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## **Thermal characteristics of the tropical tropopause layer and their implication on stratospheric moisture in CCMI models**

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The tropical tropopause layer (TTL) provides a major pathway for troposphere-to-stratosphere transport of radiatively active gases, thus it is an important region for understanding stratospheric composition and related climate variability. This work examines the thermal characteristics of the TTL in climate models using the results from state-of-the-art models participated in phase 1 of the Chemistry-Climate Model Initiative (CCMI).

The CCMI models reproduce reasonable thermal structures in the TTL on climatological and seasonal timescales. However, a near-tropopause temperature bias and corresponding stratospheric moisture bias appear in many models. The temperature bias presents a strong relationship with the ozone bias in the TTL, which causes the temperature bias through local radiative processes. The CCMI models show large inter-model differences in ozone, and it is likely due to different ozone transport mechanisms in the models. These uncertainties could pose a significant limitation on understanding the Earth's radiation budget and corresponding climate projection.