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Oral
Radio Occultation (RO) measurements play critical roles in numerical weather prediction (NWP) by complementing microwave and infrared sounder measurements with atmosphere profiles at high accuracy, precision, and vertical resolution. As the Constellation Observing System for Meteorology, Ionosphere, and Climate (COSMIC) follow-on constellation, COSMIC-2/Formosa Satellite Mission 7 was successfully launched into orbit on June 25, 2019, COSMIC-2 has been demonstrated to have better signal-noise-ratio (SNR) and deeper penetration depth than previous RO sensors such as COSMIC-1 and KOMPSAT-5. This study evaluates COSMIC-2 wet temperature and humidity data products' consistency and stability through inter-comparison with Advanced Technology Microwave Sounder (ATMS) and Cross-track Infrared Sounder (CrIS) measurements using Community Radiative Transfer Model (CRTM). It is shown that the brightness temperature (BT) derived from COSMIC-2 wet temperature and humidity data are, in general, consistent with ATMS measurements. The bias trending shows that COSMIC-2 data can monitor the SNPP ATMS measurements stability and detect the major calibration update of SNPP ATMS on Oct. 15, 2020. The yearly drift of bias between COSMIC-2 derived-BT vs. ATMS measured-BT is less than 0.06 K/year for ATMS temperature channels (i.e., CH7-12) and water vapor channels (i.e., CH19-20). The Observation-Background (O-B) bias BT trending between COSMIC-2 and European Centre for Medium-Range Weather Forecasts (ECMWF) model via ATMS captures the bias reduction after COSMIC-2 data were assimilated into the ECMWF model. For CrIS, the inter-sensor BT bias comparison focused on the SWIR band (2200 cm-1-2400 cm-1) with sounding pressure height ranging from surface to 10 hPa. Using CrIS as a reference, the CRTM-based simulation validates precision among six COSMIC-2 sensors and the consistency between COSMIC-2 and COSMIC-1 RO data. The inter-comparison of COSMIC-2 with ATMS and CrIS sounding measurements also shows that the different inversion implementation in RO 1DVAR retrieval algorithms can cause a difference in retrieved temperature and humidity profiles.
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