barcelona, Spain; <http://www.portdebarcelona.cat/en/?jsessionid=3E0A860A559DC9412E6D39C5B851C3C3>



Generalitat de Catalunya
Departament de Territori i Sostenibilitat
**Direcció General
de Qualitat Ambiental**

Isabel Hernández i Cardona
Subdirectora general de Prevenció
i Control de la Contaminació Atmosfèrica
Departament de Territori i Sostenibilitat
Av. Diagonal, 523-525
08029 Barcelona

Subject: Letter of support for Dr. Maria Teresa Pay's MSCA application

Barcelona, September 8th 2015

To whom it may concern:

Isabel Hernández Cardona, on behalf the Direcció General de Qualitat Ambiental from the Catalan Government, has manifested her support to the proposal "Particulate source apportionment to urban air pollution in Spain within a photochemical model (PASAIR)" submitted by BSC/Dr. Maria Teresa Pay for the European Marie Skłodowska-Curie (MSCA) IF-EF program.

The PASAIR project will provide a best practise guideline on the used of source apportionment in Spanish urban areas under the Air Quality Directive 2008/50/EC. The PASAIR project will provide a priority list of emission categories that contribute to air pollution in Barcelona as well as the contribution of its surrounding areas. These results will be a decision support information for our department focused on investing and implementing air quality abatement strategies. Furthermore, the PASAIR project will develop a ready-to-use source apportionment toolbox for PM and NO₂ inside the CALIOPE air quality system that can be used in testing the impact of air quality abatement strategies.

The Direcció General de Qualitat Ambiental supports the PASAIR project and if the proposal is elected, it will follow the results obtained.

Isabel Hernández i Cardona

Subdirectora general de Prevenció
i Control de la Contaminació Atmosfèrica



MINISTERIO
DE AGRICULTURA, ALIMENTACIÓN
Y MEDIO AMBIENTE

SECRETARÍA DE ESTADO DE MEDIO
AMBIENTE

DIRECCION GENERAL DE
CALIDAD Y EVALUACION
AMBIENTAL Y MEDIO NATURAL

Subject: Letter of support for Dr. Maria Teresa Pay's MSCA application

Madrid, September 7, 2015

To whom it may concern:

Spanish Ministry of Agriculture, Food and Environment expresses its support to the proposal entitled "Particulate source apportionment to urban air pollution in Spain within a photochemical model (PASAIR)" submitted by BSC/Dr. Maria Teresa Pay for the European Marie Skłodowska-Curie (MSCA) IF-EF program.

The objectives raised in the present proposal aim to establish a methodology and to develop a tool to increase the capacity of national/regional/local authorities to develop air quality plans based on source apportionment approach under the Air Quality Directive 2008/50/EC.

Spanish Ministry of Agriculture, Food and Environment is particularly interested in the activities included in the working plan of this project.

Maj-Britt Larka Abellán

SUBDIRECTORA GENERAL DE CALIDAD DEL AIRE
Y MEDIO AMBIENTE INDUSTRIAL

IDIADA

IDIADA Automotive Technology SA
L'Albornor - Apartat de Correus 20
43710 Santa Oliva (Tarragona)
T 977 186 000
F 977 168 007
www.idiada.com
www.appluscorp.com

Applus⁺

Subject: Letter of support for Dr. Maria Teresa Pay's MSCA application

Santa Oliva (Tarragona), September 9th 2015

To whom it may concern:

IDIADA is a leading company specializing in providing design, engineering, testing and homologation services to the automotive industry worldwide. In that sense, IDIADA expresses its support to the proposal entitled "Particulate source apportionment to urban air pollution in Spain within a photochemical model (PASAIR)" submitted by BSC/Dr. Maria Teresa Pay for the European Marie Skłodowska-Curie (MSCA) IF-EF program.

IDIADA is encouraged to participate as stakeholder of the PASAIR project to be informed about the contribution of road traffic by fuel type to the PM pollution of main cities in Spain. If PASAIR is awarded, we will be very interested in following the results obtained.

José-Manuel Barrios
Manager, Innovation





Port de Barcelona

WTC Barcelona, edifici Est. Moll de Barcelona, s/n
08039 Barcelona / Spain

T +34 93 306 88 00
F +34 93 398 60 06

www.portdebarcelona.cat

To whom it may concern:

With this letter I would like to express the interest of Barcelona Port Authority in the proposal entitled “Particulate source apportionment to urban air pollution in Spain within a photochemical model (PASAIR)” submitted by BSC/Dr. Maria Teresa Pay for the European Marie Skłodowska-Curie (MSCA) IF-EF program.

The Barcelona Port Authority has a main mission to lead the development of the Port of Barcelona to generate and manage infrastructure and to guarantee reliable services in order to contribute to clients’ competitiveness and create value for society at large. One of its main values is the social responsibility. In this sense, the Barcelona Port Authority is encouraged to participate as stakeholder of the PASAIR project to be informed about the contribution of the shipping emission to the PM pollution of Barcelona.

Barcelona, September 7th, 2015

A handwritten signature in blue ink, appearing to be 'Jordi Vila'.

Jordi Vila

Head of Environment

ENDPAGE

MARIE SKŁODOWSKA-CURIE ACTIONS

Individual Fellowships (IF)

Call: H2020-MCA-IF-2015

PART B

- PASAIR -

**PARTICULATE SOURCE APPORTIONMENT TO
URBAN AIR POLLUTION IN SPAIN WITHIN A
PHOTOCHEMICAL MODEL**

This proposal is to be evaluated as:

[Standard EF]