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


Transport of pollution in the Upper Troposphere by Asian Monsoon

Limited SO2 observations indicate aerosol composition 10-12 km in lower ATAL mainly Sulfate + Carbonaceous

Summary

- CAIROC observations have revealed a seasonal maximum of aerosol in the UTLS associated with the Asian monsoon. The Asian Tropopause Aerosol Layer (ATAL) has been independently validated using backscatter winds flown out of China and from India.
- Limited in situ measurements of composition (CAIRBIC) indicate that the ATAL is composed primarily of carbonaceous and sulfate aerosol. Elevated SO2 (~30 ppt) found in monsoon outflow in the UTLS (in HALO ESMV campaign).

Summary continued

- Balloon observations (BATAJ, 2015) reveal ATAL aerosols near the cold point tropopause, often in vicinity of ice cloud and elevated water vapor.
- GEOS-Chem simulation shows improved comparison with MIPAS SO2 and CALIOP backscatter with updated treatment of wet scavenging of SO2 in deep convective updrafts.
- Model indicates dominant contribution of regional sources of SO2 and OC (~70%) in ATAL composition, compared with rest-of-world contributions.


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