Horizon 2020

Call: H2020-MSCA-IF-2016

(Marie Skłodowska-Curie Individual Fellowships)

Topic: MSCA-IF-2016

Type of action: MSCA-IF-EF-ST

(Standard EF)

Proposal number: 749461

Proposal acronym: DUST-GLASS

Deadline Id: H2020-MSCA-IF-2016

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How to fill in the forms?

The administrative forms must be filled in for each proposal using the templates available in the submission system. Some data fields in the administrative forms are pre-filled based on the previous steps in the submission wizard.

Proposal ID **749461** *Acronym* **DUST-GLASS**

1 - General information

Topic	MSCA-IF-2016
Call Identifier	H2020-MSCA-IF-2016
Type of Action	MSCA-IF-EF-ST
Deadline Id	H2020-MSCA-IF-2016

Acronym	DUST-GLASS
Proposal title	Improving global dust prediction and monitoring through data assimilation of satellite-based dust aerosol optical depth

Note that for technical reasons, the following characters are not accepted in the Proposal Title and will be removed: < > " &

Duration in months	24
Scientific Area	ENV

Please select up to 5 descriptors (and at least 3) that best characterise the subject of your proposal, in descending order of relevance.

Descriptor 1	*Earth observations from space/remote sensing*	
Descriptor 2	*Atmospheric chemistry, atmospheric composition, air pollution*	
Descriptor 3	*Meteorology, atmospheric physics and dynamics*	Remove
Descriptor 4	*Climatology and climate change*	Remove
		Add

Free keywords	*data assimilation, atmospheric-dust modeling, satellite retrievals, ground measurements, dust aerosols, dust optical properties*

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Abstract

DUST-GLASS aims at improving global dust prediction and monitoring by optimizing an advanced data assimilation system (LETKF scheme) coupled with a sophisticated atmospheric-dust model (NMMB/BSC-Dust). For the accomplishment of these core scientific goals, a fine resolution (0.1o x 0.1o) global dust optical depth (DOD) database, suitable for data assimilation, will be developed via a synergy of state-of-the-art Level 2 satellite retrievals acquired by MODIS, MISR and OMI sensors (2007-2016). The impacts of assimilating this novel dataset (DOD) on model's predictive skills, both at global and regional scale, will be assessed objectively. Global forecasts (5 days) will be carried out for different periods aiming at studying dust aerosols' mobilization and transport from the major dust sources of the planet, while a global reanalysis (0.5o x 0.7o) dataset will be generated for long-term dust monitoring. In addition, regional short-term (84 hours) forecasts will be conducted for 20 Mediterranean dust outbreaks identified by a satellite algorithm in the framework of the MDRAF project (fellow's previous MC-IEF). In the evaluation analysis, the model's dust outputs will be compared versus measurements derived by ground networks (AERONET, MAN, ACTRIS) as well as against columnar/vertical satellite retrievals (MODIS, MISR, CALIOP). Moreover, temperature and radiation will be also considered since "corrections" on dust fields, thanks to data assimilation, are expected to be evident on both parameters due to dust-radiation interactions. The aforementioned variables will be compared against observations obtained by ground networks (ISB, RAOB, BSRN) and reanalysis/analysis products (ERA-Interim, FNL). Considering the multifaceted role of dust, the scientific outcomes of DUST-GLASS are expected to contribute effectively to interdisciplinary studies regarding dust aerosols as well as their associated impacts on health, anthropogenic activities, environment, weather and climate.

Remaining characters 3

Has this proposal (or a very similar one) been submitted to a Horizon 2020 Marie Skłodowska-Curie Individual Fellowship call? ○ Yes ◉ No

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Declarations

1) The applicant (future beneficiary) declares to have the explicit consent of all partner organisations (if applicable) on their participation and on the content of this proposal.	☒
2) The information contained in this proposal is correct and complete.	☒
3) This proposal complies with ethical principles (including the highest standards of research integrity — as set out, for instance, in the European Code of Conduct for Research Integrity — and including, in particular, avoiding fabrication, falsification, plagiarism or other research misconduct).	☒

4) The applicant (future beneficiary) confirms:

- to have carried out the self-check of the financial capacity of the organisation on https://ec.europa.eu/research/participants/portal/desktop/en/organisations/lfv.html or to be covered by a financial viability check in an EU project for the last closed financial year. Where the result was "weak" or "insufficient", the applicant (future beneficiary) confirms being aware of the measures that may be imposed in accordance with the H2020 Grants Manual (Chapter on Financial capacity check); or	◉
- is exempt from the financial capacity check being a public body including international organisations, higher or secondary education establishment or a legal entity, whose viability is guaranteed by a Member State or associated country, as defined in the H2020 Grants Manual (Chapter on Financial capacity check); or	○
- as sole participant in the proposal is exempt from the financial capacity check.	○

5) The applicant (future beneficiary) hereby declares:

- it is fully eligible in accordance with the criteria set out in the specific call for proposals; and	☒
- it has the financial and operational capacity to carry out the proposed action.	☒

The applicant (future beneficiary) is only responsible for the correctness of the information relating to his/her own organisation. Where the proposal to be retained for EU funding, the applicant (future beneficiary) will be required to present a formal declaration in this respect.

According to Article 131 of the Financial Regulation of 25 October 2012 on the financial rules applicable to the general budget of the Union (Official Journal L 298 of 26.10.2012, p. 1) and Article 145 of its Rules of Application (Official Journal L 362, 31.12.2012, p.1) applicants found guilty of misrepresentation may be subject to administrative and financial penalties under certain conditions.

Personal data protection

Your reply to the grant application will involve the recording and processing of personal data (such as your name, address and CV), which will be processed pursuant to Regulation (EC) No 45/2001 on the protection of individuals with regard to the processing of personal data by the Community institutions and bodies and on the free movement of such data. Unless indicated otherwise, your replies to the questions in this form and any personal data requested are required to assess your grant application in accordance with the specifications of the call for proposals and will be processed solely for that purpose. Details concerning the processing of your personal data are available on the privacy statement. Applicants may lodge a complaint about the processing of their personal data with the European Data Protection Supervisor at any time.

Your personal data may be registered in the Early Warning System (EWS) only or both in the EWS and Central Exclusion Database (CED) by the Accounting Officer of the Commission, should you be in one of the situations mentioned in:
-the Commission Decision 2008/969 of 16.12.2008 on the Early Warning System (for more information see the Privacy Statement), or
-the Commission Regulation 2008/1302 of 17.12.2008 on the Central Exclusion Database
(for more information see the Privacy Statement) .

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List of participants

#	Participant Legal Name	Country
1	NATIONAL OBSERVATORY OF ATHENS	Greece

Proposal ID **749461** *Acronym* **DUST-GLASS** *Short name* **NOA**

2 - Administrative data of participating organisations

Future Host Institution

PIC	***Legal name***
999653677	*NATIONAL OBSERVATORY OF ATHENS*

Short name: NOA

Address of the organisation

Street LOFOS NYMFON

Town ATHINA

Postcode 11810

Country Greece

Webpage www.noa.gr

Legal Status of your organisation

Research and Innovation legal statuses

Public body ..... yes
Non-profit ..... yes
International organisation ..... no
International organisation of European interest ..... no
Secondary or Higher education establishment ..... no
Research organisation ..... yes
Small and Medium-sized Enterprises (SMEs) ..... no
Academic Sector ..... yes

Legal person ..... yes

NACE Code: - - Not applicable

Does this participant deliver doctoral degrees that are recognised as such by the relevant national authorities? ○ Yes ◉ No

Proposal ID **749461** *Acronym* **DUST-GLASS** *Short name* **NOA**

Department(s) carrying out the proposed work

Department 1

Department name: IAASARS ☐ not applicable

☒ Same as organisation address

Street: LOFOS NYMFON

Town: ATHINA

Postcode: 11810

Country: Greece

If the location of the Department carrying out the proposed work is not the same as the location of the Host Institute, please note that although the proposal submission system calculates the budget of the project based on the location of the Host Institute, the budget of the project for the grant agreement will be calculated by using the country coefficient of the location of the Department carrying out the proposed work.

Proposal ID **749461** *Acronym* **DUST-GLASS** *Short name* **NOA**

Researcher

The name and e-mail of the Researcher and Supervisor are read-only in the administrative form, only additional details can be edited here. To give access rights and contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Researcher ID	H-9932-2015		
Last Name*	GKIKAS	Last Name at Birth	GKIKAS
First Name(s)*	Antonis	Gender*	(•) Male ( ) Female
Title	Dr.	Country of residence*	Greece
Nationality*	Greece	Nationality 2	
Date of Birth (DD/MM/YYYY)	11/12/1979	Country of Birth*	Greece
		Place of Birth	Athens

Contact address

Current organisation name	-		
Current Department/Faculty/Institute/ Laboratory name	-		
	☐ Same as organisation address		
Street	Georgiou Afara, 74		
Postcode/Cedex	18648	Town	DRAPETSONA
Phone	+302110129315	Country	Greece
Phone2 / Mobile	+306977240919		
E-Mail*	agkikas@cc.uoi.gr		

Proposal ID **749461** *Acronym* **DUST-GLASS** *Short name* **NOA**

Qualifications

University Degree	Date of award (DD/MM/YYYY)	28/04/2004
Doctorate (in progress)	Date of award (DD/MM/YYYY)	
Doctorate	Date of award (DD/MM/YYYY)	04/02/2013
Full time postgraduate research experience	Number of months	92
Other Academic qualifications	Date of award (DD/MM/YYYY)	

Place of activity/place of residence (previous 5 years - most recent one first)

Indicate the period(s) and the country/countries in which you have legally resided and/or had your main activity (work, studies, etc) during the last 5 years up until the deadline for the submission of the proposal. Please fill in this section without gaps, until the call deadline (14/09/2016).

Period from	Period to	Duration (days)	Country
01/07/2016	14/09/2016	76	Greece
01/05/2014	30/06/2016	792	Spain
14/09/2011	30/04/2014	960	Greece
	Total	1828	

Proposal ID **749461** *Acronym* **DUST-GLASS** *Short name* **NOA**

Supervisor

The name and e-mail of the Researcher and Supervisor are read-only in the administrative form, only additional details can be edited here. To give access rights and contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title: Dr. Sex: (•) Male ( ) Female

First name*: **Vassilis** Last name*: **Amiridis**

E-Mail*: **vamoir@noa.gr**

Position in org.: Senior Researcher

Department: INSTITUTE FOR ASTRONOMY, SPACE APPLICATIONS AND REMOTE SE

[ ] Same as organisation address

Street: I. Metaxa & Vas. Pavlou Str., Penteli, GR-15236, Greece

Town: Athens Post code: 15236

Country: Greece

Website: http://apcg.space.noa.gr/index.php?pageNum=1&option=84

Phone: +302108109116 Phone 2: +306936153326 Fax: +302106138343

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3 - Budget

Is the Researcher eligible for family allowance? (•) Yes ( ) No

Participant Number	Organisation Short Name	Country	Country Coefficient	Number of Months	Researcher Unit Cost			Institutional Unit Cost		Total
					Living Allowance	Mobility Allowance	Family Allowance	Research, training and networking costs	Management and Overheads	
1	NOA	EL	0,927	24	103453,20	14400,00	12000,00	19200,00	15600,00	164653,20
Total				24	103453,20	14400,00	12000,00	19200,00	15600,00	164653,20

Partner Organisation from Third Country does not sign the Grant Agreement, does not recruit the researcher and does not directly claim costs from the action. The entire EC contribution is transmitted to the Host organisation located in Members States or Associated Countries.

