

## **Role of saturation in the water vapor diurnal cycle in the South American Tropical Tropopause Layer**

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With a focus on two highly convective South American land regions, namely the equatorial Amazonia and the tropical region of Sao Paulo state in southern Brazil, we attempted to characterize and understand the mechanism controlling the water vapor (H<sub>2</sub>O) diurnal variability in the tropical tropopause layer (TTL). This work, part of the TRO-Pico French project, is based on a decade of Microwave Limb Sounder (MLS) H<sub>2</sub>O, temperature, relative humidity (RH<sub>i</sub>), and cloud ice water content (IWC) observations. In both regions, deep overshooting convective systems loft adiabatically cooled air, ice crystals, and H<sub>2</sub>O that hydrates the TTL. Observations performed at 01:30 am and pm however suggest a moister nighttime compared to daytime in the tropical region, and the opposite in the equatorial region. In this work, we show that the diurnal cycle of H<sub>2</sub>O potentially results from different saturation conditions in the TTL of both regions. The tropical sub-saturated TTL would favor rapid sublimation of lofted ice crystals, while the equatorial super-saturated TTL would instead delay it. We further emphasize that difference in the two regimes when considering the preliminary results from the assimilation of MLS observations in the Météo-France multi-scale Chemistry and Transport Model MOCAGE which provides a refined estimation of the H<sub>2</sub>O diurnal cycle with hourly outputs in the TTL of both regions.