Final Report – PRACE Project Access

1. General information

1.1. Proposal ID

Nº 2016153617

1.2. Type of project granted

Project Access [Single-Year]

1.3. Period of access to the PRACE facilities

1 July 2017 – 31 March 2018

1.4. Name of the PRACE facility assigned

MareNostrum IV

1.5. Name of the Principal Investigator

Sara Basart

2. Project information

2.1. Project name

High-resolution regional dust reanalysis based on ensemble data assimilation techniques (eDUST)

2.2. Main research field (in brackets the corresponding ERC fields)

(Please click twice in the box of your research field and select “checked”)

- [ ] Economics, Finance and Management (SH1, SH2)
- [ ] Linguistics, Cognition and Culture (SH3, SH4, SH5, SH6)
- [ ] Biochemistry, Bioinformatics and Life sciences (LS1, LS2, LS8, LS9)
- [ ] Physiology and Medicine (LS3, LS4, LS5 LS6, LS7)
- [ ] Mathematics and Computer Sciences (PE1, PE6)
- [ ] Fundamental Physics (PE2)
- [ ] Chemical Sciences and Materials (PE3, PE4, PE5)
- [ ] Engineering (PE7, PE8)
- [ ] Universe Sciences (PE9)
- [x] Earth System Sciences (PE10)

2.3. Institutions and research team members

Please include new research team members and institutions added after the project start as users (if applicable).

All the team members are associated to the Barcelona Supercomputing Center (BSC)

Sara Basart (Spanish; sara.basart@bsc.es)
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Added after the Project start:

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Larissa Batista (Brazilian; larissa.batista@bsc.es)

2.4. Summary of the project *(Maximum 500 words)*

Please fill in the field with the same text used in the application form.

Over the past decade, there has been a growing recognition of the crucial role of sand and dust storms (SDS) on weather, climate and ecosystems, along with their important adverse impacts upon life, health, property, economy.

Reacting to the concerns on SDS by its most affected member states, the World Meteorological Organization (WMO) endorsed the launch of the SDS Warning Advisory and Assessment System (SDS-WAS), and more recently of the first Regional Specialized Meteorological Center for Northern Africa, Middle East and Europe with activity specialization on Atmospheric Sand and Dust Forecast. The SDS-WAS mission is to enhance the delivery of timely and quality SDS forecasts, observations, information and knowledge to users through an international partnership of research and operational communities.

Understanding, managing and mitigating SDS risks requires fundamental and cross-disciplinary knowledge underpinned by state-of-the-art scientific research, the availability of reliable information on SDS past trends and current conditions, the provision of skilful forecasts and projections tailored to a diversity of users, and the

capacity to use the information effectively. At present, all these requirements are confronted by major challenges. These challenges include the lack of reliable dust information in many countries affected by SDS and the very limited integration of dust information and forecasts into practice and policy.

A major obstacle to reconstructing comprehensive dust information of the past is the scarcity of historical and routine in-situ dust observations, particularly in the countries most affected by SDS. Model simulations can be used to “fill in the blanks” and overcome the sparse coverage, low temporal resolution and partial information provided by measurements. By objectively combining model simulations with satellite observations, eDUST contributes to produce an advanced decadal high-resolution dust reanalysis for Northern Africa, Middle East and Europe. The proposed dust regional reanalysis is built on three pillars: a state-of-art dust model and data assimilation system, quality observations and understanding of their respective uncertainties, and flow-dependent uncertainties reflected by the ensemble simulations. So far current reanalysis have been thought for the global domain (missing dust processes associated to finer spatiotemporal scales) and are based on the assimilation of total aerosol optical properties (lacking observational constraints on the model individual aerosol components). The novelty of eDUST is the generation of a dataset at an unprecedented high-resolution and the assimilation of satellite products over source regions with specific observational constraints for dust.

eDUST aims at making a significant step forward in the way SDS affect society. The reanalysis dataset will become a valuable resource for numerous users to drive or diagnose their models and applications. The wider community will benefit from derived studies on the impact of dust on weather, climate, atmospheric chemistry and ecosystems. The high-resolution dust reanalysis will describe with accuracy the dust variability and trends, and provide extensive information for the socio-economic evaluation of major events, and their short (direct) and long-term (induced) impacts on society. It will also allow the assessment of the efficiency of counter-measures for particular sectors.

2.5. Description of the results obtained from the scientific point of view, future perspectives, benefits to our society and the benefits of using computer resources. *(Maximum 1000 words)*

The reanalysis produced within eDUST is based on the atmospheric-aerosol-chemistry non-hydrostatic and multiscale NMMB-MONARCH model. As a first step, we were working on the improvement of the simulation workflow to take into account computational-intensive ensemble simulations to be run over a long period; improvement of the data assimilation (DA) code efficiency and memory handling, in order to run high resolution simulations and an efficient assimilation. In a second step, we were running a set of experiments to help us to best characterize model uncertainty depending on the observations considered in the data assimilation.

