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Chemical isolation in the Asian monsoon anticyclone observed in Atmospheric Chemistry Experiment (ACE-FTS) data

M. Park[1], W. J. Randel[1], L. K. Emmons[1], P. F. Bernath[2,3], K. A. Walker[2,*], and C. D. Boone[2]
[1]National Center for Atmospheric Research, Boulder, Colorado, USA
[2]Department of Chemistry, University of Waterloo, Waterloo, Ontario, Canada
[3]Department of Chemistry, University of York, Heslington, York, UK
[*]now at: Department of Physics, University of Toronto, Toronto, Ontario, Canada

Abstract. Evidence of chemical isolation in the Asian monsoon anticyclone is presented using chemical constituents obtained from the Atmospheric Chemistry Experiment Fourier Transform Spectrometer instrument during summer (June–August) of 2004–2006. Carbon monoxide (CO) shows a broad maximum over the monsoon anticyclone region in the upper troposphere and lower stratosphere (UTLS); these enhanced CO values are associated with air pollution transported upward by convection, and confined by the strong anticyclonic circulation. Profiles inside the anticyclone show enhancement of tropospheric tracers CO, HCN, C_2H_6, and C_2H_2 between ~12 to 20 km, with maxima near 13–15 km. Strong correlations are observed among constituents, consistent with sources from near-surface pollution and biomass burning. Stratospheric tracers (O_3, HNO_3 and HCl) exhibit decreased values inside the anticyclone between ~12–20 km. These observations are further evidence of transport of lower tropospheric air into the UTLS region, and isolation of air within the anticyclone. The relative enhancements of tropospheric species inside the anticyclone are closely related to the photochemical lifetime of the species, with strongest enhancement for shorter lived species. Vertical profiles of the ratio of C_2H_2/CO (used to measure the relative age of air) suggest relatively rapid transport of fresh emissions up to the tropopause level inside the anticyclone.

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