**Atmospheric
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Comment

Interactive comment on "Retrieving global sources of aerosols from MODIS observations by inverting GOCART model" *by* O. Dubovik et al.

O. Dubovik et al.

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We thank referee for her/his encouraging comments and useful recommendations.

We have carefully analyzed the reviewer comments and tried to address her/his questions and comments in the revised manuscript and in the present response. Detailed explanations are given below.

1. As suggested by the reviewer we have changed title to reflect that the method proposed in the paper is not limited to MODIS and GOCART.

2. We have removed some details from the abstract.

3. We have made some improvement for the Section 3. For example we added few figures that should help reader to follow this Section discussion.

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4. In the beginning of Section 2.3 we have added some introductory paragraph explaining usage of smoothness constraints for aerosol emission retrieval.

5. We have included description of the variables in Eq.(28).

6. (Page 3646 in the first version of the manuscript). Question: "Page 3646: n-th difference - do you actually mean n-th derivative here?" Answer: Here we are discussing differences that are related with derivatives as shown by Eqs.(24-25). We have added some clarifications in the revised version too.

7. We agree with the following reviewer's remark: "Page 3647: A remark on using knowledge of typical time, horizontal and vertical variability: - in fact this knowledge is not very great in most cases (but still better than using a-priori guesses on emission fluxes)." We have also included some clarifications in the revised version that concur with this remark.

8. As recommended by the referee, we have added introductory paragraph explaining steepest descent method (see the text after Eqs.(39-40)).

9. We have clarified the number of size bins (7) used for modeling desert dust in GOCART.

10. Section 3.2. As suggested by the reviewer we have clarified terminology (i.e. used terms "test aerosol" and "synthetic measurements"). We have also clarified some settings of the transport model used in the inversion algorithm.

11. As recommended by the referee, we have specified the size bin used for the coarse mode aerosol. Also we added some discussion of retrieval convergence differences for retrieval of desert dust compare to the retrieval of fine aerosols.

12. We agree with the reviewer comment that desert dust can contain fine particles. This fact is stated in the manuscript, as well as, the possible manifestation of this fact in the retrieval that discriminate only fine and coarse mode aerosols.

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13. We have corrected the sentence (corresponding to Page 3671, line 9, in the first version of the manuscript).

14. We have added the discussion of the effect of subpixel cloud contamination on our retrieval results in Section 3.3.2.

15. As recommended by the reviewer (as well as Referee 1) we have included (in Section 3.4.1) statements outlining the potential of including CALIPSO data in our retrievals.

16. As recommended by the reviewer we have included (in Section 3.4.1) brief discussion of the potential possibilities of retrieving of sub-daily aerosol emissions.

17. As recommended by the reviewer (as well as Referee 3) we have tried to improve the language of the manuscript. With that purpose we have asked highly qualified native English speaker to read over the manuscript and correct it.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 3629, 2007.

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