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4 - Ethics issues table

1. HUMAN EMBRYOS/FOETUSES		Page
Does your research involve Human Embryonic Stem Cells (hESCs)?	○ Yes ◉ No	
Does your research involve the use of human embryos?	○ Yes ◉ No	
Does your research involve the use of human foetal tissues / cells?	○ Yes ◉ No	
2. HUMANS		**Page**
Does your research involve human participants?	○ Yes ◉ No	
Does your research involve physical interventions on the study participants?	○ Yes ◉ No	
3. HUMAN CELLS / TISSUES		**Page**
Does your research involve human cells or tissues (other than from Human Embryos/ Foetuses, i.e. section 1)?	○ Yes ◉ No	
4. PERSONAL DATA		**Page**
Does your research involve personal data collection and/or processing?	○ Yes ◉ No	
Does your research involve further processing of previously collected personal data (secondary use)?	○ Yes ◉ No	
5. ANIMALS		**Page**
Does your research involve animals?	○ Yes ◉ No	
6. THIRD COUNTRIES		**Page**
In case non-EU countries are involved, do the research related activities undertaken in these countries raise potential ethics issues?	○ Yes ◉ No	
Do you plan to use local resources (e.g. animal and/or human tissue samples, genetic material, live animals, human remains, materials of historical value, endangered fauna or flora samples, etc.)?	○ Yes ◉ No	
Do you plan to import any material - including personal data - from non-EU countries into the EU?	○ Yes ◉ No	
Do you plan to export any material - including personal data - from the EU to non-EU countries?	○ Yes ◉ No	
In case your research involves low and/or lower middle income countries, are any benefits-sharing actions planned?	○ Yes ◉ No	
Could the situation in the country put the individuals taking part in the research at risk?	○ Yes ◉ No	

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7. ENVIRONMENT & HEALTH and SAFETY		Page
Does your research involve the use of elements that may cause harm to the environment, to animals or plants?	○ Yes ◉ No	
Does your research deal with endangered fauna and/or flora and/or protected areas?	○ Yes ◉ No	
Does your research involve the use of elements that may cause harm to humans, including research staff?	○ Yes ◉ No	
8. DUAL USE		**Page**
Does your research involve dual-use items in the sense of Regulation 428/2009, or other items for which an authorisation is required?	○ Yes ◉ No	
9. EXCLUSIVE FOCUS ON CIVIL APPLICATIONS		**Page**
Could your research raise concerns regarding the exclusive focus on civil applications?	○ Yes ◉ No	
10. MISUSE		**Page**
Does your research have the potential for misuse of research results?	○ Yes ◉ No	
11. OTHER ETHICS ISSUES		**Page**
Are there any other ethics issues that should be taken into consideration? Please specify	○ Yes ◉ No	

I confirm that I have taken into account all ethics issues described above and that, if any ethics issues apply, I will complete the ethics self-assessment and attach the required documents. ☒

How to Complete your Ethics Self-Assessment

Proposal ID **749461** *Acronym* **DUST-GLASS**

5 - Call specific questions

Eligibility Researcher (future fellow)

1. Were you in the last 5 years in military service? ○ Yes ◉ No

Other Questions

For communication purposes only, the REA asks for permission to publish the name of the researcher (future fellow) should the proposal be retained for funding.

1. Does the researcher (future fellow) give this permission? ○ Yes ◉ No

2. Is there a secondment in Member States or Associated Countries envisaged in Part B of this proposal? ◉ Yes ○ No

In which sector is the secondment in Member States / Associated Countries foreseen?

☒ Academic ☐ Non Academic

Do you already know the organisation to which this secondment will be? ◉ Yes ○ No

Name: BARCELONA SUPERCOMPUTING CENTER

Country: Spain

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Data management activities

A new focus within Horizon 2020 is data management, for example through the use of Data Management Plan (DMP).

DMPs detail what data the project will generate, whether and how it will be exploited or made accessible for verification and re-use, and how it will be curated and preserved.

The use of a DMP is required for projects participating in the Open Research Data Pilot in the form of a deliverable in the first 6 months of the project (possible updates during the project).

Other projects are invited to submit a DMP if relevant for their planned research.

Are data management activities relevant for your proposed project?	○ Yes	◉ No

Open Research Data Pilot in Horizon 2020

All applicants can participate in the Pilot on Open Research Data in Horizon 2020[1] on a voluntary basis. This Pilot aims to improve and maximise access to and re-use of research data generated by actions.

Participants in the Pilot will be invited to formulate a Data Management Plan (DMP). DMPs detail what data the project will generate, whether and how it will be exploited or made accessible for verification and re-use, and how it will be curated and preserved.
Participating in the Pilot is flexible in the sense that it does not mean that all research data needs to be open. Rather, projects can define certain datasets to remain closed via a Data Management Plan (DMP).

Please note that participation in this Pilot does not constitute part of the evaluation process. Proposals will not be evaluated favourably because they participate in the Pilot on a voluntary basis.

We wish to participate in the Pilot on Open Research Data in Horizon 2020 on a voluntary basis	○ Yes	◉ No

[1] *According to article 43.2 of Regulation (EU) No 1290/2013 of the European Parliament and of the Council, of 11 December 2013, laying down the rules for participation and dissemination in "Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020)" and repealing Regulation (EC) No 1906/2006.*

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MARIE SKŁODOWSKA-CURIE ACTIONS

Individual Fellowships (IF)
Call: H2020-MSCA-IF-2016

PART B

"**DUST-GLASS**"

Improving global dust prediction and monitoring through data assimilation of satellite-based dust aerosol optical depth

This proposal is to be evaluated as:

[Standard EF]

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List of Participating Organisations

Please provide a list of all participating organisations (both beneficiaries and, where applicable, partner organisations) indicating the legal entity, the department carrying out the work and the supervisor.
If a secondment in Europe is planned but the partner organisation is not yet known, as a minimum the type of organisation foreseen (academic/non-academic) must be stated.
For non-academic beneficiaries, please provide additional data as indicated in the table below.

Participating organisations	Legal Entity Short Name	Academic (tick)	Non-academic (tick)	Country	Dept./ Division / Laboratory	Supervisor	Role of Partner Organisation
Beneficiary							
National Observatory of Athens	NOA	x		Greece	Institute for Astronomy, Astrophysics, Space Applications and Remote Sensing	Vassilis Amiridis	Host institute
Partner Organisation							
Barcelona Supercomputing Center	BSC	x		Spain	Earth Sciences Department	Carlos Pérez García-Pando	Hosting Secondment

1. Excellence

1.1 Quality and credibility of the research/innovation action (level of novelty, appropriate consideration of inter/multidisciplinary and gender aspects)

➢ *Introduction, state-of-the-art, objectives and overview of the action*

Annually, massive loads of dust aerosols originating mainly by natural processes[1] across the desert areas of the planet are transported at a wide range of distances away from the source regions. The major dust sources are situated across the North Africa, Middle East and Eastern Asia which along with the dust affected areas constitute the so-called "dust belt". Dust aerosols affect air quality levels in urban areas causing adverse health effects[2], ocean biogeochemistry through deposition of iron compounds[3] and phosphorous levels associated with the fertilization of tropical rainforests[4], while they can affect atmospheric processes, from short (weather)[5] to long (climate)[6] term temporal scales, due to their interaction with the shortwave (SW) and longwave (LW) radiation.

All the aforementioned impacts reflect the importance of understanding adequately the multifaceted role of dust aerosols. For this reason, several studies have relied either on ground[7] or satellite measurements[8] or modelling techniques[9] aiming at describing dust aerosols' regime. Nevertheless, each type of representation is subjected to drawbacks regarding the spatial representativeness (ground observations), level of accuracy (satellite retrievals) and representation of physical processes (models). In order to overcome these limitations, an inter-disciplinary approach via the synergistic use of observations and modelling is the optimum solution. Data assimilation provides a probabilistic approach for optimally combining model simulations and observations weighted by their respective uncertainties and obtain the 'best' estimate of atmospheric fields (analysis). Analyses are useful to initialise models and improve predictions, while reanalyses (consistent analysis datasets over a long period) are key to monitor past states of the atmosphere. In particular, various observational datasets such as columnar[10] and vertical[11] satellite retrievals, in-situ observations[12], aircraft measurements[13] and ground lidar profiles[14] have been adopted in data assimilation systems, considering all aerosols without applying any identification method for dust. In those systems assimilation increments are usually distributed among aerosol species relying merely on the model background. Several data assimilation techniques[15,16], of various complexities, are utilized in aerosol (and dust) prediction models both in operational and research mode. The achievements of these efforts[17,18] are very promising since have shown that through data assimilation the predictive skills of aerosol models are improved remarkably. However, in the literature, there is a limited number of studies in which dust aerosol products are utilized in data assimilation systems. Therefore, the research activities of the proposed project (DUST-GLASS) aim at contributing to these efforts.

The overarching research objective (RO) of DUST-GLASS is the optimization of a data assimilation system, coupled with an atmospheric-dust model, aiming at generating accurate global dust reanalysis and performing forecast studies. For the achievement of the core RO, a fine resolution global dust optical depth (DOD) database, suitable for data assimilation, will be developed through a synergy of columnar satellite retrievals (2007-2016). Finally, the model's performance will be assessed aiming at quantifying objectively the expected improvements attributed to data assimilation.

➢ *Research methodology and approach*

In the present section the research objectives (ROs) of DUST-GLASS are discussed in detail.

RO 1: *Development of a multiyear global fine resolution DOD database*

The critical optical properties that are required for the identification of dust aerosols are aerosol optical depth (AOD, indicator of aerosols' load), Ångström exponent (α, indicator of aerosols' size) and Aerosol Index (AI, indicator of aerosols' absorptivity). These parameters can be derived with high accuracy, on a daily basis and global coverage by satellites. In the framework of DUST-GLASS, fine resolution satellite retrievals, both in spatial and temporal terms, will be used for the development of a fine resolution (0.1º x 0.1°) global DOD product over the period 2007-2016. To this aim, data obtained

[1]Ginoux et al. (Rev. Geophys., 50, 2012);[2]Karanasiou et al. (Environ. Int., 15, 2012);[3]Jickells et al. (Science, 308, 2005);[4]Yu et al. (Geophys. Res. Lett., 42, 2015);[5]Pérez et al. (J. Geophys. Res., 111, 2006);[6]Spyrou et al. (Atmos. Chem. Phys., 13, 2013);[7]Kim et al. (Atmos. Chem. Phys., 11, 2011);[8]Liu et al. (J. Geophys. Res., 113, 2008);[9]Haustein et al. (Atmos. Chem. Phys., 12, 2012);[10]Yin et al. (Advances in Climate Change Research, 7, 2016);[11]Sekiyama et al. (Atmos. Chem. Phys., 10, 2010);[12]Li et al. (Atmos. Chem. Phys., 13, 2013);[13]Zhang et al. (Tellus B, 68, 2016);[14]Whang et al. (Atmos. Chem. Phys., 13, 2013);[15]Benedetti et al. (J. Geophys. Res., 114, 2009);[16]Pejanovic et al. (Geophys. Res. Abstr., 12, EGU2010-7353, 2010);[17]Zhang et al. (J. Geophys. Res., 113, 2008);[18]Niu et al. (Atmos. Chem. Phys., 8, 2008)

from the MODerate resolution Imaging Spectroradiometer (MODIS), Multi-angle Imaging SpectroRadiometer (MISR) and Ozone Monitoring Instrument (OMI), will be utilized. Aerosol optical properties are retrieved at different nominal (nadir) spatial resolutions. MODIS acquires aerosol observations at 10km x 10km, MISR at 17.6km x 17.6km and OMI at 13km x 24km.

