

Variations in trace gas distributions in the upper troposphere and stratosphere deduced from Aura Microwave Limb Sounder measurements and their relationship to the strength of transport barriers diagnosed from meteorological analyses

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Daily global trace gas measurements from the Microwave Limb Sounder (MLS) on NASA's Aura satellite, launched in July 2004, have enabled a comprehensive examination of the daily, seasonal, interannual, and interhemispheric variations in trace gas distributions in the upper troposphere and stratosphere. Here we use nearly eight years of MLS O₃, HNO₃, HCl, ClO, CH₃Cl, H₂O, CO, and N₂O measurements to analyze these variations and correlate them to the strength of transport barriers as diagnosed from meteorological analyses. Among the topics we investigate are: chemical processing in and dispersal of chemically-processed air from the lowermost portion of the winter polar vortex and the "subvortex", the region below the strong dynamical confinement of the vortex proper; the occurrence of troposphere-to-stratosphere and stratosphere-to-troposphere transport associated with the summer monsoon circulations; and the influence of the quasi-biennial oscillation and the so-called atmospheric tape recorder on tropical trace gas abundances. The observed trace gas behavior is shown to be consistent with the evolution of transport barriers.