Geoscientific
Model Development
Discussions

Interactive comment on "Testing the performance of state-of-the-art dust emission schemes using DO4Models field data" *by* K. Haustein et al.

Anonymous Referee #1

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General comments

This study examines the performance of three well-known dust emission schemes in a box model environment constrained by observations from the DO4Models field campaign in Botswana during July-October 2011. Modeling the atmospheric desert dust cycle has improved the past two decades but the remaining challenges and uncertainties are still significant. The most important aspect of this problem is the lack of detailed measurements of the dust vertical flux emitted from the soil in a variety of arid areas worldwide. Such measurements could help the modelers improve the emission parameterization schemes and take the leap towards more robust simulations and predictions of the dust cycle. The paper is well written and concise. In terms of scientific significance, I believe that the knowledge gained from the sensitivity model experiments as

they are compared to measurements is an important addition to current knowledge and practices. My comments concern mostly some obscure parts of the manuscript where clarifications are necessary to improve the quality of the narrative. The only omission I found in this work was a discussion on the errors in the measurements that might have influenced the results. I am in favor of publishing this paper with Geoscientific Model Development, after carefully addressing the minor comments that follow.

Specific comments

Introduction

1. Page 5740, line 25: "from a remote sensing"

2. Page 5741, line 17: "In this paper we report..."

Background

1. Why did the authors choose Sua Pan for the field campaign? What characteristics of the soil surface make this location unique and at the same time common to a large number of soil types in desert areas worldwide? In other words, are the conclusions transferrable to other arid regions as well or they are limited to the specific crusted type of surface? Please include the information in the text.

2. Page 5743, line 21: "anemometers at heights of".

3. Page 5743, lines 18-29: The description and differences between the measuring sites is not clear in the text (i.e. the dust sensors are included in all 11 sites?). Please make a distinct description of the AWS and MET sites as to the differences between them.

Box model development

1. The correction factor 2.61 used in the MB95 scheme was set to 1 in later publications (Marticorena et al. 1997, Laurent et al. 2006, Darmenova et al. 2009). Why did the authors choose to include the value that originates from the experiment of White

(1979)?

2. Page 5747, line 21: How do you calculate the grain size velocity ws?

3. What is the difference between minimally and fully disturbed soil size distributions? This is important to put the discussion on the findings in the right context.

4. Table 2 is confusing. Sensitivity experiments a to d occurred for all model setups? If yes, then I suggest reordering the rows by leaving the experiments a-d last and inclusive of all setups.

Results and discussion

1. Figures 2-4 contain a large number of sub-plots that make the reading of the figure very difficult. The plots are an important part for this work. I would suggest to either make the subplots bigger or cut each figure in two.

2. Figure 1 could be improved from the indication of the measuring sites in their respective location.

3. A discussion on the possible sampling errors/uncertainties in the measured quantities is essential. Inclusion of quantitative values is desirable, if possible.

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