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Observational study of the extratropical tropopause

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Many questions exist regarding the physical meaning of the extratropical tropopause. For example, what is the physical relationship between the thermal and the dynamical tropopause? Should the extratropical tropopause be characterized as a surface or a layer? If a layer, how should we identify or define it? More importantly, what should be used as the transport boundary between the stratosphere and troposphere? It is known that the thermal and the dynamical definitions often give different tropopause height. What are the consequences if we choose to use one definition as opposed to another when inferring stratosphere-troposphere exchange from observations or models? During the Stratosphere-Troposphere Analyses of Regional Transport (START) experiment in December 2005, the behavior of the tropopause was examined under a variety of dynamical conditions. Using in situ tracer measurements (O3, CO and water vapor) onboard the new NSF/NCAR research aircraft G-V and data from large scale meteorological analyses, we address many of these questions, focusing on the role of the thermal and the dynamical tropopause as a transport boundary. Analyses show that the sharpness of chemical transition across the tropopuase varies with the meteorological conditions near the tropopause. A depth of mixed air is found on the cyclonic side of the subtropical jet where significant separation occurs between the thermal and the dynamical tropopause. This type of investigation on a global scale using satellite data will also be discussed.