The development of the global DOD database will be based on Level 2 (L2) MODIS-Terra/Aqua aerosol optical depths (AODs), acquired from the latest version (Collection 006) of the retrieval algorithm. Satellite observations of aerosols' size and nature, derived from MISR and OMI, will be used in a synergistic way in order to overcome limitations imposed by MODIS deficiencies. First, series of quality checks on MODIS retrievals confidence levels[19] and AOD dependencies[20-23] (e.g. on cloud contamination), will be undertaken in order to reduce observation errors which are expected to affect the performance of the data assimilation system. Then, the acquired optical properties providing all the necessary information about aerosols' load (MODIS), size (MODIS, MISR) and nature (OMI), will be projected in a common regular latitude-longitude grid of 0.1° spacing. Finally, for the identification of DOD, appropriate upper or lower thresholds on α and AI values, respectively, will be set up and must be valid concurrently. According to the applied methodology, the fine resolution DOD will be available at a global scale, at 6-h time intervals, for each day over the period 2007-2016.

RO 2: *Optimization of data assimilation system suitable for global/regional dust simulations*

The global DOD database (RO 1) will be used in a data assimilation system coupled with the NMMB/BSC-Dust model[24,9] in order to produce a global dust reanalysis at 0.5ºx0.7° spatial resolution (2007-2016) and to perform short-term dust forecast studies. More specifically, the model will be used with the Local Ensemble Transform Kalman Filter (LETKF)[25] scheme, an ensemble-based data assimilation technique, aiming at optimizing model's fields with the assimilation of dust observations. Previous studies[26,27] revealed that the LETKF scheme is suitable for assimilating aerosol information and that improves models' ability to reproduce dust fields[28].

Dust mobilization and transport across the "dust belt" vary seasonally and regionally. For example, Saharan dust transport over the tropical Atlantic Ocean is more pronounced in boreal summer while the transport of Asian dust over the Pacific Ocean is maximized in spring. In Middle East, dust activity peaks in late spring and summer. Based on these facts, global short-term (5-days) forecasts will be conducted for different seasons aiming at investigating the ability of the model to reproduce satisfactorily dust patterns. Several model configurations[29] will be set up to check internally the data assimilation system as well as to assess the dust analysis and forecasts.

In DUST-GLASS, focus will be given also to the Mediterranean basin which is affected by dust transport throughout the year[30], in order to expand the gained knowledge from the MDRAF project (fellow's previous MC-IEF hosted at ES-BSC) in which 20 intense and widespread dust outbreaks have been identified through a satellite algorithm. For these cases, based on regional (Sahara-Europe) short-term simulations (84 hours), dust outbreaks' impacts on radiation budget, atmospheric dynamics and forecasting accuracy of the NMMB/BSC-Dust model, have been investigated. Here, this set of simulations will be repeated by coupling the data assimilation system with the numerical model. One of the key findings of MDRAF was that the consideration of dust-radiation interactions improves model's forecasting ability. Therefore, the added value of DUST-GLASS will be to assess the further improvement of model's forecasting performance attributed to data assimilation.

RO 3: *Assessment of the impact of dust assimilation on atmospheric monitoring and predictions*

The last objective of DUST-GLASS is devoted to the assessment of the global and regional dust simulations aiming at quantifying objectively the impact of data assimilation. The goals in RO 3 will be: (i) to check internally the consistency of the assimilation system, (ii) to evaluate dust analysis and (iii) to assess the possible improvements on model's predictability. Apart from dust, the downwelling radiation at surface as well as temperature fields will be considered since "corrections" on modelled DOD, thanks to data assimilation, can be seen on radiation and subsequently on temperature, particularly under high load conditions, due to dust-radiation interactions.

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[19]Hubanks et al. (http://modis-atmos.gsfc.nasa.gov/_docs/L3_ATBD_C6.pdf, 2016);[20]Livingston et al. (Atmos. Chem. Phys., 14, 2014);[21]Sayer et al. (J. Geophys. Res., 119, 2014); [22]Zhang and Reid (J. Geophys. Res., 111, 2006);[23]Hyer et al. (Atmos. Chem. Phys., 4, 2011);[24]Pérez et al. (Atmos. Chem. Phys., 11, 2011);[25]Hunt et al. (Physica D, 230, 2007);[26]Shinozuka and Redemann (Atmos. Chem. Phys., 11, 2011);[27]Schutgens et al. (Atmos. Meas. Tech., 6, 2013);[28]Schutgens et al. (Atmos. Meas. Tech., 10, 2010);[29]Di Tomaso et al. (Submitted to Geosci. Model Dev., 2016);[30]Gkikas et al. (Atmos. Chem. Phys., 13, 2013)

For the assessment of the model outputs, various datasets of independent observations or reanalysis products will be utilized as reference. In particular, the model DODs are going to be intercompared against ground retrievals derived from the AERONET and MAN (Marine Aerosol Network) networks providing aerosol measurements over land and sea, respectively. Likewise, the evaluation analysis will be made versus satellite retrievals (MODIS, MISR) taking advantage of their high accuracy and wide spatial coverage. In addition, dust aerosols' vertical profiles will be compared against profiling satellite data derived by CALIOP (Cloud-Aerosol Lidar with Orthogonal Polarization) and products from the LIVAS[31] (Lidar climatology of Vertical Aerosol Structure for space-based lidar simulation studies) database, developed at the National Observatory of Athens (NOA, host institute). As it concerns temperature, the model outputs will be assessed against weather observations obtained from meteorological stations and reanalyses products. The former data will be derived from the Integrated Surface Database (ISD) and the Universal RAwinsonde OBservation program (RAOB) while the latter ones will be derived from the ERA-Interim and FNL reanalyses. The simulated downwelling SW/LW radiation at the ground will be evaluated versus irradiances derived from the Baseline Surface Radiation Network (BSRN). In addition, optical, microphysical, chemical properties and lidar profiles obtained in supersites (e.g. Finokalia) or derived by integrated ground networks in the framework of ACTRIS (http://www.actris.net) will be used also for the evaluation of the regional simulations.

- *Originality and innovative aspects of the research programme*

Advancing dust modelling and prediction is a scientific objective of great interest covering a wide range of interdisciplinary research fields relevant to health, environment, weather and climate. The proposed project aims at contributing to this challenging goal as well as to the development of a dust reanalysis database through the assimilation of fine resolution DOD in global dust simulations.

Aerosol products, suitable for data assimilation, have been developed for the total AOD, representative over land[23] (deserts are excluded) and sea[32] at a coarse resolution (1°x1°) relying on satellite observations derived from older MODIS retrievals. A similar DOD database[1] with the one which will be created in DUST-GLASS has been developed making use of Collection 005 MODIS Deep Blue (DB) retrievals (2003-2009). Even though DOD is available at high spatial resolution (0.1°x0.1°), the latter product is restricted over land and particularly over arid and semi-arid areas, due to the implementation only of MODIS DB retrievals. Therefore, the focus on DOD (instead of AOD), the use of the most recent satellite observations (instead of older and less accurate retrievals), the fine resolution and full global coverage (with the inclusion of deserts) are the major novelties of the DOD database which will be created in the course of DUST-GLASS. Recently, a reanalysis global AOD product (both over land and sea), available at 1ºx1° spatial resolution, has been developed through assimilation of MODIS (Collection 005) and MISR (Version 22) retrievals in the Navy Aerosol Analysis and Prediction System (NAAPS)[33]. Here, the dust reanalysis product will be generated at finer resolution (0.5ºx0.7º) and by assimilating up-to-date aerosol retrievals representative only for dust. Other existing global reanalysis datasets either utilise satellite products that do not include retrievals over deserts (MACC-II) or ingest directly MODIS reflectances (MERRAreo).

In the literature there is a limited number of studies[18,34] dealing with the assimilation only of dust aerosols without including other aerosol types. Nor do there exist dust reanalyses produced with a specific observational constrain on the dust. DUST-GLASS is oriented to constrain this lack of knowledge through the application of innovative methodologies making use of observational datasets of high accuracy in conjunction with a sophisticated atmospheric-dust model. The identification of dust aerosols (RO 1) will be accomplished through a synergistic implementation of satellite aerosol optical properties. Similar studies, in terms of identifying dust from space, have been conducted in the past; however, the obtained results were valid for specific regions (e.g. Mediterranean)[30,35]. Furthermore, the use of ensemble forecast will allow exploring, quite innovatively, the exploitation of ensemble spread as measure of uncertainty in dust prediction. It must be underlined that the DUST-GLASS meets the requirements of a complete scientific project since it includes the creation of a global DOD database, the optimization of a data assimilation system coupled with an atmospheric-dust model and the assessment of the model's performance aiming at quantifying objectively the potential

[31]Amiridis et al. (Atmos. Chem. Phys., 15, 2015);[32]Shi et al. (Atmos. Chem. Phys., 11, 2011);[33]Lynch et al. (Geosci. Model Dev., 9, 2016)
[34]Wang and Niu (Atmos. Environ., 64, 2013);[35]Gkikas et al. (Atmos. Chem. Phys., 16, 2016)

positive impacts of dust data assimilation on atmospheric monitoring and predictions. Finally, the proposed fellowship will expand the existing successful NOA-BSC collaboration (e.g. SDS-WAS) to a powerful and extremely timely research field (data assimilation) and will put the candidate in a strategic pathway leading to new future career perspectives.

1.2 Quality and appropriateness of the training and of the two way transfer of knowledge between the researcher and the host

The fellow's CV proves his vast experience in utilizing earth observations for aerosol studies. The applicant's high level of knowledge and wide range of competences have been acquired during his educational phases, from co-authorships in scientific papers and his participation in several projects (Section 4). In addition, during his postdoc at ES-BSC (MC-IEF scholarship) he has gained valuable knowledge in atmospheric-dust modeling and radiation studies improving considerably his skills in the relevant research areas. In the framework of the proposed project, the applicant will have the opportunity to transfer his expertise to the host through his close collaboration with members of the local group. Furthermore, the fellow is expected to be benefited by his involvement in DUST-GLASS by acquiring new and specialised knowledge in the field of satellite observations (analysis, processing, archiving), ground lidar retrievals, data assimilation and field measurements. Moreover, the fellow will strengthen essentially his competences in atmospheric-dust modelling giving him the opportunity to invest in a scientific field of primary concern for his future career. The training activities which will take place throughout the project's period guarantee the transfer of knowledge from the host to the fellow. This certainty is justified by the high expertise, the scientific quality and the multiyear experience of the host and the secondment host in their research areas. The principal objectives of the training program are the acquisition of expertise in the following scientific topics:

- Management and implementation of fine resolution satellite and ground retrievals
- Optimization of data assimilation systems
- Atmospheric and dust modelling
- Processes of dust life cycle components
- Assessment analysis of global and regional dust simulations
- Surface-based measurements of mineral particles' physical and optical properties

A proper training in these areas will be essential for the achievement of the proposed project's tasks. Over the training period, the applicant's scientific profile will be upgraded substantially meaning that he will be able to play a more central role in cross-disciplinary projects. In addition, experience of relaying information to scientists in different multi-disciplinary and inter-disciplinary fields will also improve his technical communication skills.

