**Geoscientific
Model Development
Discussions**

Interactive comment on "The 1-way on-line coupled atmospheric chemistry model system MECO(n) – Part 1: The limited-area atmospheric chemistry model COSMO/MESSy" *by* A. Kerkweg and P. Jöckel

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We thank referee #1 for her/his valuable comments, which helped to improve our manuscript.

- *I suggest to the authors to add in the conclusions more general evaluations regarding the technical problems (such as variable names, dimensions, time, etc) and conceptual problems (such as projections, physical processes representation, etc) encountered. Answers at questions such as: the modified MESSy pro-*

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duced here will replace the MESSy version in ECHAM/MESSy? MESSy can be coupled to any model?

The MESSy version 2, coupled already to ECHAM, as documented by Jöckel et al. (Geosci. Model Dev., 3, 717-752, 2010) provides also the basis for the coupling of MESSy to COSMO presented here. The further developments and modifications are implemented for the full model system, i.e., they either do not interfere with ECHAM/MESSy (because they are not relevant for it), or they are immediately available also for ECHAM/MESSy. This is one of the basic ideas of the MESSy concept.

In line of this MESSy concept, which is mainly based on a strict separation (and re-usage) of the (technical) model infrastructure from the scientific contents of the process and diagnostic submodels, MESSy is particularly designed to be connected to (or used by) virtually any basemodel. For instance, the coding of the recently published CAABA/MECCA atmospheric chemistry box model (Sander et al., Geosci. Model Dev., 4, 373-380, 2011) follows the MESSy standardisation, allowing the straightforward application of the process submodels (MECCA, JVAL etc.) in all other MESSy-fied models (e.g., ECHAM/MESSy and COSMO/MESSy). As another example, the ocean model MPIOM has recently been coupled to ECHAM/MESSy via the MESSy interface (Pozzer et al., Geosci. Model Dev., 4, 771-784, 2011). Further work currently in progress is the coupling of MESSy to the upper atmosphere model CMAT and of the resulting CMAT/MESSy to ECHAM/MESSy (A. Baumgaertner, pers. comm.). Other projects, not detailed here, that make use of the MESSy infrastructure are also on the way. With the current manuscript, we provide another proof of concept, that real code-sharing between seemingly different models and types of models is not only desirable, but possible in a standardised modular approach.

We will expand the discussion / conclusions and we will add the requested information to answer the questions in the revised manuscript.

- *title of MS can be more precise. For example: "Part 1: Description and validation of the limited-area ..."*

The validation of the meteorological part is provided in the third part of this article series (we will state this in the revised manuscript), and the validation with full chemistry is still work in progress. Therefore, we will change the title to "Part 1: Description of the limited-area ...".

- *the acronym MECO(n) have to be explained somewhere in the text*

Yes indeed. Due to a "last-minute" acronym finding, the explanation got lost. We will add it at the end of the introduction.

- *the sections 3.1 to 3.7 should have a more explicit title such as "SWITCH/CONTROL interface for including submodels"*
  We will change the titles as follows:

  – SWITCH/CONTROL: Switches and main entry points for individual submodels
  – CHANNEL: The memory management, output and restart control
  – TIMER: The "heart beat" and event management of MESSy
  – DATA: The data transfer interface
  – MPI: A high-level interface to the MPI library
  – TRANSFORM: The interface for grid transformations
  – TRACER: The management of constituents including meta-data

- *a ri-assuming table with the changes operated in COSMO and MESSy models will be very useful for reader to understand the amount of work performed*

at a glance. The Table does not have to include all the details given in the Supplement.

Listing the changes in table form seems inappropriate and difficult to us, but we take the point and will add an Appendix section summarising the most important changes.

- *pg. 1306, Abstract, please add prior to the following phrase "This model is as consistent as possible, with respect to atmospheric chemistry ..." an explanation for which the consistency is required such as the use of boundary and initial conditions by the limited area models.*
  Done. We now state: "Limited-area models require lateral boundary conditions during run-time for all prognostic variables. Therefore the quality of a regional chemistry model is expected to improve, if boundary conditions for the chemical constituents can be provided by the driving model in consistence with the meteorological boundary conditions. The newly developed model is as consistent..."

- *pg. 1306, Abstract, "Here, the connection of the MESSy infrastructure to the COSMO model is documented." - this phrase is not in agreement with the content of the MS: Section 3 shows the implementation of the infrastructure but Section 4 shows the implementation of the submodels. Please, be more clear in differentiating between infrastructure and submodels.*
  We do not say in this sentence, that we ONLY document the implementation of the infrastructure. The successional sentence reads: "Previously published prototype submodels for simplified tracer studies are generalised to be plugged-in and used in the global and the limited-area model." For the latter we have to describe the generalisation procedure. To clarify this, we will rephrase the sentence.

- *the words "Section ?? " appear several times in the MS.*

This is an interesting bug, as the questionmarks appear in the "printer-friendly" version only. Therefore it seems to be a latex compilation error. We will inform the production office about it.

- *Fig. 3 is not readable as it is.*
  Figure 3 was composed for the full space of a DIN A4 page, due to the GMDD layout it appears squeezed. Thus it will be readable in the revised version (it is already readable by zooming in on the page in the on-line version).

- *Section 5.2, after the first phrase have to mention that the simulations shown in the MS were performed using the online coupling of COSMO/MESSy and ECHAM/MESSy presented in Kerkweg and Jöckel (2011, Part 2)*
  We agree, and will add a sentence stating that we use the on-line coupled mode of the model.

Interactive comment on Geosci. Model Dev. Discuss., 4, 1305, 2011.

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