

REQUEST FOR A SPECIAL PROJECT 2012–2014

MEMBER STATE: Netherlands

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Project Title: Inline chemistry for reactive trace gases within IFS

If this is a continuation of an existing project, please state the computer project account assigned previously.	SP	
Starting year: <small>(Each project will have a well defined duration, up to a maximum of 3 years, agreed at the beginning of the project.)</small>	2012	
Would you accept support for 1 year only, if necessary?	YES X	NO <input type="checkbox"/>

Computer resources required for 2012-2014: <small>(The maximum project duration is 3 years, therefore a continuation project cannot request resources for 2014.)</small>	2012	2013	2014
High Performance Computing Facility (units)	200k	300k	300k
Data storage capacity (total archive volume) (gigabytes)	250Gb	250Gb	250Gb

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):

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Continue overleaf

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.

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Extended abstract

In the past EU projects GEMS and MACC a system has been developed where Chemical Transport Models (CTM's) are coupled to the ECMWF's Integrated Forecasting System (IFS), Flemming et al. 2009. This system currently performs (semi-) operational assimilation and forecasts of reactive trace gases such as CO, O₃, NO_x and SO₂ in the framework of the GMES atmospheric service. Here the atmospheric chemistry transport model TM5 (Huijnen et al., 2010), serves as one of the independent chemical models.

Within the MACC project first steps have been made to implement the chemistry schemes from various CTM's, including TM5, into the IFS. This new system is referred to as C-IFS, and is designed to overcome the computational and physical limitations that are encountered in the current approach based on the coupled system. Developments included amongst others the delivery of photochemistry modules from the TM5 model. These are now integrated in the IFS model code, in close collaboration with ECMWF staff. First tests with the new C-IFS system revealed a reasonable performance of this modeling system, but at the same time illustrated several shortcomings which need to be resolved. This includes a too strong oxidizing capacity of the current modeling system. Also there are possibilities to further improve the computational efficiency of the current implementation.

Within the follow-up project MACC-II, we aim at a further improvement and benchmarking of the C-IFS system. This includes a detailed comparison of the photochemistry in C-IFS versus the offline model TM5, as well as compared to other CTM's. Various parameterizations in the system, such as photolysis, dry / wet deposition and heterogeneous chemistry, need to be tested in more detail, and improved if needed. Also the impact of the different transport schemes should to be evaluated further. This requires the execution of various short (2 month) or long (3 year) sensitivity runs with both the C-IFS and the offline system. We aim at the deliverability of the C-IFS system to the wider community at the end of 2014.

References

- Huijnen, V., J. Williams, M. van Weele, T. van Noije, M. Krol, F. Dentener, J. de Laat, F. Boersma, and co-authors (2010), The global chemistry transport model TM5: description and evaluation of the tropospheric chemistry version 3.0. *Geosci. Model Dev.*, 3, 445-473,
- Flemming, J., A. Inness, H. Flentje, V. Huijnen, P. Moinat, M. G. Schultz, and O. Stein (2009), Coupling global chemistry transport models to ECMWF's integrated forecast system, *Geosci. Model Dev.*, 2, 253-265.