During eDUST we evaluated the potential for data assimilation of the IASI dust datasets produced within the ESA Climate change Initiative (CCI) project as well as vertical extinction profiles provided by ACTRIS which is the European Research

Infrastructure for the observation of Aerosol, Clouds and Trace Gases.

Data assimilation experiments were run for four different IASI dust optical depth (DOD) global datasets provided by ESA-CCI project to assess the impact of their assimilation in the NMMB-MONARCH model (*ESA CCI report, 2018*). The four IASI DOD retrieval products (i.e. IMARS v5.2, LMD v2.1, MAPIR v3.5 and ULB v8) were assimilated on their own in individual experiments, or combined in the same experiment, thus generating five different IASI analyses (see Figure 1) for the period from 1 February to 30 June 2015. The data assimilation system was set to a similar configuration used to assimilate MODIS observations in Di Tomaso et al. (2017). An ensemble of model simulations is generated for data assimilation purposes. Each ensemble member is run with a perturbation of model parameters which are deemed to be particularly uncertain in the dust emission scheme. The structure of our source perturbations, for both types of perturbations, is temporally and spatially constant. The spin-up period for the ensemble ensures that perturbations applied at the sources propagate everywhere in the globe. The ensemble simulation, with or without data assimilation, were run using 12 ensemble members. We used the total dust mixing ratio as analysis variable in the state vector, a 24 h assimilation window, and observations are considered for assimilation at four time slots within the window, at 0, 6, 12, and 18 UTC. The system uses as first guess a 1-day forecast with output every 6 h. Simulated observation and background departures are calculated at each time slot. For most of the IASI products, the evaluation of the IASI analyses with an independent set of observations demonstrates some regional improvements of the aerosol representation in the model. However, the IASI analyses show overall a higher bias than a reference simulation when compared to independent observations.

Additionally, two specific case studies were conducted within the H2020 ACTRIS-2 project (www.actris.eu) to constrain the vertical structure of the dust plume in the NMMB-MONARCH model by the assimilation of aerosol profiles measured by lidars (*ACTRIS-2 Final Report, in preparation*). The sparse nature of lidar ground-based observations is better handled with reasonably high resolution simulations, which are more efficiently run on a regional, rather than a global, domain. Therefore, the DA scheme, initially built for a global regular grid (see Di Tomaso et al., 2017), has been adapted to the NMMB-MONARCH regional rotated coordinate system. The rotated frame is used in order to reduce the variation of the grid size. The two study cases were (i) in Senegal in the Sahel on 30-31 March 2015 (Figure 2 and Figure 3), and (ii) in the East Mediterranean region during April 19-23, 2017 (Figure 4). For this purpose a 12 member forecast ensemble based on known uncertainties in the physical parametrizations of the mineral dust emission scheme has been created as described in the previous exercise. We use a 24-hour assimilation window and observations are considered for assimilation at four time slots within the window, at 0, 6, 12 and 18 UTC. The system uses as first guess a 1-day forecast with output every 6 hours. Simulated observation and background departures are calculated at each time slot. Consistently with the increment plots, in both study cases in Senegal and the Eastern Mediterranean, the Figures 3 and 4 show an overall correction of a model underestimation of the total column extinction. Furthermore, assimilated observations are able to correct in most cases the plume height showing the benefits of assimilations profiles for aerosol forecasts.

Particularly for eDUST's objectives, the implementation of the ensemble forecast for

NMMB-MONARCH has been enhanced with the perturbation of meteorological initial and boundary conditions and the use of different parametrisation schemes for dust emission modelling, additionally to the already implemented perturbations of model emission parameters. Therefore, various settings can now be chosen of perturbing only one or more emission parameters, dust scheme or meteorological inputs, or a combination of them. These different settings have been tested during the project to identify the best characterization of model uncertainty through ensemble forecasts. Model uncertainty (expressed as background error covariance in the DA algorithm) is estimated from the realisations of the dust fields in the ensemble. A baseline configuration for the reanalysis can be currently run using 16 by 16 processors for the DA application, a 24 hour assimilation window, a time resolution of 3 hours, an observation influence that smoothly (exponentially) fades to zero before a distance of 20 model grid points from the observation location (in the horizontal plane), and 12 members for the ensemble. In all our experiments we use the LETKF implementation with a four-dimensional extension as described in Di Tomaso (2017). MODIS "coarse" DOD product (over land) produced by Paul Ginoux (GFDL) are assimilated at 12 UTC, i.e. the closest analysis time slot to the satellite overpass. Experiments with and without assimilation have been run for one year (2012), using the same settings of the control single-member experiment. The resulting DOD averaged for February and March of 2012 for the control, and the mean analysis experiments are shown in Figure 5 meanwhile time series of model DOD for the control simulation and mean analysis at IER Cinzana AERONET station (in the Sahel) is shown in Figure 6. These time series show that, while the characterisation of some dust events benefits of satellite assimilation, some dust events are missed by the model simulations and not improved by data assimilation. The latter could be due to misrepresentation of model uncertainty, i.e. to a limitation of the ensemble perturbations used in this simulation.

