

The COSMIC-2/FORMAST-7 Mission: the Early Results from the NOAA STAR

Shu-Peng Ho, NOAA, College Park, MD; and X. Zhou, X. Shao, and B. Zhang

Given its importance to numerical weather prediction (NWP), the National Oceanic and Atmospheric Administration (NOAA) National Environmental Satellite, Data, and Information Service (NESDIS) decided that radio Occultation (RO) will be a long-term core observable to be treated the same way we treat microwave and infrared radiances. Launched on June 25, 2019, Constellation Observing System for Meteorology, Ionosphere, and Climate (COSMIC) 2 mission and Formosa Satellite Mission 7 (COSMIC2/FORTSAT7, hereafter COSMIC2) has produced close to 4000 neutral atmospheric profiles and electronic density profiles per day. COSMIC-2 mission is led by the NOAA and US Air Force (USAF) and partnering with Taiwan's National Space Organization (NSPO). UCAR COSMIC Data Archive Center (CDAAC) is the COSMIC-2 data processing center (DPC). The NESDIS Center for Satellite Applications and Research (STAR) has become the GNSS RO operation and science center. STAR also develop RO data processing package to convert COSMIC-2 L0 data to excess phase and using independently developed Full Spectrum Inversion (FSI) package to convert excess phase to bending angle and refractivity profiles. STAR also developed a one-dimension variational (1D-var) inversion package to invert the refractivity profile to atmospheric temperature and moisture profiles.

COSMIC-2 is with a significantly increased Signal-to-Noise ratio (SNR) compared to other RO missions. However, how the improved signal strength and reduced receiver noise for COSMIC-2 may improve RO retrievals is not explicitly quantified. In this study, we will specifically investigate how the high SNR signals from COSMIC-2 can improve RO retrievals, especially in the lower Tropical troposphere. We will use temperature, moisture, and pressure measurements from Vaisala RS 41 (fourth generation) radiosondes to compare to those from COSMIC-2.

We will quantify the COSMIC-2 temperature in the lower stratosphere, moisture in the troposphere, and refractivity profiles in both stratosphere and troposphere. Also, we will use GPS RO refractivity profiles from different RO missions, including COSMIC and KOMPSAT-5, to examine the stability and precision of the COSMIC-2 data. We will compare the STAR derived bending angle and refractivity profiles with those produced by UCAR CDAAC. We will present the investigation of the causes of the comparison differences between STAR and UCAR products.