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Data assimilation of CALIPSO aerosol observations

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Abstract. We have developed an advanced data assimilation system for a global aerosol model with a four-dimensional ensemble Kalman filter in which the Level 1B data from the Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO) were successfully assimilated for the first time, to the best of the authors' knowledge. A one-month data assimilation cycle experiment for dust, sulfate, and sea-salt aerosols was performed in May 2007. The results were validated via two independent observations: 1) the ground-based lidar network in East Asia, managed by the National Institute for Environmental Studies of Japan, and 2) weather reports of aeolian dust events in Japan. Detailed four-dimensional structures of aerosol outflows from source regions over oceans and continents for various particle types and sizes were well reproduced. The intensity of dust emission at each grid point was also corrected by this data assimilation system. These results are valuable for the comprehensive analysis of aerosol behavior as well as aerosol forecasting.

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