The potentiality of the use of DA in operational dust forecasts or dust reanalysis experiments to improve the performance of the model results is demonstrated in the results obtained in the context of eDUST. Otherwise, DA is a useful tool for data analysis as it is demonstrated in the ESA CCI and ACTRIS-2 exercises to understand the retrievals obtained by the experimental researchers. This type of simulations based on an ensemble of model(s) won't be possible without the access to HPC resources.

2.6. Expected future work in the area

The set experiments conducted within eDUST considering global gridded satellite data (for the IASI exercise) and ground-station vertical profiles (for the ACTRIS-2 exercise) show the benefits of model-observations synergistic approaches to improve forecasts products. All these sensitivity experiments for assimilation of different aerosol observations products undertook in eDUST has been fundamental for the production of the reanalysis that is nowadays ongoing.

Furthermore, all the technical task related to the improvement of the simulation workflow; improvement of the data assimilation code efficiency and memory handling developed during eDUST will be fundamental for the recent granted PRACE eFRAGMENT project. eFRAGMENT is directly connected to the ongoing

ERC Consolidator Grant FRontiers in dust minerAloGical coMposition and its Effects upoN climate (Fragment) project that aims to generate integrated and quantitative knowledge of the role of dust mineralogy in dust-radiation, dust-chemistry and dust-cloud interactions based on modelling experiments.

2.7. Images of the results including description or caption *(Minimum resolution 300 dpi)*
All tables and figures (including photographs, schemas, graphs and diagrams) should be numbered with Arabic numerals (1, 2,...n) and include a descriptive caption. Please attach the images to this form.

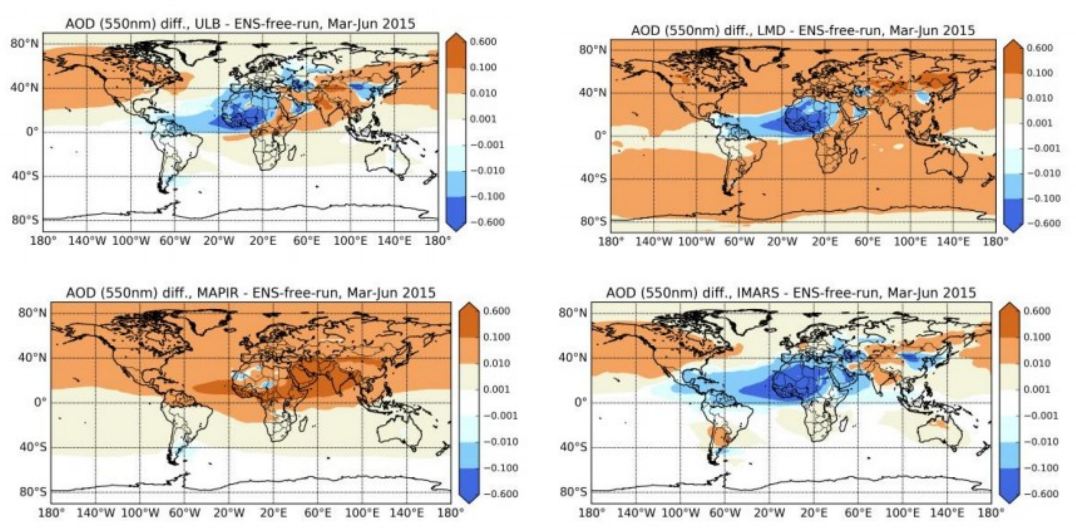

Figure 1. Differences between analyses and free run by assimilating 4 IASI dust extinction retrievals: ULB v8 (upper left), LMD v2.1 (upper right), MAPIR v3.5 (lower left) and IMARS v5.2 (lower right).