1.3 Quality of the supervision and of the integration in the team/institution

- *Qualifications and experience of the supervisor(s)*

Dr. Vassilis Amiridis is a Senior Researcher at the National Observatory of Athens (NOA), Greece. He is an expert in aerosol remote sensing from ground, including lidar and sunphotometric techniques. Recently, he pioneered the optimization of CALIPSO observations based on data and methods developed within the ACTRIS European Research Infrastructure. He has participated in 25 EU and European Space Agency (ESA) research projects and experimental campaigns in 5 of which as coordinator and 5 as principal investigator for NOA. He is also the national delegate at the GMES/COPERNICUS Committee and Expert of the Earth System Science domain (ESSEM) Committee under COST European Cooperation in Science and Technology. His recent projects include LIVAS ("LIdar climatology of Vertical Aerosol Structure for space-based lidar simulation studies") and MarcoPolo (Monitoring and Assessment of Regional air quality in China using space Observations–Project Of Long-term Sino-European co-Operation). He has more than 60 publications in peer-reviewed journals with more than 1200 citations from third-party (h-index=21). Moreover, he has participated in 22 international conferences, being invited to present his work in 8 of them. He has supervised or is a member of the supervising committee of 8 PhD and 12 MSc students and leads the Atmospheric Physics and Chemistry Group (APCG) of NOA (apcg.space.noa.gr). He is a member of the editorial board of EGU's Atmospheric Measurement Techniques Journal (IF = 3.2) and an active reviewer in 25 scientific journals. His lidar-related activities have been acknowledged by EARLINET, which has elected him as a council member for the period 2012–2018.

Dr. Carlos Pérez García-Pando is Ramón y Cajal Researcher, AXA Professor on Sand and Dust Storms (SDS) and leader of the Atmospheric Composition group at ES-BSC. His research focuses on

understanding the physical and chemical processes controlling atmospheric aerosols, and evaluating their effects upon climate, ocean biogeochemistry, air quality, and health. His core area of expertise is atmospheric mineral dust. He is also a model developer with a large experience in HPC and operational forecasting. Between 2009 and 2016 he worked at the NASA GISS and Columbia University. Aside of his significant research achievements related to dust-radiation interactions, dust-mineralogy and dust effects on health, he led together with Dr. Oriol Jorba from BSC an international multi-institutional initiative to develop a unique unified (regional and global) prediction model for weather, atmospheric aerosols and chemistry that today provides operational forecasts widely used by the international scientific community, weather services, companies and air quality managers. He also played a seminal role in the design, creation, and successful implementation of the WMO Regional Centres on SDS prediction in Spain, the only operational dust forecasting service in the region fully recognized by WMO. Dr. Pérez García-Pando's work resulted in 50 peer-reviewed papers (67% in Q1, h-Index: 26, i10-Index: 40, citations: 2612, source: Google Scholar), 20 chapters in books/proceedings/reports, 150 contributions to conferences/workshops/seminars (26 as invited speaker) and the edition of a book of proceedings. He organized an international conference and a workshop on SDS. He participated in 27 international (US and EU) and national projects (in 6 of them as PD, PI or co-PI). He co-advised 3 PhD students, 3 Master students, and 1 Postdoc. His work was highlighted among others by NASA and the European Centre for Medium-Range Weather Forecasts (ECMWF), and covered by international media such as The Guardian. Dr. Pérez García-Pando was recently awarded with an AXA Chair to support an ambitious mineral dust research program at BSC.

- *Hosting arrangements*

DUST-GLASS will take place primarily at NOA while a secondment of six months at ES-BSC has been scheduled during the second year of the project. Both institutes will provide to the applicant all the necessary infrastructures and resources required for the successful accomplishment of DUST-GLASS tasks. More specifically, the applicant will have direct and remote access to high performance computers, to all the available software tools and data required for the attainment of project's tasks. In addition, the fellow will have the continuous support of the participant institutes' IT personnel, fully experienced in dealing with research projects, in order to overcome any possible technical issue.

The Scientist In Charge (SIC, Dr. Vassilis Amiridis) of the fellow is leading the APCG group (23 members) of NOA which is specialized in multidisciplinary aerosol research thanks to the diversity of expertise of its staff. The SIC has extensive experience in managing research projects and he is founding member of the committee for the new MSc program of NOA on satellite remote sensing (http://space.uop.gr/). The applicant's placement at NOA will give him the opportunity to collaborate closely with members of the APCG group and more particular with experienced researchers in satellite observations (PhD Eleni Marinou) and atmospheric/dust modelling (Dr. Stavros Solomos). In addition, DUST-GLASS will be benefited by the contribution of Prof. Nikos Mihalopoulos who is the head scientist of the Finokalia supersite (Crete, Greece), a core station of ACTRIS, with disposed long-term records of several environmental parameters which will be used for the evaluation of the regional simulations (RO 3). The applicant during his secondment at ES-BSC will collaborate mainly with his co-supervisor Dr. Carlos Pérez García-Pando, Dr. Oriol Jorba (expert in atmospheric-chemistry modelling) and Dr. Enza Di Tomaso (expert in data assimilation) as well as with other scientists and researchers in the field of atmospheric sciences. By the beginning of the project, the fellow along with his SIC and co-supervisor will construct a Career Development Plan (CDP) identifying fellow's needs in scientific and complementary skills, in view of his long-term career goals.

The fellow will participate in the APCG group's weekly meetings and monthly seminars aiming at interacting with other researchers, presenting the project's evolution to the local scientific team and identifying possible synergies with other research projects. It must be mentioned also that all the participants of the proposed project will be in contact continuously in order to track the progress of its research activities, ensuring thus its precise accomplishment both at scientific and timeliness terms. Likewise, the applicant's placement in both institutes will give him the opportunity to advice and supervise students at high educational level conducting research on atmospheric sciences.

From a management point of view, the NOA secretariat services will be responsible for handling project's financial and practical arrangements, providing any assistance in making contact with personnel at both the EU and national level. The host will take care of issues concerning the training of the fellow, the appropriate management of the project, the preparation of the project's assessment

reports and will have the overall responsibility to ensure that the contract is followed in every aspect and that the researcher is operating as defined by the Grant Agreement. The SIC will be the single contact person for any liaison with the EU Commission. Finally, the host institute will take care of any unforeseen problems that may arise and will try to solve any possible conflict or difficulty.

1.4 Capacity of the researcher to reach or re-enforce a position of professional maturity/independence

The applicant's placement at NOA, will offer him the opportunity to be trained furthermore on measurements and methods to perform aerosol research, as well as to support the host institute's research group with his expertise in aerosol observations, gained from his multi-year experience in the relevant scientific fields. Likewise, the applicant will contribute to the host institute's research activities with his valuable experience on atmospheric-dust modelling acquired during his postdoc at ES-BSC. Moreover, during the proposed project the applicant will maintain and reinforce his fruitful collaboration with the research group of ES-BSC gaining more experience in the field of dust modelling. It must be mentioned that in the framework of DUST-GLASS, the fellow will acquire knowledge in data assimilation which constitutes an ideal bond between observations and models. These new competences will make the fellow and the host able to set the foundation for conducting research in data assimilation in Greece which nowadays lacks expertise in the relevant field.

From the applicant's CV, it is apparent his strong ability for independent research as well as his high degree of responsibility. Both guarantee the accurate implementation of an ambitious project as the proposed one. The training that he will acquire will be at the highest level since both institutes are among the top class laboratories in Europe and globally in their relevant scientific fields. During the proposed project, it is expected that as a researcher the applicant will improve his knowledge level and build on existing skills already possessed. Also, it is expected that he will acquire new and advanced complementary competencies in bottom-up settlement of scientific problems and project management which are crucial for the mature stages of a young scientist. Moreover, there are many advantages to be gained from such a period of mobility - in the sense that the fellow will be stimulated by a new environment and will have the possibility to make new scientific contacts both in the participant institutes and via established scientific collaborations. By the end of the project, he will have acquired strong competencies that will help him to work as an independent scientist as well as to lead a scientific group in the field of satellite aerosol research and atmospheric-dust modelling with an enhanced publication record. Hopefully, his improved skills will help him to achieve his appointment in an academic or research position in his country or elsewhere in Europe.

2. Impact

2.1 Enhancing the potential and future career prospects of the researcher

Through the successful accomplishment of DUST-GLASS, the fellow will advance substantially his scientific profile and he will acquire all the necessary skills in managing a project initiated and organized by him. From a scientific point of view, the proposed project offers to the applicant a great opportunity to enrich furthermore his strong background in aerosol studies and to improve substantially his knowledge level in atmospheric-dust modelling. One of the main objectives of DUST-GLASS deals with data assimilation techniques and therefore the applicant's involvement in the relevant tasks will allow him to acquire competences in a less known to him research field, opening-up thus a new prospect in his research career. As part of the project's outreach activities, the fellow is expected to publish scientific papers in high-impact peer reviewed journals in the corresponding disciplines as well as to announce research findings in the most well-known international conferences and workshops in the relevant scientific fields, increasing thus his existing record of publications. Through these dissemination activities the fellow will upgrade remarkably his CV and he will be able to reach a tenure-track position as well as to participate at high competiveness project calls (e.g. European Research Council) in his future steps.

From a management point of view, the proposed project represents a great opportunity for the applicant to build up on the existing skills gained from his first MC-IEF. In all project's actions, the fellow will manage several scientific problems from end-to-end which must be resolved in a precise and straightforward way. By doing so, the applicant will get training and experience which are needed in order to become an accomplished and multidisciplinary researcher. The success of the proposed project is ensured by the quality of the participant institutes. NOA (host institute), is the Centre of Excellence in remote sensing in Greece and acts as the national link to ESA. In particular, NOA hosts

the first ESA mirror site, a Ground Segment infrastructure for distributing European earth observation data to the Balkans, North Africa and Middle East, a role recently acknowledged to NOA by the EU and GEO through the H2020 GEO-CRADLE project, starting on January 2016, aiming to integrate regional services. ES-BSC (secondment host), is established as one of the top laboratories at a European and global level in the field of atmospheric and dust modelling. The research group of ES-BSC has a multiyear experience in the relevant scientific area working on the development of the NMMB/BSC Chemical Transport Model (NMMB/BSC-CTM) which is an advanced chemical weather prediction system for applications from global to regional domains. NMMB/BSC-CTM contributes to different model inter-comparisons like the Aerosol Comparisons between Observations and Models (AeroCom), the International Cooperative for Aerosol Prediction (ICAP) initiative and the Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS), a project developed under the umbrella of the World Meteorological Organization (WMO) with focus on improving capabilities of sand and dust storm forecasts. One of the focus areas regarding the in-house developments of the NMMB/BSC-CTM model is devoted to the improvement of dust and weather forecasts and the proposed project aims to contribute essentially to this direction. NOA and ES-BSC are undoubtedly experts in their relevant research areas as indicated by their international collaborations, their participation in scientific networks and their multiyear experience on atmospheric sciences. This fact intensifies the opportunities given to the fellow to acquire new and innovative expertise. Over the training period of DUST-GLASS, the fellow will have the opportunity to interact with experts in satellite retrievals and remote sensing (NOA) and in atmospheric modelling and data assimilation (ES-BSC) acquiring appropriate advanced training and multidisciplinary skills.

