

Characteristics of Waves in the Tropical Tropopause Layer

Ji-Eun Kim¹, M. Joan Alexander¹, and T. Paul Bui²

¹ NorthWest Research Associates, CoRA Office, Boulder, USA

² NASA Ames Research Center, Moffet Field, CA, USA

Resolving waves in the tropical tropopause layer (TTL) in climate models is beneficial in many ways. Waves in the TTL play an important role in regulating the water vapor transport into the stratosphere by modulating temperature and subsequent cirrus cloud formation. Also, wave-driven wind perturbations affect the distribution of atmospheric constituents and enable effective mixing of air. Furthermore, waves propagating into the stratosphere contribute to driving the mean tropical upwelling and quasi-biennial oscillation (QBO) of stratospheric wind. To properly represent waves in the stratosphere in global models, good representations of waves in the TTL is necessary since stratospheric waves mainly originate in the troposphere.

We will present basic properties of TTL waves such as geographic and seasonal variability, frequencies, and vertical wave scales from various observations including radiosondes, aircraft measurements, and COSMIC GPS temperatures. Results from reanalysis data will be compared to observations to identify missing components of wave properties. We will especially highlight the properties of fine vertical scale waves. Our comparisons between observations and reanalysis data will show that coarse vertical resolutions in current analysis systems and climate models hamper proper representations of wave-induced processes in the TTL and stratosphere.