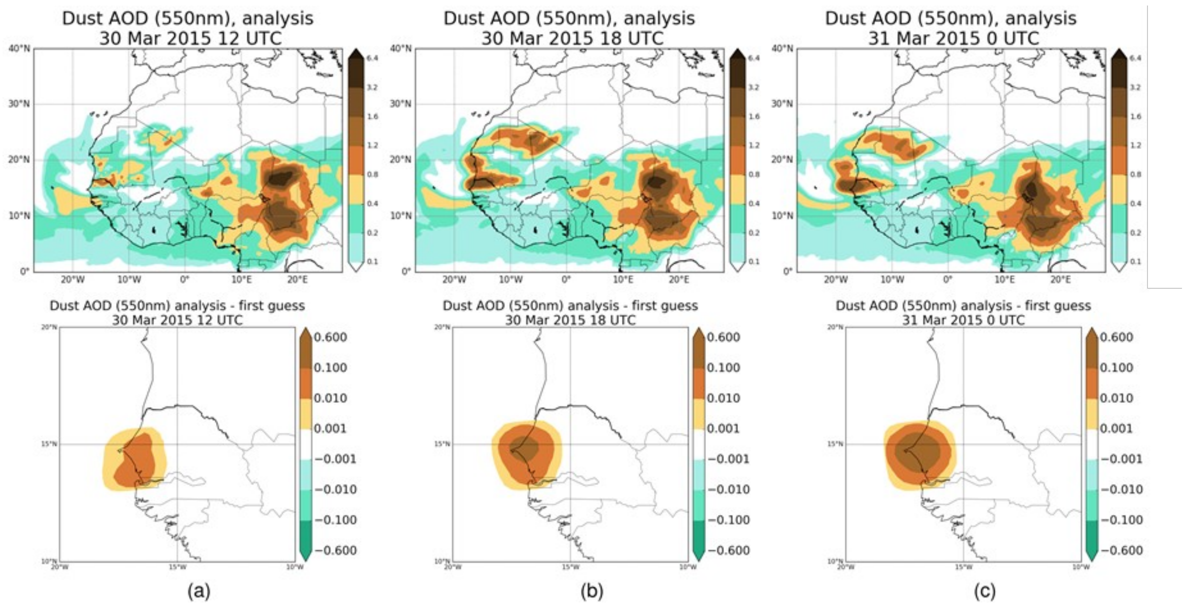

Figure 2: Dust Optical Depth (Dust AOD) analysis at 550 nm at three time steps of the assimilation window produced by the assimilation of a lidar extinction profile at the M'Bour site in Senegal and the analysis increments (analysis – first guess) corresponding to each analysis. The profile was measured on 30 March 2015 at 18 UTC.

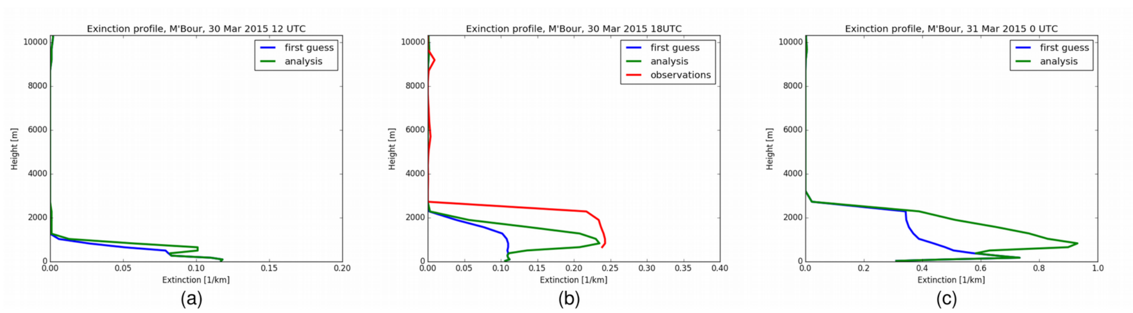

Figure 3: Aerosol extinction profiles at 532 nm for the model first guess (blue), the analysis (green), and, when available, for the assimilated observations (red) at the M'Bour site at three time steps of the assimilation window.

