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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Parametric sensitivity and uncertainty analysis of dimethylsulfide oxidation in the remote marine boundary layer" *by* D. D. Lucas and R. G. Prinn

Anonymous Referee #3

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The main objective of the paper is to identify the key parameters and sources of uncertainty in the diurnal DMS cycle in the remote marine boundary layer. The results of uncertainties and sensitivity analysis using two different analytical methods are presented focusing on the concentrations of DMS, SO_2, MSA and H_2SO_4. There is a lot of work in this paper, which enables to quantify carefully sensitivity coefficients of different orders, and the uncertainties in concentrations due to uncertainties in the model parameters.

The methods rely on the 1D model described in Lucas and Prinn, 2003, and quoted here as "structurally simple" by the authors. The use of such a model should thus be justified more rigorously, indicating how all the processes involved in the DMS cycle of

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the remote marine atmosphere are well-represented and what are their limitations and the limitations of the chosen assumtions: for instance, what is the relevance of p_m? What is the reference for NO and NO_3 concentrations?

Another point concerns the use of the two analytical methods. It is difficult for the reader to understand why these two methods have been chosen: are they really suitable for the described physical system and are there other existing? This should be detailed at the beginning of section 3. Moreover, some properties of the methods are scattered in the text (end of subsection 3.2.1 : "In this sense. . .", end of subsection 4.2: "expensive to compute. . .", first paragraph of subsection 5.1: "computationnaly. . .") instead of being synthetically described. I think a brief comparison of the two methods describing their advantages and inconvenients (for instance, their computational costs) is also necessary in section 3.

Detailed comments:

Introduction: the importance of MSA and H_2SO_4 in the formation of aerosols could be pointed out here. This will also justify why only concentrations of DMS, SO_2, MSA and H_2SO_4 are discussed in the paper.

2.1.3: how are fast reacting sulfur-based radicals calculated, photochemical equilibrium?

4.1: eq. 6 does not come from derivative of Eq. 1 but Eq. 5.

5.1: in relation with point 2 in the general discussion above, it should be emphasized why three different methods have been used in order to estimate the PDFs moments (especially DIM-S)?

5.1.1: the PCM moments are calculated assuming the variables are independant. This should be justified for the used concentrations.

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6.2.4: it will be also interesting to discuss the shift of sensitivity from morning to evening (for example SO_2).

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 6379, 2004.

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