



Anthropogenic and volcanic contributions to aerosol composition and decadal variations in the upper troposphere and lower stratosphere

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We present our study of decadal variations (2000-2012) of aerosols in the upper troposphere and lower stratosphere (UTLS) in terms of the origins and transport mechanisms through modeling and analysis of observations. We use a global model that incorporates emissions from anthropogenic, biomass burning, volcanic, and other natural sources to simulate the aerosols and track their origins. The model results are compared to satellite observations from OSIRIS, SCIAMACHY, GOMOS, and CALIOP and aircraft observations from the CARRIBIC project. Although volcanic sources exerts large, sporadic perturbation to the UTLS aerosol composition, mainly due to the nature of volcanic eruptions and relatively high altitude injections, anthropogenic aerosols, especially from Asia, are transported from surface to high altitudes mainly via the monsoon convective transport with well-organized seasonal cycles in the UT region. We estimate the relative contributions of natural and anthropogenic aerosols in different altitudes in UTLS and discuss the implication of the continuous increase of Asian anthropogenic emissions.