Summarizing, the fellow by taking advantage of all these opportunities thanks to DUST-GLASS will reinforce his scientific profile, he will broad his research network and he will receive valuable experience of independent thinking. From a long-term perspective point of view, all these invaluable benefits will place the fellow in a perfect position to create an independent career path.

2.2 Quality of the proposed measures to exploit and disseminate the action results

A priority concern of the fellowship is the dissemination of the obtained research findings and achievements of DUST-GLASS to as many users as possible. To this aim, the fellowship will take advantage of any possible dissemination action aiming at maximizing the visibility of the proposed project. More specifically, the key results acquired in the course of DUST-GLASS will be published in open-access peer reviewed journals of high scientific importance. Likewise, the applicant will present the research results in the most well-known international conferences in the geosciences field, namely the European Geosciences Union (EGU) General Assembly and the American Geophysical Union (AGU) Fall Meeting. Apart from interdisciplinary conferences, the fellow will also participate in specialized meetings/workshops (e.g. European Aerosol Conference, EAC) in the field of aerosol research. In order to reinforce further the dissemination actions, the achievements of DUST-GLASS will be announced via the websites of the APCG group and the BSC institute. Moreover, thanks to the wide international networks and extended collaborations of host and secondment host, the obtained results will be promoted to other research groups and institutes focusing on aerosol studies. The fellow guarantees the routinely contact with the research teams providing the observational datasets which will be used in DUST-GLASS as well as with other scientific groups working on similar topics. In the framework of outreach activities, the applicant will give oral presentations internally at the APCG group and in the ES-BSC seminars as well as at other institutes/universities to foster interaction of other scientists and to get important feedback from experts in the field. One of the target groups of promotion activities comprises undergraduate and master students following education courses in related fields. For this reason, the fellow will arrange lectures in the MSc program of NOA on satellite remote sensing (http://space.uop.gr/) and at universities presenting scientific outcomes of the project as well as different topics related to aerosol research, aiming at engaging with students and attract their attention about the importance of aerosol science.

The variety of research (satellite retrievals, data assimilation, atmospheric-dust modelling) which will be conducted in the course of the proposed project boosts the exploitation of its data, techniques and products. The produced global fine resolution DOD database as well as the dust reanalysis product will be stored in the institutional repositories and will be freely available to any scientist who may be interested in conducting research in dust aerosol studies. One of the core aspects of DUST-GLASS is the improvement of dust forecasts through data assimilation. Considering mineral particles' impacts

on health, environment, social economic activities, energy sector, weather and climate it is more than evident the necessity of the proposed research as well as the wide range of scientific fields in which the acquired results can be exploited. Finally, the gained knowledge and experience from the proposed project will be exploited in operational services. In particular, near real time (NRT) satellite retrievals can potentially applied to the data assimilation system coupled with the NMMB/BSC-Dust model contributing to different model inter-comparison initiatives (ICAP, AeroCom, SDS-WAS).

2.3. Quality of the proposed measures to communicate the action activities to different target audiences

Due to the variety of dust impacts on humans' life, both at short and long-term perspectives, the number of interdisciplinary research studies, focused on improving our knowledge about the crucial role of mineral particles, is increasing rapidly during the last years. This fact clearly reflects the increasing concern of citizens to be informed about air quality in metropolitan areas, adverse health effects and climate change which consist also priorities of research funded by the European Commission. Nevertheless, the transfer of this valuable information to non-scientific audiences is a task which requires well-structured measures aiming at facilitating the communication to the public of aerosol research significance on environmental policy-making decisions. To this aim, in the framework of DUST-GLASS, the following outreach activities for the public and secondary school students have been organized and listed below:

- Through the APCG website, experts and non-experts will be able to be informed about the latest news, the technical description and the obtained results of DUST-GLASS
- Publication of non-technical articles regarding aerosol research and atmospheric sciences
- Publication of popularized articles in which will be described the role of dust aerosols and their associated impacts on environment, climate, health and socioeconomic activities
- Publication of scientific material, adaptable for secondary school students, in which will be provided information about dust aerosols
- Visits in secondary schools giving lectures about aerosol research and atmospheric sciences
- Organization of meetings, held in NOA, where young students can be informed about the project's activities as well as for generic topics relevant in the field of atmospheric sciences

3. Quality and Efficiency of the Implementation

3.1 Coherence and effectiveness of the work plan

DUST-GLASS is organized in seven work packages (WPs). WP1 and WP2 are dedicated to project management and dissemination activities, respectively. In WP3, pre-research (technical) activities of the project are covered. The remaining four WPs (WP4 – WP7) are focused on the scientific analyses. In the following Gantt chart is presented the timetable (in Project Months, PMs) of DUST-GLASS. Further details, regarding work packages' titles, deliverables and milestones, follow below, while a brief description of the tasks (Ts), if applicable, in each WP is given in Section 3.2.

Gantt chart of DUST-GLASS

Project Months		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
WP1																									
WP2									SU1				C1	S1			P1	C2		S2	C3	SU2			C4 S3 P2
WP3	T3.1																								
WP4	T4.1																								
	T4.2																								
WP5	T5.1																								
	T5.2																								
WP6	T6.1																								
	T6.2																								
WP7	T7.1																								
	T7.2																								
Milestones		M1							M2					M3						M4	M5				M6
Deliverables		D1												D2-3											D4-8
Secondment															at ES-BSC										

- *Work packages titles*

WP1: Project management of DUST-GLASS *[PM 1-24]*

WP2: Dissemination activities of DUST-GLASS
WP3: Decoding of the raw satellite retrievals *[PM 1-3]*
WP4: Error analysis and investigation of AOD dependencies *[PM 3-8]*
WP5: Development of the fine resolution satellite-based DOD global database *[PM 8-13]*
WP6: Model dust simulations coupled with the data assimilation system for the generation of dust reanalysis and forecasts *[PM 14-19]*
WP7: Assessment of global and regional dust simulations *[PM 19-24]*

- *Milestones*

M1: Career Development Plan of the experienced researcher *[PM 1, WP1]*
M2: Error analysis of satellite AOD retrievals *[PM 8, WP 3-4]*
M3: Development of global dust fine resolution DOD product (2007 – 2016) *[PM 13, WP 5]*
M4: Accomplishment of global and regional dust simulations *[PM 19, WP 6]*
M5: Dust reanalysis product (2007 – 2016) *[PM 20, WP 6]*
M6: Evaluation of global and regional model dust simulations *[PM 24, WP 7]*

- *Deliverables*

D1: Career Development Plan of the experienced researcher *[PM 1]*
D2: Mid-term report of DUST-GLASS *[PM 13]*
D3: Fine resolution global DOD database (2007 to 2016) *[PM 13]*
D4: Dust reanalysis database over the period 2007-2016 *[PM 24]*
D5: Final report of DUST-GLASS *[PM 24]*
D6: Publications in open access peer reviewed scientific journals *[PM 24]*
D7: Oral and poster presentations given by the fellow in conferences/workshops *[PM 24]*
D8: Oral presentations given by the fellow in internal meetings/seminars *[PM 24]*

- *Secondment*

A secondment has been scheduled between PM14 and PM19 when the fellow will move to ES-BSC for the completion of global and regional dust simulations with the NMMB/BSC-Dust model (WP6). During his stay there, the fellow will be further trained on data assimilation through his involvement in the relevant activities (further extending the data assimilation capability of the NMMB/BSC-Dust model) acquiring the appropriate knowledge and skills on data assimilation systems. Moreover, the applicant over the secondment period will refine the evaluation strategy of global and regional simulations (WP7) in collaboration with his co-supervisor (Dr. Carlos Pérez García-Pando) as well as with the other ES-BSC participants (Dr. Oriol Jorba, Dr. Enza Di Tomaso) of DUST-GLASS. Finally, the fellow will present (ES-BSC seminars) to the local scientific group, the past, ongoing and oncoming activities of DUST-GLASS.

3.2 Appropriateness of the allocation of tasks and resources

A short description of the work packages of DUST-GLASS is given below.
WP1: The first work package has been designed in order to monitor the progress of the research activities (WP3-7), to facilitate the fellowship's internal communication (Section 3.3) and to resolve any setback which can endanger the timely accomplishment of project's tasks (see Section 3.3).
WP2: In WP2 are included the DUST-GLASS dissemination activities (Sections 2.2 and 2.3) regarding publications in scientific journals (P), participation in conferences/workshops (C), internal seminars (S) and lectures to university and secondary school students (SU).
WP3: The task (T3.1) of WP3 is to download, decode and store the raw satellite retrievals which will be used in the analysis. The aforementioned observations, available at fine spatial and temporal resolution, will be derived from the public MODIS, MISR and OMI ftp servers.
WP4: The main tasks of WP4 are: (i) the assessment of MODIS AOD quality flags applied in the raw satellite retrievals (T4.1) and (ii) error analysis of AOD regarding its dependencies on surface reflectance, viewing geometry, cloud contamination, surface elevation and wind speed (over maritime areas) (T4.2).
WP5: WP5 consists of two tasks where at the first one the acquired optical properties providing all the necessary information regarding aerosols' load, size and nature, will be projected in a common regular latitude-longitude grid of 0.1° spacing (T5.1) while in the second one the global fine resolution DOD database (2007-2016) will be developed (T5.2).
WP6: In WP6, the data assimilation system will be coupled with the NMMB/BSC-Dust model which will be used for the global (T6.1) and regional (T6.2) dust simulations described in RO 2.

WP7: The last WP is devoted to the assessment, both at global (T7.1) and regional (T7.2), of the NMMB/BSC-Dust model's performance (RO 3).

3.3 Appropriateness of the management structure and procedures, including risk management

- *Organisation and management structure*

In order to ensure the precise accomplishment of the proposed research, the fellow in collaboration with SIC will monitor, through weekly meetings, the progress of the project and its consistency according to the timetable (Section 3.1). The scope of these meetings will be the fellow to discuss with SIC about his research advancements, to organize the upcoming scientific and dissemination activities of the project as well as to manage any difficulty may be encountered. The aforementioned issues will be also in the agenda of regular meetings that will take place involving the rest participants who will contribute to the project's research activities. Finally, periodic reports detailing the progress of the research plan will be prepared and stored to monitor the evolution.