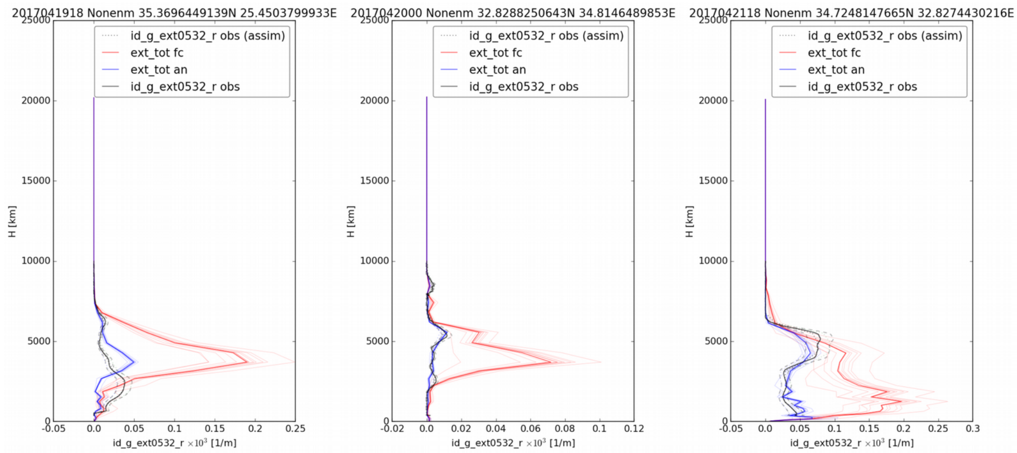

Figure 4: Aerosol extinction vertical profiles at 532nm for the ensemble forecast (red), the ensemble analysis (blue) and the observations (black) at Finokalia (in Crete) on April 19 at 18 UTC (left), at Haifa (Israel) on April 20 at 0 UTC (centre) and at Limassol (Cyprus) on April 21 at 18 UTC (right). Bold lines for model profiles indicate ensemble mean values, while thin lines indicate ensemble member values. Observation uncertainty is depicted with dashed black lines. The altitude 0 is the value of the model surface topography.

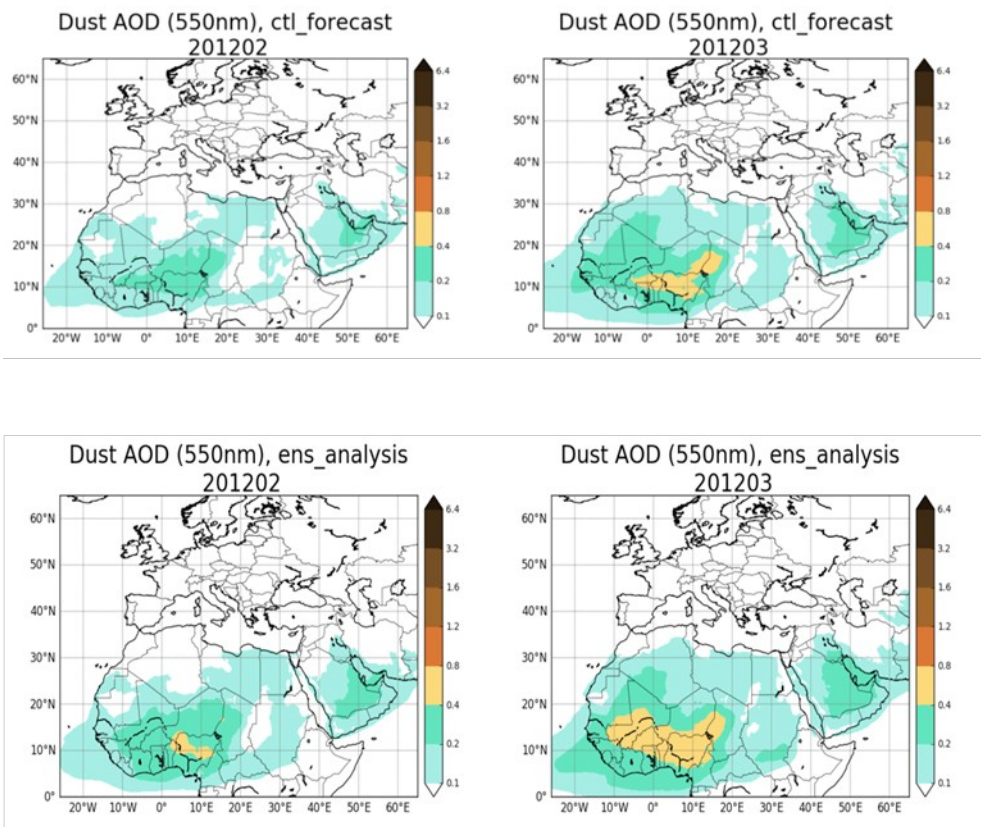

Figure 5: Dust Optical Depth (Dust AOD) averaged for February and March of 2012 for the control (CTL, top row) and the mean analysis (bottom row) experiments.

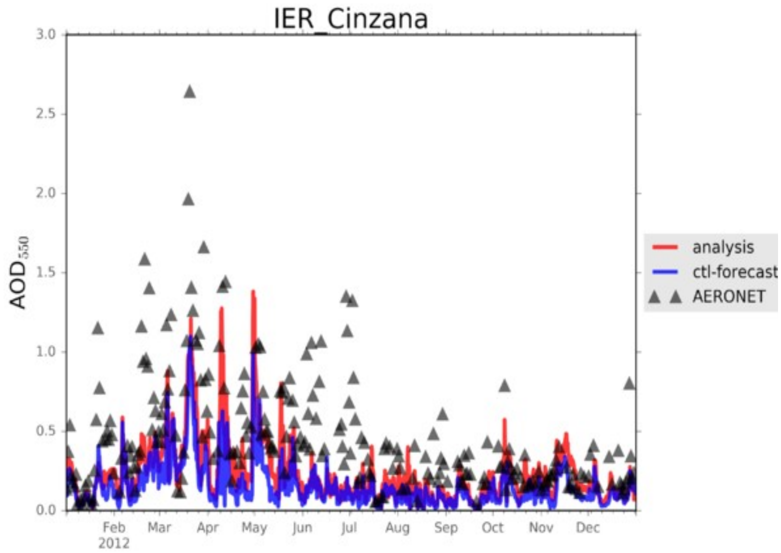

Figure 6: Time series of dust AOD values for the year 2012 at IER Cinzana AERONET station (in the Sahel) for the control (CTL) experiment, for the mean analysis and for AERONET direct-sun AOD (black triangles) in dust- dominated conditions.

