



Changes in the tropical belt and their effect on trace gas distributions in the UTLS

Sean Davis (1,2) and Karen Rosenlof (1)

(1) Chemical Sciences Division, Earth System Research Lab, National Oceanic and Atmospheric Administration, Boulder, CO, USA (sean.m.davis@noaa.gov), (2) Cooperative Institute for Research in Environmental Sciences, University of Colorado at Boulder, Boulder, CO, USA

Recent evidence suggests that changes have occurred in the position and strength of the subtropical jet/mixing-barrier regions, and the related width of the “tropical belt”. Observational estimates of the tropical widening range from around 0.2 – 3 degrees per decade, and in general these rates are much greater than those predicted by climate models. In addition to effects on temperature and precipitation patterns, tropical widening phenomena will likely affect the large-scale distributions of trace species in the UTLS, although their precise influence is not well constrained. In this presentation, we show an update to previous tropical width and tropical widening estimates based on outgoing longwave radiation from satellite measurements, and Hadley cell overturning and tropopause changes in multiple meteorological reanalyses. These timeseries, updated through the end of 2009, indicate a continued widening of the tropics, and differences between widening in the various metrics are used to highlight differing aspects of changes in the general circulation. We also present new methods for quantifying the strength and location of the subtropical jet/mixing-barrier region based on effective diffusivity calculated from potential vorticity in meteorological reanalyses. Cycles and trends in the effective diffusivity mixing-barrier are presented and compared to the other tropical belt metrics. We also present preliminary research as to how these tropical belt metrics correlate with interannual and longer timescale variations in satellite and balloon observations of ozone and water vapor in the UTLS.