Atmos. Chem. Phys. Discuss., 13, C4569–C4572, 2013
www.atmos-chem-phys-discuss.net/13/C4569/2013/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Online coupled regional meteorology-chemistry models in Europe: current status and prospects" *by* A. Baklanov et al.

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Received and published: 9 July 2013

I commend the authors' efforts for putting together this comprehensive review article. At the same time I would like to echo some of the concerns raised by other reviewers regarding lack of uniformity in the writing styles and organization/balance of information across the different sections of the manuscript. Writing a review with so many co-authors is a complicated task, but I believe the present manuscript will be a valuable contribution to the literature once these editorial type concerns are satisfactorily addressed.

Specific Comments:

1. The current title of the paper seems to suggest (at least to me) that the models discussed in this paper were developed in Europe. However, since some of the models (e.g., WRF-Chem, WRF-CMAQ) were developed elsewhere, but are used in Europe, I suggest revising the title slightly to "... models **used** in Europe..." to avoid any potential confusion.

2. Since this article is written as part of a COST Action initiative, it would be useful to explain that early on in the paper, perhaps towards the end of Introduction (instead of Section 2 on page 12549), before giving the outline of the paper. Also, please provide a link to the COST Action website.

3. Page 12563, Subsection 4.3.6, Line 2-7: MOSAIC is incorrectly listed as a thermodynamic model of inorganic aerosols. MOSAIC is an aerosol module which includes sectional aerosol dynamics, particle-phase thermodynamics, and dynamic mass transfer of semi-volatile species between the gas and particle phases. MESA (Zaveri et al., 2005) is the particle-phase thermodynamics module that is used in MOSAIC. I suggest revising this portion of the text as follows:

   "Solving the system via a set of selected equilibrium relationships that can be optimized according to the chemical regime of the system is the most widely used approach in 3-D modelling: such thermodynamic models of inorganic aerosols include for example EQUISOLV II (Jacobson, 1999), ISORROPIA, ISORROPIA II (Fountoukis and Nenes, 2007), **MESA (Zaveri et al., 2005)**, and PD-FiTE (Topping et al., 2009, 2012). The equilibrium between the gas phase and the particles is reached rapidly for fine particles but may take several minutes for coarse particles. Some **aerosol modules such as MOSAIC (Zaveri et al., 2008)** account for this potential mass transfer limitation by implementing a dynamic approach, which **may** be limited to coarse particles for computational efficiency."

   Reference: Zaveri, R. A., R. C. Easter, and L. K. Peters (2005), A computationally efficient Multicomponent Equilibrium Solver for Aerosols (MESA), J. Geophys.

Res., 110, D24203, doi:10.1029/2004JD005618.

4. Page 12565: Subsection 4.3.9 seems to repeat some of the material already discussed in 4.3.6, but unfortunately neither does an adequate job of summarizing the key details of the various aerosol modules used in Europe via different host MetChem models. I suggest that section 4.3.6 be restricted to discussing which inorganic species are typically included in various models used in Europe and move the discussion of aerosol thermodynamics and gas-particle mass transfer to subsection 4.3.9. Also suggest renaming the title of subsection 4.3.9 to "Aerosol Thermodynamics and Gas-Particle Mass Transfer." Finally, it would also be very useful include the following details for the various aerosol modules in Table 7: Aerosol Thermodynamics Module, Gas-Particle Partitioning (i.e., equilibrium, dynamic, or hybrid).

Minor Comments:

Page 12545, Line 6: How is "OCMC" the acronym for "online fully integrated meteorology-chemistry"?

Page 12547, Line 11: Replace "Sect." with "Section"

Page 12552, Line 27: In the first half of this sentence it is mentioned that more than 20 online coupled models are currently in use while later in the same sentence it says "now – about 10". Please clarify.

Table 6. The number of species in the standard CBM-Z mechanism is 55 while the optional DMS chemistry has 11 species. So I suggest entering "55-66" in the "Chem species" entry for CBM-Z – it is currently left blank.

Page 12641, A17: Please list (with references) the standard aerosol modules available in the publicly available versions of WRF-Chem (e.g., MADE-SORGAM, MOSAIC, GOCART, MADRID).

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 12541, 2013.