2.8. Publications or reports regarding the developed project

Please use the following format: Author(s). “Title”. Publication, volume, issue, page, month year

- Benedetti et al. (in preparation). ACTRIS-2 Final report on Model evaluation, assimilation and trend studies, Technical report.
- Benedetti et al. (in preparation). The relevance of ACTRIS-2 data for aerosol modelling, to be submitted in ACP.
- Di Tomaso et al. (2019). Report on the reanalysis configuration, ERA4CS DustClim project, Technical Report.
- Kinne et al., (2018) Climate Assessment Report Deliverable number D5.1b, ESA Climate Change Initiative, Aerosol_cci2, Technical report refererence: aerosol CAR.

2.9. Patents registered in relation with the developed project *(Maximum 850 characters)*

Please use the following format: patent identifier, title and description.

None.

2.10. Name and Surname of the students that have deployed their thesis collaborating in the developed project and title of the thesis.

None.

2.11. Talks given in the area of the project

Please use the following format: Author(s). "Title". Conference, location, month year

- Klose et al., Constraining soil dust emissions from natural and anthropogenic sources (ICAR X, Bordeaux, France, 25-29 June 2018)
- Basart et al., DustClim (AdaptationFutures, JPI Climate side event: Exploring ways of International Cooperation in Climate Services for Africa, Cape Town, South Africa, 18 June 2018)
- Jorba et al., BSC Update: MONARCH model (10th ICAP working group meeting: Seamless model development: Aerosol modelling across timescales, Exeter, UK, 6-8 June 2018)
- Basart et al., inDust: International Network to Encourage the Use of Monitoring and Forecasting Dust Products (10th ICAP working group meeting: Seamless model development: Aerosol modelling across timescales, Exeter, UK, 6-8 June 2018)
- Pérez García-Pando et al., Impact of soil dust aerosols upon weather and climate (Second WMO Workshop on Operational Climate Prediction, Barcelona, Spain, 30 May-1 June 2018)
- Di Tomaso et al., "Dust assimilation activities at the Barcelona Supercomputing Center (9th International Workshop on Sand / Dust storm and Associated Dustfall, La Laguna, Tenerife, Spain, 22-25 May 2018)
- Klose et al., Constraining soil dust emissions from natural and anthropogenic sources (9th International Workshop on Sand / Dust storm and Associated Dustfall, La Laguna, Tenerife, Spain, 22-25 May 2018)
- Basart et al., inDust: International Network to Encourage the Use of Monitoring and Forecasting Dust Products (9th International Workshop on Sand / Dust storm and Associated Dustfall, La Laguna, Tenerife, Spain, 22-25 May 2018)
- Basart et al., Dust forecasting models (Training Workshop on Sand and Dust Storms in West Africa, 21 May 2018, La Laguna, Tenerife, Spain)
- Jorba et al Aerosol intensive optical properties in the NMMB-MONARCH model (36th ITM on Air Pollution Modelling and its Application)
- Basart et al., inDust: International Network to Encourage the Use of Monitoring and Forecasting Dust Products (EGU 2018, Vienna, Austria, 9-13 April 2018).
- Basart et al., Training Workshop on Sand and Dust Storms in the Arab Region (Cairo, Egypt, 10-12 February 2018)
- Di Tomaso et al., Assimilation experiments of IASI dust retrievals (12th Aerosol_cci phase 2 progress meeting, Harwell, UK, 14-15 December 2017).
- Basart et al., Modelling the impact of dust on air quality at BSC: From R&D to operations (WMO GAW International Workshop on Air Pollution for Africa: from Regional to Urban, 4-6 December 2017, Pretoria, Sudafrica)
- Jorba et al., Atmospheric Chemistry with the online multiscale NMMB-MONARCHv1.0 model: global-regional evaluations and data assimilation capability (26 GLOREAM workshop, 27-29 November 2017, Berlin, Germany)
- Pérez García-Pando et al., Modelización del Polvo Mineral Atmosférico (Jornada sobre el polvo atmosférico y sus impactos en diferentes sectores, AEMET, 22

November 2017)

