

**Constraining climate trends at the tropical tropopause**

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A body of literature suggests that stratospheric water vapor concentrations are controlled, to first order, by temperatures at the tropical cold-point tropopause. Our understanding of the variability and long-term evolution of this climate feedback process is hampered by uncertainties in observations of both temperature and water vapor. Studies have used radiosonde measurements to infer a cooling trend at the tropical tropopause over recent decades. The objective of our study is to examine thoroughly and rigorously the sensitivity of this finding to inhomogeneities in the radiosonde records, incorporating the most recent observations. Our approach consists of comparison of temperature trends at the cold point and at nearby fixed pressure levels in unadjusted data with trends at fixed levels in a number of adjusted data sets, and comparison of cold-point trends for different times of day. The results indicate that previous studies using unadjusted data overestimated the magnitude of the cooling trend at the tropopause over recent decades. However, there still appears to be cooling after data inhomogeneities are accounted for, at most stations and in all regions of the tropics. The sharp temperature decline at the end of 2000 noted in previous studies is a robust feature. We also analyze the relationships between variability and trends in tropopause height, pressure and temperature. Finally, we use specialized statistical methods to explore how extremes in the tropopause quantities have changed over time.