

Interactive comment on “Data assimilation of CALIPSO aerosol observations” by T. T. Sekiyama et al.

Anonymous Referee #2

Received and published: 22 April 2009

The authors introduced a new data assimilation application using Local Ensemble Transformed Kalman Filtering and a global aerosol model. This is the first paper to assimilate observations derived from space-based lidar CALIOP. Independent validations using ground-based lidar and weather reports demonstrated that the application successfully improved the 4D distribution of Asian aerosol outflows. The authors also attempted to optimize dust emissions from CALIOP data. Although the results are interesting and deserve to be published in ACP, the authors have not included and/or specified some important aspects of methodology. Below, the authors can read some helpful comments and suggestions.

1) Abstract and Summary: The authors described that the application corrected 'global' dust emission distribution. However, the paper described validations over the Asian

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



region only. The authors should show validations for other dust sources.

2) Section 2: Please describe the methodology and setting of the application in greater detail because this paper specifically explained development and validation of a new data assimilation system.

2a) Page 5793, Line 6: Please briefly describe the LETKF methodology.

2b) Page 5792, Line 10: Please describe the observation operator in greater detail.

2c) Page 5793, Line 15: Please briefly explain how the authors initialized ensemble members. In addition, add some brief discussion related to the ensemble size.

2d) Page 5793, Line 13: I could find no explanation about local regions used for this study: the localization parameters are sensitive not only to the assimilation performance but also to the ensemble size.

2e) Page 5793, Line 20: Hunt, Kostelich and Szunyogh (2006) suggested that an inappropriately long time interval (or assimilation window) leads to unreasonable assimilation results. Please add brief comments related to the setting of the time interval.

2f) Page 5793, Line 5: Did the dust emission factor have a negative value after assimilation?

3) Figure 1: Please add longitude to the X-axis in Fig. 1 or draw the CALIPSO orbit in Fig. 2 or Fig. 5.

4) Figure 1 and Page 5795, Line 5: Although the 4D-LETKF considerably improved the dust vertical distribution near 30-40°N, my concern lies with the reference model result. According to Fig. 1 and Hara et al. referred in this paper, the main dust cloud existed between 36-42°N at 2-5 km centering at ~40°N. The reference model result could not capture the dust cloud critically. One would consider that the model presented some problems and that the authors should improve the dust emission scheme or the physics and dynamics procedures of the model before assimilation.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



5) Figure 5: I recommend adding the aerosol distribution from passive satellite measurements to make your results more rigorous.

6) Some mention of which parameter (concentrations or the emission factor) is more sensitive to (or important for) the dust assimilation results would be useful.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 5785, 2009.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

