



Observations of PAN and its confinement in the Asian Monsoon Anticyclone in high spatial resolution

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This talk presents a set of observations by the CRyogenic Infrared Spectrometers and Telescopes for the Atmosphere (CRISTA) infrared limb sounder on the SPAS platform in low-earth orbit. The spatially highly resolved trace gas measurements of six days in August 1997 allow a close look on the confinement of air masses within the Asian Summer Monsoon (ASM) anticyclone. Peroxyacetyl nitrate (PAN) is a secondary pollutant without sources in the stratosphere and acts as a tropospheric tracer. In combination with ozone as a stratospheric tracer, an eddy-shedding event of the ASM could be observed. The measured PAN volume mixing ratios (VMR) correlate well with potential vorticity (PV) derived from ECMWF ERA-Interim model data. Computing the gradient of PAN over PV on isentropes reveals that PAN VMR exhibit the strongest decrease at each isentrope for an increasing value of PV, which may be used to identify the extent of the ASM on that isentrope. CRISTA measurements also provide the temperature of measured air parcels and thus allow to derive the location of the thermal tropopause. We find that the thermal tropopause coincides with the border of the positive PAN anomaly both horizontally and vertically within the ASM anticyclone. In contrast, the shed eddy exhibits enhanced PAN VMRs for 1 to 2 km above the thermal tropopause. The amount of mixing may also be characterised by projecting the derived air parcels into tracer-tracer space using PAN and ozone as tropospheric and stratospheric tracer, respectively. This reveals that the anticyclone contains few mixed parcels in contrast to the region between the anticyclone and the shed eddy. This implies that while the anticyclone confines polluted air masses well, eddy shedding provides a very rapid horizontal transport pathway of Asian pollution into the extratropical lowermost stratosphere with a time scale of only a few days.