QOS2016-254, 2016
Quadrennial Ozone Symposium of the International Ozone Commission

Using Microwave Limb Sounder observations and the Match technique to assess the validity of analysis winds and heating rates.

N.J. Livesey (1), M.L. Santee (1), G.L. Manney (2,3)

(1) California Institute of Technology, Jet Propulsion Laboratory, Pasadena, United States (nathaniel.j.livesey@jpl.nasa.gov), (2) NorthWest Research Associates, (3) New Mexico Institute of Mining and Technology

The long-standing "Match" technique uses Lagrangian trajectories to identify cases where the composition of an airmass is observed on two or more occasions. This approach accounts for the impact of advection on the airmass, enabling observed changes in airmass composition to be ascribed to chemical or microphysical processes, or to irreversible mixing. The Match technique was pioneered with ozonesonde observations, and used to quantify chemical destruction of Arctic stratospheric ozone. The technique has previously been applied to the far denser ozone observations from the Microwave Limb Sounder (MLS) instrument on NASA's Aura satellite, launched in 2004, and used to quantify both Arctic and Antarctic ozone loss for multiple years. We extend that prior work to MLS observations of other trace gases, including nitrous oxide and methyl chloride, both long-lived trace gases, and water vapor, which behaves as a long-lived trace gas in most circumstances. In the absence of chemical or microphysical processes, observed changes in the abundance of these species in matched airmasses can be indicative of irreversible mixing and/or of errors in the trajectory calculations used to identify matched observations. Accordingly, this technique can provide insights into the accuracy of analysis fields used to drive the trajectories. We present preliminary results from such an analysis, focused on the winds and heating rates in the recently released MERRA-2 analysis dataset.