- Research and/or administrative risks that might endanger reaching the action objectives

Any risk related to scientific, technical and administrative aspects of the proposed project, apart from occasional delays with the milestones/deliverables, is expected to be minor without affecting essentially its precise implementation. As it concerns the scientific part, the risk mitigation is ensured by the high quality and experience of the SIC as well as of DUST-GLASS participants. Moreover, the datasets which will be used in each task of the project are freely available for research purposes and widely used in atmospheric sciences community. In addition, the analysis will be accomplished with open source software tools and the numerical simulations will be conducted with the NMMB/BSC-Dust model which has been developed in ES-BSC. The fellowship will be benefited by the support of the IT personnel of both institutes fully capable in resolving technical issues which can endanger the timely accomplishment of the project. The ample competences of host's secretariat services in handling financial and practical arrangements of research projects reduce the risk level regarding administrative issues. Even though all kind of risks have been identified, the fellowship would rely on the management work package (WP1; Section 3.1) in case the project has to face unexpected setbacks.

3.4 Appropriateness of the institutional environment (infrastructure)

Throughout the project's period, the fellow will have at his disposal all the necessary resources and infrastructures needed in order to reach the scientific and training objectives of DUST-GLASS. Both host and secondment host are committed to provide to the applicant full access to available databases stored in their repositories, in-house developed software for processing and computational resources. Moreover, the institutional participants will provide to the fellow the scientific and technical support for using the aforementioned facilities for research purposes. Below are given brief summaries of infrastructures available at NOA (host) and ES-BSC (secondment host).

NOA: In the context of the European Centre of Excellence BEYOND (www.beyond-eocenter.eu), NOA owns and operates significant space-based monitoring infrastructure and acquisition facilities, attributing to its leading role in Space and Earth Observation (EO) domains, at both national and international level. NOA operates a strong ground-based component as well, including state-of-the-art monitoring facilities like the advanced Polly^{XT} lidar in Finokalia, Crete, the mobile EMORAL lidar station and AERONET sun-photometric stations in Greece. Taking advantage of the existing EO receiving infrastructures, and the secured access to space agencies as ESA, NASA, DLR, CSA, JAXA, as well as the use of ground-based infrastructure and advanced models, NOA provides NRT observations and services to operational program frameworks of EC, ESA and to authorities and entities, at national and European level (e.g. ministries, civil protection authorities). Finally, NOA is equipped with cluster computing facilities consisting of 4 Intel(R) Xeon(R) E5-2640 v2 nodes (of InfiniBand switch) with a total of 128 CPUs and 256 GB RAM.

ES-BSC: BSC is one of the first eight Spanish "Severo Ochoa Centre of Excellence" awarded by the Spanish Government and one of the four hosting members of the European PRACE Research Infrastructure FP7 project. BSC hosts the MareNostrum III supercomputer, used in a Tier-0 PRACE system with 1Pflop/s capacity. The ES-BSC aims at carrying out research in Earth system modelling. The high performance capabilities and the close collaboration with the Computer Sciences department allow increasing the spatial/temporal resolution of atmospheric modelling systems to improve our knowledge on dynamic patterns of air pollutants in complex terrains and atmospheric interactions/feedbacks of physico-chemical processes.

4. CV of the Experienced Researcher

The fellow, Gkikas Antonis, was born in Athens, Greece, on 11 December 1979. His BSc title was received in 2004 from the Technological Educational Institute of Crete, Greece, in the field of Natural Resources and Environmental Engineering (Grade: 7.3 out of 10) [BSc thesis title: *Weather forecast atmospheric models*]. His MSc degree in Meteorology, Climatology and Atmospheric Physics (Grade: 8.56 out of 10) was received in 2007 [MSc thesis: *Aerosol optical properties in the broader area of the Mediterranean basin*] (Grade: Excellent). His PhD thesis (2012) dealt with the study of aerosol episodes in the Mediterranean basin [PhD thesis: *Study of aerosol episodes over the broader area of the Mediterranean basin based on contemporary satellite data*] (Grade: Excellent). Both MSc and PhD studies have been accomplished in the Laboratory of Meteorology of the Physics Department at the University of Ioannina (Greece). The scientific goals of his PhD were: (i) the development of an objective and dynamic satellite algorithm able to identify various types of aerosol episodes over the broader Mediterranean area, during the period 2000 - 2007, (ii) the description of aerosol episodes' regime (frequency of occurrence, intensity and duration) from grid cell to regional scales, (iii) the objective classification, based on multivariate statistical methods (Factor Analysis and Cluster Analysis), of atmospheric circulation patterns favouring the occurrence of aerosol episodes and (iv) the assessment of the direct radiative effects (DREs) under episodes conditions, at a local scale, based on the SBDART (Santa Barbara DISORT Atmospheric Radiative Transfer Model) radiation transfer model.

After the completion of his PhD, the applicant was working as a postdoctoral researcher in the Laboratory of Meteorology (University of Ioannina) and he was also collaborating as an external co-operator with the National Observatory of Athens, the University of Aegean and the University of Crete. In 2014, the fellow awarded with an individual Marie-Curie FP7-PEOPLE-IEF Scholarship which consists one of the most well-known and highly competitive personal grants at a European level. From May 2014 to April 2016 (2 years), the fellow worked as a postdoctoral researcher, in the framework of the MDRAF project funded by his MC-IEF scholarship, in the Earth Sciences Department of the Barcelona Supercomputing Center. Since 2006, he has worked in 8 research projects, participated as a co-author in 15 publications in peer-reviewed scientific journals and 52 scientific conference proceedings (13 National and 39 International). In addition, he has participated as a reviewer in four scientific journals (Natural Hazards and Earth System Sciences, Atmospheric Chemistry and Physics, Atmospheric Environment, Advances in Meteorology). In 2003, he worked for six months, on weather observation and forecasting, at the weather office of the airforce military base in Souda (Chania, Crete).

His main scientific interests lie in the field of aerosol science, and more specifically on aerosol optical/physical properties with a multi-year experience in using diverse satellite and ground observations provided at different spatial and temporal scales. Furthermore, he has acquired valuable experience on atmospheric-dust modelling through his collaboration with specialized researchers in one of the top international institutes (Barcelona Supercomputing Center) in dust modelling, in the framework of his EU Marie Curie MDRAF project. During his education phases and research activities, the fellow has acquired a significant knowledge of computer operating systems (e.g. Windows, Linux) and programming languages (e.g. Fortran, IDL, Python, CDO, NCL) as well as on applications running on high performance computers.

4.1 Publications in peer-reviewed scientific journals, peer-reviewed conference proceedings and/or monographs

The applicant has contributed in 15 research papers published in high quality scientific journals and he has been the first/second author in 7 of them. Moreover, the obtained results have been cited 139 times by 112 documents (h-index: 6) according to the Scopus database. The majority (12 out of 15) of the peer-reviewed publications in which the applicant has been involved have been announced in scientific journals ranked at the first quartile of the SCI metrics. In addition, the applicant has participated in the most well-know international conferences and workshops in the field of aerosol science as well as in Greek national conferences in the field of meteorology, climatology and atmospheric physics. More specifically, he has prepared high quality oral and poster presentations

being the first author in 27 out 52 national and international conference proceedings. Below, are provided the publications in peer-reviewed scientific journals as well as the publications in international conference proceedings which are relevant to the topic of the proposed project.

Publications in peer-reviewed scientific journals

1. **A. Gkikas**, N. Hatzianastassiou, N. Mihalopoulos: «**Aerosol events in the broader Mediterranean basin based 7-year (2000 – 2007) MODIS C005 data**», *Ann. Geophys*., 27, 3509-3522, doi:10.5194/angeo-27-3509-2009, 2009.
2. N. Hatzianastassiou, **A. Gkikas**, N. Mihalopoulos, O. Torres, and B. D. Katsoulis: **«Natural versus anthropogenic aerosols in the eastern Mediterranean basin derived from multiyear TOMS and MODIS satellite data»**, *J. Geophys. Res.*, 114, D24202, doi:10.1029/2009JD011982, 2009.
3. A. Bartzokas, V. Kotroni, K. Lagouvardos, C.J. Lolis, **A. Gkikas**, and M.I. Tsirogianni: «**Weather forecast in north-western Greece: RISKMED warnings and verification of MM5 model**», *Nat. Hazards Earth Syst. Sci.*, 10, 383–394, 2010.
4. A. Bartzokas, J. Azzopardi, L. Bertotti, A. Buzzi, L. Cavaleri, D. Conte, S. Davolio, S. Dietrich, A. Drago, O. Drofa, **A. Gkikas**, V. Kotroni, K. Lagouvardos, C.J. Lolis, S. Michaelides, M. Miglietta, A. Mugnai, S. Music, K. Nikolaides, F. Porcù, K. Savvidou, and M.I. Tsirogianni: **«The RISKMED project: Philosophy, methods and products»,** *Nat. Hazards Earth Syst. Sci.*, 10, 1393–1401, 2010.
5. E.E. Houssos, C.J. Lolis, **A. Gkikas**, N. Hatzianastassiou, A. Bartzokas: **«On the atmospheric circulation characteristics associated with fog in Ioannina, north-western Greece»,** *Int. J. Climatol.*, 32: 1847–1862. doi: 10.1002/joc.2399, 2012.
6. **A. Gkikas**, E.E. Houssos, N. Hatzianastassiou, C.D. Papadimas, A. Bartzokas: «**Synoptic conditions favouring the occurrence of aerosol episodes over the broader Mediterranean basin**», *Q.J.R. Meteorol. Soc.*, 138: 932–949. doi: 10.1002/qj.978, 2012.
7. G. Athanasssiou, N. Hatzianastassiou, **A. Gkikas**, C. Papadimas: «**Estimating aerosol optical depth over the broader Greek area from MODIS satellite**», *Water Air Soil Pollut.*, 224:1605, doi: 10.1007/s11270-013-1605-2, 2013.
8. V. Amiridis, U. Wandinger, E. Marinou, E. Giannakaki, A. Tsekeri, S. Basart, S. Kazadzis, **A. Gkikas,** M. Taylor, J. Baldasano, and A. Ansmann: **«Optimizing CALIPSO Saharan dust retrievals»**, *Atmos. Chem. Phys.*, 13, 12089-12106, doi:10.5194/acp-13-12089-2013, 2013.
9. **A. Gkikas**, N. Hatzianastassiou, N. Mihalopoulos, V. Katsoulis, S. Kazadzis, J. Pey, X. Querol, and O. Torres: **«The regime of intense desert dust episodes in the Mediterranean based on contemporary satellite observations and ground measurements»**, *Atmos. Chem. Phys.*, 13, 12135-12154, doi:10.5194/acp-13-12135-2013, 2013.
10. M. Taylor, S. Kazadzis, A. Tsekeri, **A. Gkikas**, and V. Amiridis: **«Satellite retrieval of aerosol microphysical and optical parameters using neural networks: a new methodology applied to the Sahara desert dust peak»**, *Atmos. Meas. Tech.*, 7, 3151-3175, doi:10.5194/amt-7-3151-2014, 2014.
11. M. B. Korras Carracca, N. Hatzianastassiou, C. Matsoukas, **A. Gkikas**, and C.D. Papadimas: **«The regime of aerosol asymmetry parameter over Europe, Mediterranean and Middle East based on MODIS satellite data: evaluation against surface AERONET measurements»**, *Atmos. Chem. Phys.., 15, 13113-13132, 2015*.
12. **A. Gkikas**, E.E. Houssos, C.J. Lolis, A. Bartzokas, N. Mihalopoulos, N. Hatzianastassiou: «**Atmospheric circulation evolution related to desert dust episodes over the Mediterranean**», *Q.J.R. Meteorol. Soc.*, 141, 690, 1634 – 1645, doi:10.1002/qj.2466, 2015.
13. E. Flaounas, V. Kotroni, K. Lagouvardos, S. Kazadzis, **A. Gkikas**, N. Hatzianastassiou: «**Cyclone contribution to dust transport over the Mediterranean region**», *Atmos. Sci. Let.*, doi: 10.1002/asl.584, 2015.
14. **A. Gkikas**, N. Hatzianastassiou, N. Mihalopoulos, and O. Torres: **«Characterization of aerosols episodes in the greater Mediterranean Sea area from satellite observations (2000–2007)»**, *Atmos. Environ.*, 128, 286–304, doi:10.1016/j.atmosenv.2015.11.056, 2016.