- Pérez García-Pando et al., CURSO: EL CICLO DEL POLVO MINERAL EN LA ATMÓSFERA: OBSERVACIÓN Y PREDICCIÓN (AEMET, 20 November 2017, Barcelona)
- Basart et al., Modelling of the impact of dust on air quality (PSF/TAIEX Workshop on Air Pollution, Industrial, Emissions, Sand and Dust Storms, 21-22 November 2017, Tehran, Iran)
- Basart et al., 6th Training Course on WMO SDS-WAS Products: Dust prediction models (Istanul, Turkey, 25-27 October 2017)
- Basart et al., 5th International Workshop on Middle East Dust Sources and Their Impacts: High-resolution SDS forecast requirements for the Middle East (Istanbul, Turkey, 23-25 October 2017)
- Pérez García-Pando et al., 5th International Workshop on Middle East Dust Sources and Their Impacts: Dust Modeling: Challenges and Perspectives (Istanbul, Turkey, 23-25 October 2017)
- Basart et al., Curso Interno de AEMET sobre Observación y predicción del contenido de polvo mineral en la atmósfera - Modelización del polvo atmosférico (Barcelona, Spain, 16-16 October 2017)
- Pérez García-Pando et al., Progress, challenges and perspectives in modeling dust composition (Keynote) (Goldschmidt Conference 2017, Paris, 17 August 2017)
- Pérez García-Pando et al., Dust-radiation interactions: from weather to climate (ICAP meeting in Lille, 26-28 June 2017)
- Pérez García-Pando et al., BSC Update (ICAP meeting in Lille, 26-28 June 2017)
- Pérez García-Pando et al., Atmospheric Composition research, modeling and services at BSC (ISGlobal, 13 June 2017)
- Di Tomaso et al., Progress on the BSC user case study on data assimilation (11th Aerosol_cci phase 2 progress meeting, Barcelona, Spain, 22-23 May 2017).

2.12. Other information (URLs, logos, photos, etc.)

Please fill in the box with the regarding information and attach the photos or logos to this form.

None.

2.13. Any further funding obtained as a result of the developed project

- The ERA4CS DustClim project (https://sds-was.aemet.es/projects-research/dustclim) is supporting the developing of the ongoing dust reanalysis considered in eDUST for the development of dust-oriented products for particular socio-economic sectors.

- The ERC FRontiers in dust minerAloGical coMposition and its Effects upoN climate (Fragment) will contribute new fundamental understanding of the size-resolved mineralogy of dust at emission and its relationship with the parent soil. Within the project, we will generate integrated and quantitative knowledge of the role of dust mineralogy in dust-radiation, dust-chemistry and dust-cloud interactions based on modelling experiments.

- The H2020 SOLWATT project is developing innovative solutions to significantly reducuction of water used by concentrated solar power (CSP) plants (by 35% for wet cooled & by 90% for dry cooled). In particular, it demonstrates, the efficiency of the proposed innovations on solar field cleaning, power-block cooling, water recycling system, and plant operation strategy. In this context, dust forecast products (with assimilation of observations) provided by the NMMB-MONARCH is being used to provide a soiling forecast products for the solar energy sector.

- Furthermore, the BSC is leading the COST Action inDust (http://www.cost-indust.eu/) that aims to establish a network involving research institutions, service providers and potential end users of information on airborne dust. In this context, the exceptional dust reanalysis considered in eDust will be a fundamental source of long-term information on dust products over North Africa and the Middle East where there is a lack of observations.

3. Feedback and technical deployment

3.1. Feedback on the centres/PRACE mechanism *(Maximum 500 words)*

The support received from the PRACE centre was very valuable to overcome the different technical issues encountered during the execution of the project (see Annex 1). We have to mention, that a new supercomputer like Marenostrum4, should be thoroughly tested before being included as new resource for a PRACE call. Several of the problems identified during our project were external to our application and related to the infrastructure.

3.2. Explanation of how the computer time was used compared with the work plan presented in the proposal. Justification of discrepancies, especially if the computer time was not completely used. *(Maximum 500 words)*

The 15-years dust reanalysis considered within eDUST has not been completed. Several technical issues arose during the use of the new supercomputer Marenostrum4 during the project, and a large fraction of the computing resources were not used at the end of the project. We asked to extend our project to consume a larger fraction of the allocated hours, but the petition was not accepted by PRACE.

We have faced several technical issues with the new Marenostrum4 machine that started to work on 1st July 2017. After several iterations with BSC support team, we identified several instabilities of our applications depending on the environment setting, use of srun or mpirun, compilers and libraries used to run our code that was not occurring with the previous Marenostrum3. This took several months of an unstable performance of the code (see the list of tickets opened with PRACE support in Annex 1), delaying the advance of the initial work plan presented in the accepted project. At the end of the project, we were able to consume only 56% of the allocated time due to the above technical problems.

However, the work undertook in eDUST has been fundamental to set the basis for the production of a high resolution dust reanalysis.

