OCTAV-UTLS (Observed Composition Trends and Variability in the UTLS) SPARC Activity - Jet-relevant Data Analyses of NOAA Ozonesonde Records

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The variability of the tracer distribution at the tropopause introduces a large uncertainty to estimates of future surface temperatures (e.g., Riese et al., 2012). Further, recent work shows that ozone trends in the upper troposphere / lower stratosphere (UTLS) are poorly understood and are strongly affected by dynamical processes (Chipperfield et. al, 2018; and references therein). It is therefore essential to account for the variability of the jets and tropopause location and their effects, particularly for assessing long-term composition changes. The Stratosphere-Troposphere Process and their Role in Climate (SPARC) and WMO-sponsored activity OCTAV-UTLS (Observed Composition Trends and Variability in the UTLS) aims to reduce the uncertainties in trend estimates by accounting for dynamically-induced sources of variability. As a central task for OCTAV-UTLS, we are developing and applying common metrics to compare UTLS data using geophysically-based coordinate systems including tropopause and upper tropospheric jet relative coordinates. The central tool to achieve these goals is the JETPAC-tool (Jet and Tropopause Products for Analysis and Characterization; Manney et al., 2011, 2014, 2017; Manney & Hegglin, 2018), which provides this information based on modern reanalysis datasets consistently across numerous measurement platforms with different sampling, resolution, and measurement uncertainties. Our presentation will provide an overview of the OCTAV-UTLS activity and examples of analyses of ozone variability measured by NOAA GMD and NASA SHADOZ ozonesondes over the same time period and over different geophysical regions. We will specifically assess the effect of different geophysically-based coordinates on the variability of ozone distributions.

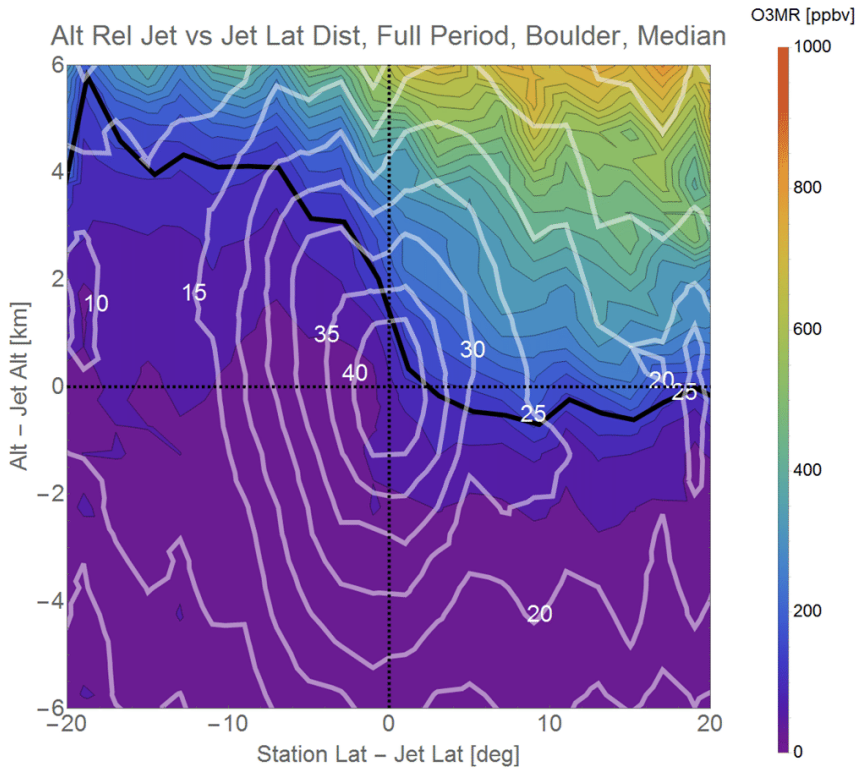

Figure 1. Mean ozone mixing ratio distribution derived from Boulder, CO 1979–2013 observations and binned in coordinates relative to the latitude and altitude of the subtropical jet. Ozone mixing ratio is depicted in color, the legend is shown on the right side of the plot. An ozone anomaly is seen in the right half of the plot, where high ozone values wrap around the jet location (the origin on the plot), suggesting stratosphere to troposphere transport in that region. White contours are wind speeds (m/sec) averaged over a distance from the jet, where highest wind speeds are centered on the origin of the plot. The black solid line is the median of the 4.5 PV tropopause height binned relative to the Subtropical jet location.