REQUEST FOR A SPECIAL PROJECT 2013–2015

MEMBER STATE: Netherlands

Principal Investigator[1]: Dr. V. Huijnen

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Project Title: 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** NLMACC	
Starting year: (Each project will have a well defined duration, up to a maximum of 3 years, agreed at the beginning of the project.)	2012	
Would you accept support for 1 year only, if necessary?	YES X	NO ☐

Computer resources required for 2013-2015: (The maximum project duration is 3 years, therefore a continuation project cannot request resources for 2015.)	**2013**	**2014**	**2015**
High Performance Computing Facility (units)	300k	300k	
Data storage capacity (total archive volume) (gigabytes)	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): ……

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.

Principal Investigator: Dr. V. Huijnen

Project Title: Inline chemistry for reactive trace gases within IFS

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, O_3, NO_x and SO_2 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 and its follow-up project MACC-II first steps have been made to implement the chemistry schemes from various CTM's, including the TM5, MOCAGE and MOZART, 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. In the past years the photochemical modules from the TM5 model have been implemented into C-IFS and a large number of test runs have been conducted. The work was performed in close collaboration with ECMWF staff. Assessment of the new C-IFS system revealed a reasonable to good performance of this modeling system, mostly showing similar performance compared to the well-tuned offline TM5 model. At current stage it can be considered in good shape for further, more scientific assessment of the system. Also the current system is provided to other partners in the project, e.g. for application of chemical data assimilation or to couple it to a new aerosol model (Mann et al., 2010). Possibilities to further improve the computational efficiency of the current implementation need to be exploited, and remaining biases in the system, such as relatively high tropospheric O3 over the northern hemisphere need further investigation.

Within the framework of the MACC-II project, we aim at a further improvement and benchmarking of the C-IFS system (Flemming et al., 2012). This includes a detailed evaluation of the photochemistry in C-IFS as compared to the offline model TM5, as well as compared to other CTM's, by running the system for the base year 2008. Various parameterizations in the system, such as photolysis, dry / wet deposition and lightning NOx emissions, will be tested in more detail, and improved if needed. This requires the execution of various short (2 month) or long (2 year) sensitivity runs with both the C-IFS and the offline system. We aim at the deliverably of the C-IFS system to the wider community at the end of 2014.

References

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.

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.

Mann, G.W., Carslaw, K.S., Spracklen, D.V., Ridley, D.A., Manktelow, P.T., Chipperfield, M.P., Pickering, S.J. & Johnson, C.E. (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.

Flemming, J., Innes, A., Stein, O., Huijnen, V., Arteta J., Elbern, H. and Woodhouse M. (2012), Updated development plan for C-IFS., MACC-II report RG D57.1.