

LATE REQUEST FOR A SPECIAL PROJECT 2012–2014

MEMBER STATE: France

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Project Title:	Validation and improvement of a stratospheric microphysical aerosol scheme in the IFS

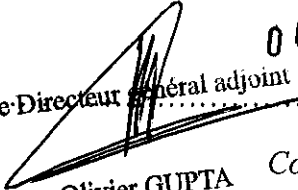
Would you accept support for 1 year only, if necessary?	YES <input checked="" type="checkbox"/>	NO <input type="checkbox"/>
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Computer resources required for 2012-2014: <small>(The project duration is limited to a maximum of 3 years, agreed at the beginning of the project. For late requests the project will start in the current year.)</small>	2012	2013	2014
High Performance Computing Facility (units)	600k	700k	700k
Data storage capacity (total archive volume) (gigabytes)	1200	1800	2400

An electronic copy of this form **must be sent** via e-mail to:

special_projects@ecmwf.int

Electronic copy of the form sent on (please specify date):

06 AVR. 2012
Le Directeur général adjoint

Olivier GUPTA *Continue overleaf*

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¹ The Principal Investigator will act as contact person for this Special Project and, in particular, will be asked to register the project, provide an annual progress report of the project's activities, etc.

Extended abstract

It is expected that Special Projects requesting large amounts of computing resources (500,000 SBU or more) should provide a more detailed abstract/project description (3-5 pages) including a scientific plan, a justification of the computer resources requested and the technical characteristics of the code to be used. The Scientific Advisory Committee and the Technical Advisory Committee review the scientific and technical aspects of each Special Project application. The review process takes into account the resources available, the quality of the scientific and technical proposals, the use of ECMWF software and data infrastructure, and their relevance to ECMWF's objectives. - Descriptions of all accepted projects will be published on the ECMWF website.

This special project is intended to support the participation of University of Pierre et Marie Curie in the MACC II programme. The aim of this participation is twofold: 1) it will finalise the extension of the GLOMAP aerosol scheme implemented in the IFS to the stratosphere and validate the scheme, and 2) it will develop a data assimilation system around the IFS-GLOMAP for the stratospheric aerosol layer.

The previous MACC project saw the incorporation of the GLOMAP-mode microphysical aerosol module (Mann et al., 2010) in the IFS, and basic testing of the new system against in situ observations (Woodhouse et al., 2011). The IFS-GLOMAP system code describes the chemical composition and other relevant microphysical processes for stratospheric sulphuric aerosols. However, there are several features that seem to be at odd with observations and other model simulations. The parameterisations of mode splitting and sedimentation velocities in the stratosphere have been identified as weaknesses that we need to address in this project (Bekki et al., 2011).

As part of MACC II, the extension and testing of the troposphere code in the stratosphere is required before considering developing and evaluating a data assimilation method for the IFS-GLOMAP system. The data assimilation method is also required when modelling the stratospheric aerosols (in particular those injected following strong volcanic eruptions). Our plan is to assimilate CALIOP observations of the aerosol backscatter profile as done by Vernier and Jumelet (2011) using a simplified advection model (<http://spie.org/x47874.xml?ArticleID=x47874>). We will rely on recent development made by Angela Benedetti (ECMWF) who has already channelled CALIOP aerosol data into the IFS data assimilation system. Special attention will be paid to the description of the background and observational error covariance matrices and the coupling between the data assimilation of tropospheric and stratospheric aerosol information.

This work is being conducted with partners at ECMWF and University of Leeds, and will make the stratospheric configuration in the IFS-GLOMAP system operational. The operational IFS-GLOMAP system will ultimately form part of the GMES Atmosphere Service, providing detailed aerosol forecasts for predicting air quality and radiation, and boundary conditions for regional models.

For direct model development and evaluation, and considering the long life time of stratospheric aerosols, it is planned to run between 5 and 10 low-resolution simulations of two years each in free-running mode (without forecasting). For the data assimilation method a larger number of shorter (from 1 month to 1 year) simulations is needed.

References

Bekki et al., 2011. Report On Deliverable D_G_AER_1.3: Adepatation and Validation of UKCA-mode code for stratosphere (UPMC –Leeds-MetOffice).

Mann et al., 2010. Description and evaluation of GLOMAP-mode: a modal global aerosol microphysics model for the UKCA composition-climate model Geoscientific Model Development, 3, 519-551.

Vernier J.P. and J.Jumelet, Advances in forecasting volcanic plume evolution(2011), SPIE Newsroom. doi: 10.1117/2.1201103.003530.

Woodhouse et al., 2011. Implementation and evaluation of GLOMAP-mode in the IFS. MACC deliverable report D_G-AER_1.8.