3.3. Please, let us know if you plan to apply for a PRACE project access again in the future. Please explain us why or why not. *(Maximum 500 words)*

In addition the benefits of running models with the assimilation of observations (and the corresponding ensemble members), the operational models are going to finer spatial resolutions which requires to test our codes in different HPC platforms. We have applied for another PRACE project (eFRAGMENT) to continue the research developed in eDUST. PRACE resources are a fundamental support to achieve our research objectives.

Annex 1. List of tickets with BSC PRACE support:

- 20170718 - [rt.bsc.es #172133] PRACE project user pr1edr03
    - Model compiled similar options used in Marenostrum3. Random segmentation faults during running time.
    - Supports suggest using "module load fabric", which solved the problem.
- 20170725 - [rt.bsc.es #172396] pr1edr00: jobs se mueren
    - Testing executions with 1500 and 138 processes. Jobs died without clear reason, resubmitting the job seems the solution.
    - Support identified nodes with problems and disable from the system.
- 20170921 - [rt.bsc.es #175655] PRACE project user pr1edr03: jobs crashing randomly
    - Still experiencing random crashes. Resubmitting the job until proper success.
    - Support identifies two types of crashes:
        - The execution runs out of wall-clock-time, it seems the model is freezed.
        - From Support: When a previous job left a node in a non-optimal state, e.g. swapping heavily, the following jobs might not be able to use the OPA for a while and connections using hfi1 fail. This happened in these cases and the only solution at the moment is to resubmit the failed jobs. We are working to fix this issue.
    - Meeting with BSC Support team to identify the reason for the problems with the model.
- 20171011 - [rt.bsc.es #176813] Job frito 453014
    - The model seems to freeze and the job finishes by wall-clock-limit. Now submitting jobs of 1544 processors for 3 days. If this error is not detected in time, a lot of cpu.hours are lost without useful results.
    - MareNostrum4 system upgrade maintenance, starting on October 23rd.
- 20171116 - [rt.bsc.es #179217] Problems for executing simulation during November 11-12
    - During the weekend on 11-12 November there were some interruptions during the execution of our jobs (group pr1edr00) in MN4. The jobs disappeared of the MN4 cue. Other BSC users that used MN4 had the same problem.
    - PRACE support asked us about the jobs id but, unfortunately, any us saved them. Since this incident, we were trying to save all the information in our logs.
- 20171115 - [rt.bsc.es #179148] Problems running simulations in MN4 using the PRACE account
    - Running the ensemble configuration, and out of 2184 MONARCH model runs (i.e. 182 dates for 12 members) this morning I found 588 re-submissions because of error. In one of these cases, 10 re-

submissions (the max number I had allowed) were not enough to run a particular date and member, which unfortunately invalidates the whole simulation.
    - Solution from support after some time of studying the problem: use "export PSM2_MQ_RNDV_HFI_THRESH=1024000" and "module load fabric"
- 20180123 - [rt.bsc.es #182963] Model freezes in mn4
    - Still experiencing jobs that freeze without stopping the submitted job.
    - From support: We are aware that recently there have been some problems in the simulations run by Earth Science users. All of them seem to freeze at one point, wasting the rest of the execution time. Our colleagues from system administration are taking a look into this issue right now, they are checking all the OPA infrastructure to see if the error comes from that point. When we have news on our side, we will let you know. Meanwhile, please, keep an eye on the huge simulations and cancel them if you see they are stuck.
- 20180126 - [rt.bsc.es #183071] Marenostrum4 80 node reservation available
    - Special reservation with good nodes allocated to identify Earth Sciences codes problems. Our model still shows problems in that reservation.
    - Meeting with BSC Support team debugging the code with ddt debugger. After several test we identified the subroutine that was creating the freezing problem of the model. Depending on how the model is compiled and executed the model freezes in that subroutine or finishes, this never happened before in the HPC systems used. We also identified that using "srun" the model was more unstable that using "mpirun". A patch was implemented in the code and "mpirun" used to run the model. Now the instabilities seem to be minimized.
- 20180202 - [rt.bsc.es #183670] problems with some jobs in MN4
    - Here the problem was that mpirun was opening more processors than the ones requested in the job header, so our attempts to use a big number of processors were failing.
    - Support solution: use "mpirun -np $NPROC"
- 20180214 - [rt.bsc.es #184563] "Stale file handle" error
    - This was only a temporary problem, but as a result the autosubmit experiment stopped.
    - Support solution: There are some issues in login1 of MareNostrum. In the meanwhile, please switch to any other login node
- 20180221 - [rt.bsc.es #185074] Partition Down
    - This was only a temporary problem with queues.
    - Support solution: Due to some problems, we have been forced to freeze queue status for a while. You do not have to worry, in brief we will return them back to normality.
- 20180227 - [rt.bsc.es #185466] node failure

- o Support comments that nodes that fail are automatically taken out from the queue system. Resubmit.