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Asian dust outflow in the PBL and free atmosphere retrieved by NASA CALIPSO and an assimilated dust transport model

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Abstract. Three-dimensional structures of Asian dust transport in the planetary boundary layer (PBL) and free atmosphere occurring successively during the end of May 2007 were clarified using results of space-borne backscatter lidar, Cloud-Aerosol Lidar with Orthogonal Polarization (CALIOP), and results obtained using a data-assimilated version of a dust transport model (RC4) based on a ground-based NIES lidar network. The dust layer depths and the vertical and horizontal structure simulated by RC4 agreed with those of CALIOP observations from the dust source region to the far-downstream region. Two important transport mechanisms of Asian dust in the PBL and free atmosphere were clarified: a low-level dust outbreak within the dry slot region of a well-developed low-pressure system, and formation of an elevated dust layer within the warm sector of a low-pressure system. We also represent the aging of pure dust particles using the particle depolarization ratio (PDR) at 532 nm and the color ratio (CR) at 1064 nm and 532 nm. Aerosols with high PDR were observed uniformly over the dust source region. While the dust cloud was transported to the eastern downwind regions, aerosols with low PDR and high CR occur in the layer of less than 1 km height, suggesting a mixing state of spherical aerosols and dust in the surface layer.

[Final Revised Paper](#) (PDF, 26178 KB) [Discussion Paper](#) (ACPD)

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