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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Technical Note: an implementation of the dry removal processes DRY DEPosition and SEDImentation in the Modular Earth Submodel System (MESSy)" *by* A. Kerkweg et al.

Anonymous Referee #3

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Kerkweg et al. acpd-2006-0167 describes practical details of two new submodels, DRYDEP (DRY DEPosition) and SEDI (SEDImentation), implemented in the Modular Earth Submodel System (MESSy). As mentioned in Introduction, the manuscript gives the users of these two submodels an opportunity to understand and to be capable of modifying the code if needed. The authors therefore elaborate writing down mathematical formulations and procedural details (some are specific to MESSy and others are of more general interest), whose theoretical backgrounds have been published in previous literatures including textbooks or being prepared for publication. The zeroth-

oder and first-order schemes used for SEDI (as described in Sects. 2.2.1 and 2.2.2) appears the only exception containing some original elaboration which came from the second author's Ph.D. thesis.

The manuscript is well written and I am sure it will be very useful for the users of DRYDEP and SEDI. On the other hand, I do not see a significant originality in this work at least for the DRYDEP part of this work. I cannot exactly evaluate the SEDI part of this work, because I do not expertise the aerosol sedimentation process. But the description of implementation procedures of both gas and aerosol dry deposition and sedimention in a single literature in this level of detail is rare. In this respect I think the manuscript is useful to general readers as well and may be accepted as a technical note after the authors have addressed the following points.

Specific comments:

1) Surface types (or land use category)

The authors distinguish relatively small numbers of surface types (or landuse type) for parameterizing various resistances. This probably comes from the work of Ganzeveld and Lelieveld (1995). But the Wesely (1989) parameterization, on which the authors' present work is also based, distinguish 11 landuse types, in marked contrast to single vegetation type considered by the authors. Perhaps the authors should describe how to fill in the gap when applying Wesely-type resistance parameterization.

2) Effective Henry's law coefficient

The surface resistance parameterization depends on effective Henry's law coefficient, which accounts for apparent increase of solubility from intrinsic Henry's law coefficient by ionic dissociation in aqueous solution. Since pH affects the effective Henry's law coefficient, the authors should mention what pH to assume when introducing the new entries.

3) Soil pH map?

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The surface resistance on soil depends on the soil pH as summarized in Table 3. I wonder if the soil-pH map comes along with the DRYDEP code as an external supplementary file, especially because such a map is not normally a part of landuse map used by host meteorological models.

Technical suggestions:

- abstract

Change "Gas phase and aerosol dry deposition are" to "Dry deposition of gases and aerosols is"

- page 6854, line 13

Change "relative" to "relatively"

- page 6854, line 20

Change "which" to "whose"

- page 6854, line 23

Change "particle distribution" to "particle-size distribution"

- page 6854, line 24

Change "online calculated aerosol distributions" to "aerosol-size distributions calculated online"

- page 6855, line 2

Change "wants to clarify" to "is dedicated to describe"

- page 6855, line 12

Change "as these carry" to "as they carry"

- page 6857, line 2

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EGU

Change "quasi-laminary" to "quasi-laminar"

- page 6858, line 18

Change "similar" to "similarly"

- page 6858, line 20

Change "A unified formula as for Ra and Rqbr ..." to "Unlike Ra and Rqbr, the universal formula ..."

- page 6860, Eq. 7

Perhaps the second multiplication factor "(1 - f_si + f_land * f_si)" should be corrected to "(1 - f_si - f_land + f_land * f_si)"

- page 6860, line 7

Add "where" before "f_si"

- page 6872, lines 14 and 22

Change "Henry coefficient" to "Henry's law coefficient"

- page 6872, line 24

Change "sea uptake" to "sea-surface uptake"

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 6853, 2006.

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Interactive Comment