Geosci. Model Dev. Discuss., 3, C428–C430, 2010
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Geoscientific
Model Development
Discussions

Interactive comment on "Development and validation of a size-resolved particle dry deposition scheme for applications in aerosol transport models" *by* A. Petroff and L. Zhang

Anonymous Referee #1

Received and published: 13 October 2010

The present paper aims at improving the representation of dry deposition in aerosol transport model. More specifically, authors propose to improve the modelling of dry deposition over vegetated surface by deriving an improved scheme from a previous work from Petroff et al (2008a; 2009) with an updated representation of surface resistance and collection efficiencies. The dry deposition module is also applied to other surface types mainly water surface, deserts-like and snow/ice covered surfaces. This new scheme is based on the resistive approach following the work of Zhang et al (2001; 2003). This latter model that is currently used in aerosol models is compared to the new one and with a large set of available observations. The results show that this new scheme allows a better representation of dry deposition velocities over 2 types

of vegetated surfaces. Especially the representation of the amplitude and position of the minimum of these velocities as a function of the particle diameter and surface type seems to be better reproduced. The subject of the paper is interesting. Authors have made huge efforts to present the tools and the underlying theory. The methodology used to derive the new scheme from the detailed scheme of Petroff et al (2008a; 2009) and to evaluate its skills is sound nevertheless the analysis of the relative performances of both models remain maybe too much qualitative. Even if the number of available observations for each surface type is weak a better quantification of the results would greatly improve the paper especially in the case of the vegetated surfaces. Maybe a more clear synthesis of the results is also needed. I think that these aspects would highlight the results of the paper and this way could convince aerosol modellers to use it for their applications. For these reasons, i agree with the publication of this article in the GMD journal with some minor revisions concerning the previous remark. I propose few corrections and /or clarifications to the authors that i hope could improve the paper.

Abstract:

I think that the abstract as well as the conclusion needs to be completed with a more explicit quantification of the results.

Section 1 - Introduction:

P1318 – line 22-23: It is missing more details about the impact of the dry deposition process (as a sink of aerosols) comparatively to other sinks (especially wet deposition) and their related life time.

P1319 – line 09-10: Please give the Vd values obtained for rougher canopies.

P1320 – line 10-11: Could you precise the kind of canopies?

P1320 – line 12-13: To which kind of surfaces the range of Vd values in the accumulation mode you are mentioning is corresponding?

Section 2 - Theoretical considerations

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P1321 – line 17: "...Paulson (1970); Dyer (1974) ...", replace the ";" by "..and.."

P1321 – line 19: correction needed for "...formumations..."

P1323 – line 11: correction needed for "...exemple..."

P1324 – line 16-17: you made the assumption that the aerosol was a homogeneous phase with interactions of any kind between particles. Can you argue more about that? Are this processes negligible in your case? If not can we estimate the associated uncertainties?

Section 3 – Results

In general, concerning this section, it would have been interesting for each evaluation of the scheme (i.e for different surface type) to clearly explain (recall) what it is expected concerning the discrepancies between both model in light of the different settings that are used. Especially, are we supposed to wait the same results for both for non vegetated surfaces? Why?

P1333 – line 20: you do not justify the choice of the aerosol density. Moreover, you are using other values in the following. It is maybe details but it would be nice to clarify it.

P1334 – line 7: my question here is related to the general remark concerning this section. Why you do not present the results obtained with Zhang et al (2001)? Is it too much similar?

P1334 – line 12: Explain clearly what is driving the choice of zR .

P1336 – line 5-11: this paragraph should be clarified maybe just rephrase it.

Conclusion

Cf remarks for the abstract and in general the need of the closer analysis of the results.

Interactive comment on Geosci. Model Dev. Discuss., 3, 1317, 2010.