The polar summer Tropopause Inversion Layer

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Introduction

The tropopause inversion layer (TIL) refers to a region of enhanced static stability above the extratropical tropopause, associated with a small temperature inversion. Birner (2002, 2006) discovered the TIL using high-resolution radiosonde data organized in tropopause coordinates. GPS radio occultation measurements show that the TIL is a global phenomenon, and also reveal that the strongest inversion layer is observed in the summer polar regions (Randel et al., 2007; Grise et al., 2009).

Climatology of TIL from GPS data

Examples of polar tropopause inversions from radiosondes and nearby COSMIC soundings

What causes the strong polar inversion layer?

The forcing and maintenance of the TIL is a topic of ongoing research, and dynamical and radiative mechanisms have been proposed. The strong radiative cooling effects of water vapor near the tropopause are one potential mechanism.

Amplitude of the tropopause temperature inversion as a function of latitude during summer in both hemispheres. The inversion is defined as $T(z_{100}) - T(z_{50})$.

Midlatitude calculations from Randel et al. 2007

References


Thanks for discussions with: Franz Forster, Thomas Birner and Andreas Grotheer.