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Interactive comment on “Mass deposition fluxes of Saharan mineral dust to the tropical northeast Atlantic Ocean: an intercomparison of methods” by N. Niedermeier et al.

Anonymous Referee #3

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General comments

This work provides an overview of different methodologies for the calculation of the Saharan dust deposited mass in a specific part of the Atlantic Ocean. The authors have used a sufficient amount of recent observations (meteorological and microphysical) to test the various methodologies and conclude on their differences. In addition to the observations, the authors make use of a regional dust model (COSMO-MUSCAT) to test the modelled deposited fields (derived from the included deposition scheme) against the observations. In terms of scientific quality and significance, the subject of this paper is of scientific interest as it gathers and makes use of information on different

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methodologies that could potentially help future researchers in selecting one of these methods. The title of the manuscript reflects the contents of the paper and is consider sufficient.

The paper is generally well written and sufficient in length. The comments on the manuscript are related mostly with some questions that have arisen during the review and need to be addressed. Also, there is a need to make the text more easily readable and concise in the technical parts. Finally, what I feel is missing from the summary/conclusions, is the authors' recommendation on how and why to choose one of these methodologies (maybe give a preference in one of the methods) for a potential interested researcher and the addition of previous work on these methodologies. The authors have made a small comment on the preferred methodology (MMe+Cmass,PMSDmd), but I would suggest devoting more text in their conclusion and associate it to previously published work. Such conclusion would add to the scientific merit of the paper and will dissociate it from being another application of methods and models.

The specific comments that follow will help to clarify and strengthen the quality of the paper through recommendations on the presentation and the discussion of the results. I am in favor of publishing this work with Atmospheric Chemistry and Physics, after the minor revision comments have been addressed.

Specific comments

Abstract The conclusion provided in lines 16-20, that compares the modelled with the measured deposition fluxes, does not provide any scientifically important information. The use of a regional dust model in this work is purely auxiliary, and if a different dust model was used, it would lead to a different percentage of compliance with the measurements. I would suggest adding a sentence on the preference on one of the observational methodologies, based on the experience gained from this work.

Section 3.1.1: Even though this method appears to be the most prominent one, the

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assumption on the shape of the particles (spheres as shown in Equation 4) does induce some errors in the calculated fields. Even though such errors cannot be quantified, they are worth mentioning in the document. Dubovic et al. (2006) discuss the effect of nonsphericity in remote sensing of desert dust.

Section 3.2: The algorithm for the dry deposition velocity (Equation 7) should not be referred to Heinold et al. (2007). The authors should replace this reference with the following: “The dry deposition velocity (v_d) is based on the resistance approach of Slinn and Slinn (1980) as implemented by Kumar et al. (1996)”. The references are included at the end of this review.

Section 4.3: Please explain the meaning of the DOY values shown in Periods 1 to 4. If the DOY is Day Of Year, then what is the value 36.5? If that is the Julian day, why entering in February by 5 days when in section 4 (Results) the events of the high dust concentration end in day 32?

Technical corrections Page 33029, line 2: “.. the total error for cmass,PMSD results. . .”

Page 33039, title of section 3.1.2: I believe that the variable name should be cmass,SOAP in the parenthesis.

Page 33042, equation 11: Please explain in the text the variables w' and T_s' .

Page 33044, line 12: Please add a reference to equation 17.

Page 33045, line 13: cmass,DMSD should be replaced by cmass,PMSDmd.

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Slinn, S.A., Slinn, W.G.N., 1980. Predictions for particle deposition on natural-waters. *Atmospheric Environment* 14,1013–1016.

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