REQUEST FOR ADDITIONAL RESOURCES IN THE CURRENT YEAR FOR AN EXISTING SPECIAL PROJECT

MEMBER STATE: Netherlands

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Project title: Inline chemistry for tropospheric and stratospheric trace gases in IFS

Project account: **SPNLMACC**

Additional computer resources requested for	**2016**
High Performance Computing Facility (units)	400 kSBU
Data storage capacity (total) (Gbytes)	250 Gb

Continue overleaf

[1] The Principal Investigator is the contact person for this Special Project

Technical reasons and scientific justifications why additional resources are needed

This is a request for an increase by 400kSBU on top of the granted 800kSBU for HPC resources for the current year. The reason for this request is that the model resolution of T159, considered appropriate for C-IFS runs in the initial version of the special project proposal, turned out insufficient for accurate modelling of transport of trace gases for stratospheric chemistry applications. Furthermore, the reviewers of the paper describing the stratospheric chemistry implementation in C-IFS asked me to execute a number of additional sensitivity runs, and for additional years, to prove the scientific soundness of the C-IFS-CB05-BASCOE system. While the paper has appeared now in GMD (Huijnen et al., 2016), the computational resources have unfortunately been exhausted for any further testing and developments this year.

Updated estimation of required computational resources

In the old testing setup C-IFS-CB05 is run with a 1-hour time step on a resolution of T159L60, which corresponds to a horizontal resolution of approx. 1.1 deg. In this setup the total billing units for a one-year hindcast simulation are estimated to be approx. 18 kSBU. With a doubling of the number of chemical tracers (merging CB05 chemistry with BASCOE), the costs increase accordingly to ~35 kSBU. Similar increases can be expected in runs where an aerosol model is run in conjunction with the tropospheric chemistry.

For CIFS-CB05-BASCOE runs we need a horizontal resolution of at least T255. Furthermore, the dynamical time step for the chemistry to remain stable should be reduced to 0.5 hour at maximum. A one-year model run on this resolution requires ~55 kSBU. Considering the longer time scales at which processes take place in the stratosphere, also longer runs are needed for diagnosis.

Here we assume that about an equivalence of 25 one-year hindcast runs will be executed each year, with computational expenses of, on average, 55kSBU per year. This adds up to a total of 1.4 M.SBU annually needed. For the remainder of this year (October-December 2016) an increase of 400 kSBU should be sufficient. Such annual hindcast runs are used as benchmark specific system setups, and execute various sensitivity experiments. Considering the ongoing developments in the C-IFS system, uncertainties remain in the specification of costs for future model runs.

Reference

Huijnen, V., Flemming, J., Chabrillat, S., Errera, Q., Christophe, Y., Blechschmidt, A.-M., Richter, A., and Eskes, H.: C-IFS-CB05-BASCOE: stratospheric chemistry in the Integrated Forecasting System of ECMWF, Geosci. Model Dev., 9, 3071-3091, doi:10.5194/gmd-9-3071-2016, 2016.