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We construct a 9–year long data record (from 01/2007 until 12/2015) of the tropospheric specific humidity (SH) using Global Positioning System radio occultation (GPS-RO) observations from the Constellation Observing System for Meteorology, Ionosphere and Climate (COSMIC) satellites. Our record covers the tropics and subtropics from 40S to 40N and includes estimates of the zonally averaged monthly mean SH states and interannual anomalies, together with their variabilities and trends. It extends from 700 hPa up to 400 hPa and includes three major climate zones: a) the inter-tropical convergence zone (ITCZ), b) the trade wind belts, and c) the subtropics. We compare the COSMIC-RO time series against those generated by the European Center for Medium-range Weather Forecasts Re-Analysis Interim (ERA-Interim), the Modern-Era Retrospective analysis for Research and Applications (MERRA), and the Atmospheric Infrared Sounder (AIRS). Our objective is to validate the RO SH retrievals, which could potentially augment other independent measurements, and promote the RO humidity data to the broader science community. We find that the ROs capture the interannual SH variability and agree to within 1-sigma uncertainty with all other data sets. This makes GPS-RO SH an excellent complementary space-based observational platform with sufficient accuracy and vertical resolution to monitor decadal SH climate trends.
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