Particle microphysics in the UTLS region and its association with the prevailing dynamics

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Objective:
To study the characteristics of particulates in the Upper Troposphere and Lower Stratosphere (UTLS) and its association with the prevailing dynamics at tropics.

Experiment and Data:
Collocated Lidar and Radar observations from Gadanki [13.5°N, 79.2°E], INDIA for the period 1998-2003
- Lidar operated at 532 nm, with pulse width of 7 ns at 20 Hz rate having dual polarization capability
- MST radar operated at 53 MHz in vertical beam mode
- Radiosonde data from India Meteorology Department, Chennai

Mean Particulate Backscatter Coefficient

Integrated Particulate Backscatter Coefficient

Particulate backscatter coefficient shows significant annual variation. Relatively high values are observed in the UT region during summer and in LS region during winter.

Annual variation of particulate backscatter in the UT and LS region display distinctly contrasting features.

General similarity in the annual variation of VDR in the UT and LS indicates that the annual variation of particle habit in these two regions are more or less similar. This suggest that influencing microphysics for the variation in VDR are almost the same indicating the existence of coupling between the two regions. However, a general decrease in VDR from UT to LS suggests that the particles tend to become more regular in shape and smaller in size in the LS region.

Annual adjustment in tropopause altitude is an important mechanism for exchange processes.

Mean Particulate Backscatter coefficient & Vertical Mass flux in the UTLS region

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In UT, the upward mass flux dominates during February-March and September-October period and downward mass flux dominates in the April-August months.

In LS, strong upward mass flux is observed in the January-March and October-December period and a strong downward draft is seen during the May-August period.

Summery:
- The annual variation of particulate backscatter in the UT and LS region display distinctly contrasting features.
- The tropospheric convective activity significantly influences the microphysical properties of particulates in the UTLS region.
- Relatively low value of VDR in the LS region suggests that the particles are relatively small in size and more-or-less spherical in shape compared to those in the UT region.

References:

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