

The optical features in the transition zone between cirrus and clear-sky Observed by CALIOP over China

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The horizontal profiles of optical properties all clearly shown stair-step shape, reflects the change of concentration, size and shape.

The horizontal profiles of backscatter coefficient and depolarization ratio, respectively in log-space and linear-space, could be expressed as functions of distance. The quadratic-fitting in cirrus and linear fitting in transition zone and clear sky can be in good agreement with the statistics. The layer shown the three sections of cirrus body, transition zone and clear sky, and the transition zone could be further subdivided into an intra-cloud gently-changing area, a linear abruptly-changing area and an external-cloud gently-changing area. The transition zone was located between -12km and 8km, and the linear abruptly-changing area lied between -4km and 1km, where optical characteristics changed most radically.

Optical properties shown different relationship in cirrus, transition zone and clear sky, and the probability density distribution (PDF) of transition zone position presented a structure different from the horizontal profiles of optical properties. It implies that the transition took place within the internal change of micro-physical and optical features, but not the mixing of different particles.

Typical features of ice particles presented 0.55-1.25 of color ratio and >0.12 of depolarization ratio. The proportion of typical-feature particles also demonstrated stepped horizontal profile, its relationship with the optical-property profiles was different in the three sections, which reflected the internal change of scattering particles. The transition was not solely caused by the concentration changes of particle.

Key words: cirrus, clear sky, transition zone, the Cloud-Aerosol Lidar with Orthogonal Polarization (CALIOP), aerosols

References (if needed)

Rui Li, Hongke Cai, et al., 2014: The optical properties and longwave radiative forcing in the lateral boundary of cirrus cloud. *Geophysical Research Letters*, 41(10), 3666-3675.