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Oral
Radio Occultation (RO) is becoming a core observation in National Oceanic and Atmospheric Administration (NOAA). NOAA has routinely ingested the current NOAA mission (i.e., Constellation Observing System for Meteorology, Ionosphere, and Climate-2/Formosa Satellite Mission 7, COSMIC-2 thereafter) and partners' missions (i.e., Challenging Minisatellite Payload, Korea Multi-Purpose Satellite-5, KOMPSAT-5) into the NCEP numerical weather prediction systems. NOAA is also purchasing Commercial Weather Data (CWD) for RO from two vendors, GeoOptics and SPIRE. Currently, NOAA has received one-month (from 15 December 2020 to 14 January 2021) RO data from GeoOptics and SPIRE during the Deliver Order-1 (DO-1) period.

Unlike those RO data collected from national-supported large RO satellite missions (i.e., COSMIC-2), both GeoOptics and SPIRE RO data are collected from CubeSat. Like COSMIC-2's TriG (Global Positioning System - GPS, GALILEO, and GLObal NAvigation Satellite System - GLONASS) GNSS (Global Navigation Satellite System)-RO Receiver System (TGRS), CICERO receiver can also track signals from GPS, GALILEO, and GLONASS. The SPIRE Stratos RO antenna-receiver payload can track Global Navigation Satellite System (GNSS) signals from GPS, GLONASS, Galileo, and Quasi-Zenith Satellite System (QZSS). The mean L1 SNRs (in V/V) of SPIRE and GeoOpitcs are about 300 V/V and 700 V/V, respectively, which are much lower than those from COSMIC-2. The mean COSMIC-2 L1 SNR is equal to 1100 V/V.

This study focuses on investigating whether the lower SNR measurements from the SPIRE and GeoOpitcs measurements will also produce high-quality RO products like those from COSMIC-2. Because RO data also are used as anchor references for other satellite data, to have a full impact on NWP and climate studies, RO measurements must be accurate, stable, timely, and geographically well-distributed. Using similar approaches to quantify the COSMIC-2 data quality, we will conduct the climate quality assessment of both the GeoOptics and SPIRE neutral atmospheric profiles regarding their stability, precision, and accuracy. We will also specifically investigate how the SPIRE and GeoOptics lower SNR phase data will affect the quality of the retrieved bending angle and refractivity profiles. The SPIRE and GeoOptics refractivity profiles will be used as inputs for the STAR 1D var inversion algorithm to derive the temperature and moisture profiles. We will use the collocated Vaisala RS41 radiosonde temperature and moisture measurements to validate those thermal profiles derived from SPIRE and GeoOpitcs refractivity. We will use the local spectral width (LSW) method to estimate the observation errors for both CWD RO missions and compared them to those from COSMIC-2.
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