15. **A. Gkikas**, S. Basart, N. Hatzianastassiou, E. Marinou, V. Amiridis, S. Kazadzis, J. Pey, X. Querol, O. Jorba, S. Gassó, and J.M. Baldasano: **«Mediterranean intense desert dust outbreaks and their vertical structure based on remote sensing data»**, *Atmos. Chem. Phys.*, 16, 8609-8642, doi:10.5194/acp-16-8609-2016, 2016.
16. **A. Gkikas**, et al. «**Direct radiative effect of intense dust outbreaks in the Mediterranean**» (*in preparation*)**.**
17. **A. Gkikas**, et al. «**Intercomparison of MODIS-Aqua C051 and C006 Level 3 Deep Blue AOD and Ångström exponent retrievals over the Sahara desert and the Arabian Peninsula during the period 2002-2014**» (*in preparation*)**.**

Publications in international conference proceedings

1. **A. Gkikas**, N. Hatzianastassiou, N. Mihalopoulos: «**Study and characterization of aerosol episodes in the Mediterranean basin for the 7-year period 2000 – 2007 based on MODIS data**», European Aerosol Conference, Abstract T06A115O, Greece, Thessaloniki, 24 – 29 August 2008.
2. **A. Gkikas,** N. Hatzianastassiou, N. Mihalopoulos, O.Torres, B. D. Katsoulis: «**The role of natural and anthropogenic particles in the eastern Mediterranean basin aerosol levels based on multi-year TOMS and MODIS satellite data**», M15.52/29204, p. 167, Our warming planet, IAMAS-IAPSO-IACS MOCA-09, Joint General Assembly, Montreal, Canada, July 19 – 29, 2009.
3. **A. Gkikas**, N. Hatzianastassiou, N. Mihalopoulos: «**Direct radiative effect of extreme desert dust episodes in the Mediterranean basin**», International Aerosol Conference, Finland, Helsinski, 2F3, 29 August – 3 September 2010.
4. N. Mihalopoulos, S. Kleanthous, G. Kouvarakis, **A. Gkikas**, E. Vasilliadou, C. Theodosi, C. Zoubali, N. Hatzianastassiou: «**Interannnual variability of dust over the Eastern Mediterranean**», 6th International workshop on sand/duststorms and associated dustfall, 7-9 September 2011, Athens, Greece.
5. M. Taylor, S. Kazantzis, A. Tsekeri, **A. Gkikas** and V. Amiridis: «**Calculation of aerosol microphysical properties by neural network inversion of ground-based AERONET data**», European Aerosol Conference, Spain, Granada, 2 – 7 September, 2012.
6. V. Amiridis, U. Wandinger, E. Marinou, A. Tsekeri, E. Giannakaki, S. Kazadzis, **A. Gkikas** and A. Ansmann: «**Optimization of CALIPSO dust retrievals over Europe and North Africa**», First International Conference on Remote Sensing and Geoinformation 2013, 8-10 April 2013, Paphos, Cyprus.
7. **A. Gkikas**, N. Hatzianastassiou, N. Mihalopoulos, V. Katsoulis, S. Kazadzis, J. Pey, X. Querol, and O. Torres: «**A satellite based algorithm for identifying desert dust episodes: the regime of episodes in the Mediterranean basin and evaluation against surface measurements**», Geophysical Research Abstracts, Vol. 15, EGU2013-14205-1, EGU General Assembly 2013, 2013.
8. N. Hatzianastassiou, C.D. Papadimas, **A. Gkikas**, C. Matsoukas, A. M. Sayer, N. C. Hsu, I. Vardavas: «**Aerosol radiative effects over global arid and semi-arid regions based on MODIS Deep Blue satellite observations**», Geophysical Research Abstracts, Vol. 16, EGU2014-16014, EGU General Assembly 2014, 2014.
9. E. Flaounas, V. Kotroni, K. Lagouvardos, S. Kazadzis, **A. Gkikas** and N. Hatzianastassiou: «**Cyclones contribution to dust transport over the Mediterranean region**», Geophysical Research Abstracts, Vol. 17, EGU2015-14807, EGU General Assembly 2015, 2015.
10. **A. Gkikas**, S. Basart, M. Korras-Carraca, C. Papadimas, N. Hatzianastassiou, A. Sayer, C. Hsu, J.M. Baldasano: «**Intercomparison of MODIS-Aqua C051 and C006 Level 3 Deep Blue AOD and Ångström exponent retrievals over the Sahara desert and the Arabian Peninsula during the period 2002-2014**», Geophysical Research Abstracts, Vol. 17, EGU2015-13537, EGU General Assembly 2015, 2015.
11. **A. Gkikas**, S. Basart, N. Hatzianastassiou, J. Pey, X. Querol, V. Amiridis, O. Jorba, S. Gassó, J.M. Baldasano: «**Study of the Mediterranean desert dust outbreaks' vertical structure on**

a synergistic use of satellite and ground retrievals», Geophysical Research Abstracts, Vol. 17, EGU2015-13713-1, EGU General Assembly 2015, 2015.

12. **A. Gkikas**, V. Obiso, S. Basart, O. Jorba, C. Pérez García-Pando, N. Hatzianastassiou, S. Gassó and J.M. Baldasano: «**Direct radiative effect of an intense Mediterranean desert dust outbreak, based on NMMB/BSC-Dust model simulations: the case of 2 August 2012**», European Aerosol Conference, Italy, Milan, 6 – 11 September, 2015.
13. **A. Gkikas**, V. Obiso, S. Basart, O. Jorba, C. Pérez García-Pando, N. Hatzianastassiou, S. Gassó and J.M. Baldasano: «**Direct radiative effect of intense dust outbreaks in the Mediterranean**», AGU Fall Meeting, San Francisco, USA, 14 – 18 December, 2015.
14. N. Hatzianastassiou, **A. Gkikas**, C. D. Papadimas, M. Gavrouzou: «**Intense dust episodes in the Mediterranean and possible effects on atmospheric lapse rates**», Geophysical Research Abstracts, Vol. 18, EGU2016-14601, EGU General Assembly 2016, 2016.
15. **A. Gkikas**, V. Obiso, L. Vendrell, S. Basart, O. Jorba, C. Pérez García-Pando, N. Hatzianastassiou, S. Gassó and J.M. Baldasano: «**Direct radiative effects induced by intense desert dust outbreaks over the broader Mediterranean basin**», Geophysical Research Abstracts, Vol. 18, EGU2016-6736, EGU General Assembly 2016, 2016.
16. M. Betsikas, N. Hatzianastassiou, C.D. Papadimas, **A. Gkikas**, C. Matsoukas, A. Sayer, C. Hsu and I. Vardavas: «**Assessment of the MODIS-Terra Collection 006 aerosol optical depth data over the greater Mediterranean basin and inter-comparison against MODIS C005 and AERONET**», Geophysical Research Abstracts, Vol. 18, EGU2016-15907, EGU General Assembly 2016, 2016.
17. **A. Gkikas**, V. Obiso, L. Vendrell, S. Basart, O. Jorba, C. Pérez García-Pando, N. Hatzianastassiou, S. Gassó and J.M. Baldasano: «**Mediterranean desert dust outbreaks' direct radiative effects based on regional model simulations**», 8th International Workshop on Sand/Duststorms and Associated Dustfall, Lisbon, 1 – 4 May 2016.

4.2 Participation in research projects

The applicant during his research career has participated in 8 scientific projects contributing in data analysis, dissemination of the relevant results (i.e. journal publications, conference oral and poster presentations) as well as in the writing of reports. The list of the research projects is presented in a chronological order below:

- **1/11/2006 – 31/12/2007**: «Weather Risk Reduction in the Central and Eastern Mediterranean – RISKMED». (http://www.riskmed.net)
- **4/11/2008 – 24/11/2008**: «Weather Risk Reduction in the Central and Eastern Mediterranean – RISKMED»
- **1/3/2008 – 31/12/2009**: «Study of aerosol optical properties in Epirus and the northwestern Greek area based on high resolution contemporary satellite measurements»
- **1/6/2011 – 31/12/2011:** «Aerosol and Cloud Influence on the global surface UV irradiance retrieved from satellite sensors (ACI-UV)»
- **1/10/11 – 31/5/2012: «**LIFE+PM^3**»**
- **1/2/2012 – 30/4/2012: «**Aerosol and Cloud Influence on the global surface UV irradiance retrieved from satellite sensors (ACI-UV)**»**
- **1/8/2012 – 31/12/2013: «**Lidar Climatology of Vertical Aerosol Structure for Space-Based Lidar Simulation Studies – LIVAS» (http://lidar.space.noa.gr:8080/livas/)
- **20/11/2012 – 31/5/2013:** «Deucalion: modern educational tools for precaution measures during extreme weather events» (http://deucalion.edu.gr/about.php?wp)
- **1/11/2012 – 30/4/2014:** «Identification of sources and physicochemical properties of fine and ultrafine suspended particles affecting the climate of Greece»
- **1/5/2014 – 30/4/2016**: «Effects of Mediterranean desert dust outbreaks on radiation, atmospheric dynamics and forecasting accuracy of a numerical mesoscale model – MDRAF»

4.3 Scholarships

In 2014, the applicant awarded with an individual Marie-Curie scholarship (MC-IEF-Intra-European Fellowships) receiving funding from the European Union's Seventh Framework Programme (FP7-PEOPLE-2013-IEF) for research, technological development and demonstration under grant agreement No 622662.

Title:	Effects of Mediterranean desert dust outbreaks on radiation, atmospheric dynamics and forecasting accuracy of a numerical mesoscale model
Acronym:	MDRAF
Weblink:	http://cordis.europa.eu/project/rcn/187703_en.html
Period:	1 May 2014 – 30 April 2016 (2 years)
Host institute:	Barcelona Supercomputing Center (BSC)
Objectives:	• Description of the Mediterranean desert dust outbreaks' three dimensional structure based on remote sensing data. • Assessment of the direct radiative effects, induced by widespread and intense Mediterranean desert dust outbreaks, based on regional model short-term simulations.

