

MONITORING THE TROPICAL TROPOPAUSE WITH RADIO OCCULTATION DATA

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The tropopause as the boundary region between the convectively mixed troposphere and the stably stratified stratosphere is an important domain of the atmospheric system. Tropopause parameters are expected to be valuable indicators for climate change. Radio Occultation (RO) data with their high vertical resolution are well suited for the determination of tropopause parameters. We analyzed more than five years of RO data taken onboard the CHAMP satellite, focusing on characteristics near the tropical tropopause, and compared to ECMWF operational analyses and NCEP reanalyses. Systematic deviations in mean temperatures persisted throughout the whole time span under investigation, except for the period after February 2006. We show that the observed deviations until February 2006 resulted from too low vertical and horizontal resolution in ECMWF analyses preventing them from representing atmospheric wave activity in the tropopause region in the same highly resolved manner as the CHAMP RO tropopause profiles. With a comprehensive update of the ECMWF system in February 2006, effectively doubling the amount of levels in the upper troposphere and lower stratosphere, the observed deviations between CHAMP and ECMWF were significantly reduced. NCEP reanalysis tropopause temperatures exhibit warm deviations of about 4 K against CHAMP until the end of 2004, decreasing to about 2 K from 2005 onwards. Tropical tropopause parameters (temperature and altitude) derived from Formosat-3/COSMIC, CHAMP, SAC-C, and GRACE show remarkable consistency (generally < 0.3 K, < 50 m agreement) and indicate that data from different RO mission can indeed be combined without need for inter-calibration.