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We present an update of the latest Jet Propulsion Laboratory GNSS-RO climate data record (CDR) included as part of the Observations for Model Intercomparison Project (Obs4MIPs). The Obs4MIPs GNSS-RO CDR comprises of gridded global observations from 5 different satellite platforms: CHAMP (2002-2008), GRACE (2006-2017), COSMIC (2006-present), TerraSar-X (2012-present) and KOMPSAT-5 (2016-present); and includes 75 vertical pressure levels covering the mid-troposphere to the upper stratosphere. Here, we will describe the methodology used to derive the dataset and its uncertainty, while providing an evaluation of its performance. Additionally, we utilize these observations to assess global and tropical climate trends and interannual climate signals. The results show we can determine vertically and timely resolved robust trends, which are generally in good agreement against ERA-5, MERRA-2 and NOAA-DOE Reanalysis II. These 17-years (2002–2018) temperature trends time series show temperature increases of 0.29 K/decade (in the Tropics) and 0.20 K/decade (Globally) at 200 hPa. Additionally, zonal anomalies show increased warming in the Northern Hemisphere’s extratropical region (over 3-times compared with other regions in the Globe), potentially associated with Arctic Amplification. Lastly, we demonstrate the RO capability to capture ENSO and QBO signals, using both temperature anomalies and vertically-resolved empirical orthogonal functions, which also allow characterization of atmospheric lags between surface and UTLS warming during ENSO events.
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