Characterizing the Asian Tropopause Aerosol Layer (ATAL) using satellite observations, balloon measurements and a chemical transport model


Summary

亚洲上空平流层气溶胶层（ATAL）的观测和模拟

eneficent Henry’s Law equilibrium with aqueous oxidation by H2O2, followed by wet scavenging in convective updrafts.

Model indicates ATAL sulfate sustained by convective lofting of SO2, combined gas-phase conversion (July, 2008, 30N)

Contributions from Indian and Chinese sources, with % contributions (white contours). Model indicates a dominant (>40%) contribution from Indian emissions to ATAL in July, 2008; Chinese emissions (20-30%) remain largely outside the anticyclone in this episode; rest-of-world emissions (not shown) found to contribute <20% to ATAL. These contributions change with transience of the ATAL anticyclone.

Model comparison with MIPAS SO2 and CALIOP scattering ratio (SR) improved with updated treatment for SO2 scavenging in convective updrafts

Summary continued

Ballon observations (BATAL, 2015) reveal ATAL aerosols near the cold point tropopause, often in vicinity of ice cloud and elevated water vapor.

- AtAL observations in convective updrafts

Limited in situ measurements of composition (CARIBIC) indicate that the ATAL is composed primarily of carbonaceous and sulfate aerosols. Elevated SO2 (10-30 ppt) found in monsoon outflow in the UTLS (in HALO (EMVal campaign).

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