4.4 Contribution to book chapters

Since 2013, the applicant is a member of a scientific group, under the supervision of Prof. Aristides Bartzokas (Physics Department, University of Ioannina, Greece), working on the translation to Greek of the meteorology book entitled "*Understanding Weather and Climate*" (Prentice Hall, 6th Edition). More specifically, the applicant is in charge for the translation of Chapters 7-11 related to issues of precipitation processes, global atmospheric circulation, air masses and fronts, midlatitude cyclones and severe weather events.

4.5 Teaching and working experience

The applicant, during his MSc and PhD studies (University of Ioannina) was working also as an assistant teacher in the laboratories of Atmospheric Physics, for five academic years (2009-2014), being responsible for the experimental set up as well as for the guidance of students in executing their exercises. Finally, the applicant has been working for six months (Jun-Nov 2003), in the framework of his graduate traineeship, in the weather office of the military air base in Souda (Crete, Greece). His daily responsibilities were the operational weather forecast and observation as well as the production of weather map analyses.

5. Capacity of the Participating Organisations

National Observatory of Athens, Greece – NOA	
General Description	The National Observatory of Athens (NOA) is a Research Centre with continuous presence in science and education at international level, for more than 170 years. The Institute for Astronomy, Astrophysics, Space Applications and Remote Sensing (IAASARS) has been actively involved in space sciences, space applications and Earth Observation with remarkable achievements in leading research, and operational activities in the context of EU flagship programs/initiatives (COPERNICUS, GEO, SPACE) and ESA projects. Detailed evaluation of the institute's activities can be found online (goo.gl/pURJWZ).
Role and Commitment of key persons (supervisor)	Dr. Vassilis Amiridis will be the SIC. He is expert in ground- and space-based dust observation.
Key Research Facilities, Infrastructure and Equipment	NOA owns and operates: a) a ground-based advanced Polly^{XT} lidar, the mobile EMORAL lidar station, and 2 AERONET sun photometric stations, b) satellite ground segment monitoring infrastructure and acquisition facilities, including ESA Mirror Site Collaborative Ground Segment c) processing, archiving, and cataloguing computing facilities for handling satellite data d) dust modelling lab and computer clusters.
Independent research premises?	Yes. NOA has independent facilities at two locations in Athens, Greece (Thisseion and Penteli) and has access to the remote sensing research stations of Finokalia, Crete, and the Navarino Environmental Observatory (NEO)
Previous Involvement in Research and Training Programmes	**Selected research programmes:** EU-EARLINET (earlinet.org); EU-GMES/MACC (www.gmes-atmosphere.eu); EU-AMFIC (www.amfic.eu); ESA-LIVAS (goo.gl/sZmVCB) **Selected training programmes:** PROTIPA-Human Networks (National training network activity); VA has supervised 5 Post-docs, 9 PhDs, 10 MScs. With EU-Marie Curie funding, he co-supervised Michael Taylor at NOA.
Current involvement in Research and Training Programmes	**Selected research programmes:** EU-ACTRIS (www.actris.net); EU-BEYOND (beyond-eocenter.eu); ESA-CharadmExp (charadmexp.gr); ESA-MULTIPLY (Development of a European HSRL airborne facility); Coordinates Geo-CRADLE ("Coordinating and integRating state-of-the-art Earth Observation Activities in the regions of NA, ME, and Balkans and Developing Links with GEO related initiatives towards GEOSS"). **Selected training programmes:** NOA is the main participant in the MSc programme "Space Science Technologies and Applications" (space.uop.gr). VA is (co)supervising 3 Post-docs, 3 PhDs, 2 MSc students. With EU-Marie Curie funding, he co-supervises Phd candidate A. Argyrouli (ITaRS ITN).
Relevant Publications and/or research/innovation products	Amiridis, V. et al. LIVAS: a 3-D multi-wavelength aerosol/cloud database based on CALIPSO and EARLINET. Atmos. Chem. Phys. 15, 7127–7153 (2015). Amiridis, V. et al. Optimizing CALIPSO Saharan dust retrievals. Atmos. Chem. Phys. 13, 12089–12106 (2013). Solomos, S., et al. Density currents as a desert dust mobilization mechanism. Atmos. Chem. Phys. 12, 11199-11211 (2012). Amiridis, V., et al. The potential of the synergistic use of passive and active remote sensing measurements for the validation of a regional dust model, Annales Geophys., 27, 3155-3164, (2009).

Earth Sciences – Barcelona Supercomputing Center, Spain – ES-BSC	
General description	The Barcelona Supercomputing Center (BSC) was established in 2005 and serves as the national supercomputing facility. Currently, it is hosting 1 of the 6 European Tier-0 supercomputers and is among the best supercomputing centers in the world. The mission of BSC, as a unique fusion of a classic national scientific support structure and a cutting-edge research institute, is to research, develop and manage information technologies in order to facilitate scientific progress. Recruitment procedures are based on principles of merit, transparency, competition and gender balance and the center has been awarded with the badge of Human Resources Excellence in Research (HRS4R) in April 2015.
Key Persons and Expertise (supervisor)	Dr. Carlos Pérez García-Pando will be the co-supervisor. He is expert in dust modelling and his scientific interests lie in the field of mineral dust physical and optical properties as well as on dust impacts on climate, ocean biogeochemistry, air quality, and health.
Key Research facilities, infrastructure and equipment	The BSC manages supercomputing facilities, notably MareNostrum, currently 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. There are also a range of purpose-built fat nodes and a storage facility that facilitates research on Big Data issues.
Previous and Current Involvement in Research and Training Programmes	**Fellowships:** Since 2008, BSC hosted several Marie-Curie Individual Fellowhips (e.g. EEPPIBM, MDRAF). One of the MSC IF has been awarded under Dr. Oriol Jorba supervision in 2015 (INAQUA) and three ITNs (SCALUS, NEMOH, COPA-GT). BSC also hosts national fellowships, both for early-stage and senior postdoctoral positions (approximately 30 were awarded since 2006). **Collaboration with universities:** within BSC, there is a large record of collaboration with Universidad Politècnica de Catalunya (UPC) including the Master degree in Environmental Engineering (UPC), associated with the ES-BSC. **Excellence Programs and Networks:** A number of training activities are organized under the framework of: Severo Ochoa Excellence Program, RES, NVIDIA CUDA/GPU excellence center, PRACE, HiPEAC and H2020-EINFRA-Centers of Excellence for computing applications (PoP, ESiWACE, BioExcel, NoMaD, MaX, EoCoE). **Research Fellowships:** BSC is currently awarded with 9 early-stage postdoc (7 Juan de la Cierva and 2 Beatriu de Pinós), 12 senior (5 Ramón y Cajal, 3 I3 and 6 ICREA) and is supporting 4 ITN, 2 RISE and 4 Marie-Curie Individual Fellowships. Two of these Marie-Curie actions (DPETNA, NeTNPPAO) are currently developed in BSC-ES, which will host the present Marie-Curie proposal. **Current involvement in Research Programs:** ACTRIS-2 (Aerosols, Clouds, and Trace gases Research InfraStructure) is a European Project supported by the European Commission Horizon 2020 Research and Innovation Framework Programme (H2020-INFRAIA-2014-2015) from 1 May 2015 to 30 April 2019. The BSC is a partner for this project. Project website: http://www.actris.eu/
Relevant Publications and/or research/innovation product	Pérez, C. et al. 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, (2011). Haustein, K. et al. Atmospheric dust modeling from meso to global scales with the online NMMB/BSC-Dust model – Part 2: Model description, annual simulations and evaluation. Atmos. Chem. Phys., 12, 2933-2958, (2012). Di Tomaso, E., et al. Assimilation of MODIS Dark Target and Deep Blue observations in the dust aerosol component of NMMB/BSC-CTM version 1.0, submitted in Geosci. Model Dev., (2016).

6. Ethical Issues

Compliance with the relevant ethics provisions is essential from the beginning to the end of the action and is an integral part of research funded by the European Union within Horizon 2020.

Applicants submitting research proposals for funding within Marie Skłodowska-Curie actions in Horizon 2020 should demonstrate proactively to the REA that they are aware of and will comply with European and national legislation and fundamental ethical principles, including those reflected in the Charter of Fundamental Rights of the European Union and the European Convention on Human Rights and its Supplementary Protocols.

Please be aware that it is the applicants' responsibility to identify any potential ethical issue, to handle the ethical aspects of the proposal and to detail how these aspects will be addressed.

The Ethics Review Procedure in Horizon 2020

All proposals above threshold and considered for funding will undergo an Ethics Review carried out by independent ethics experts. When submitting a proposal to Horizon 2020, all applicants are required to complete an "**Ethics Issues Table (EIT)**" in the Part A of the proposal. Applicants who flag ethical issues in the EIT have to also complete a more in depth **Ethics Self-Assessment in Part B**.

No ethical issues were flagged in Part A of DUST-GLASS

ENDPAGE

MARIE SKŁODOWSKA-CURIE ACTIONS

Individual Fellowships (IF)
Call: H2020-MSCA-IF-2016

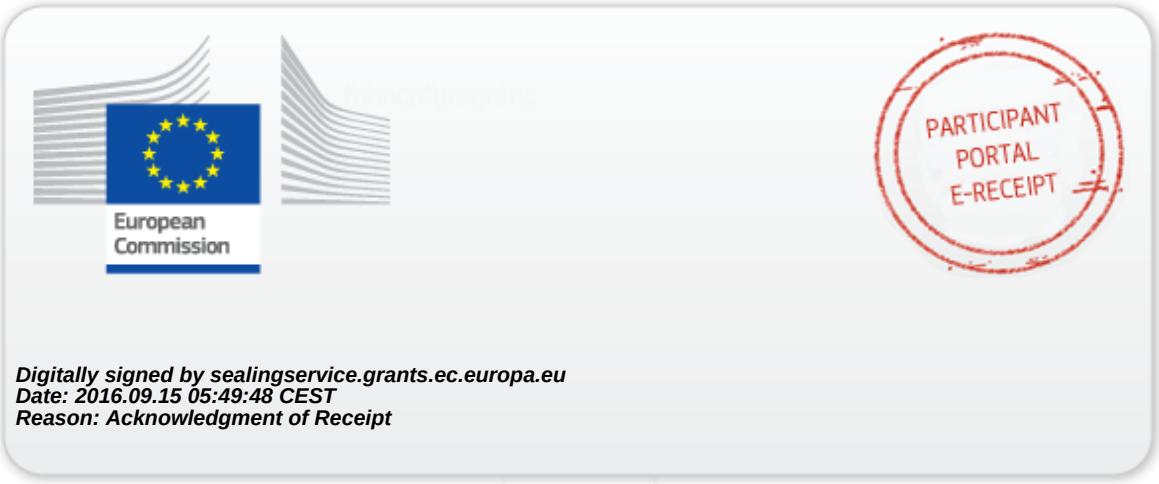
PART B

"**DUST-GLASS**"

Improving global dust prediction and monitoring through data assimilation of satellite-based dust aerosol optical depth

This proposal is to be evaluated as:

[Standard EF]



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