

Data Processing and Scientific Evaluation of Spire GNSS RO Data for the NASA Commercial Data Buy Program

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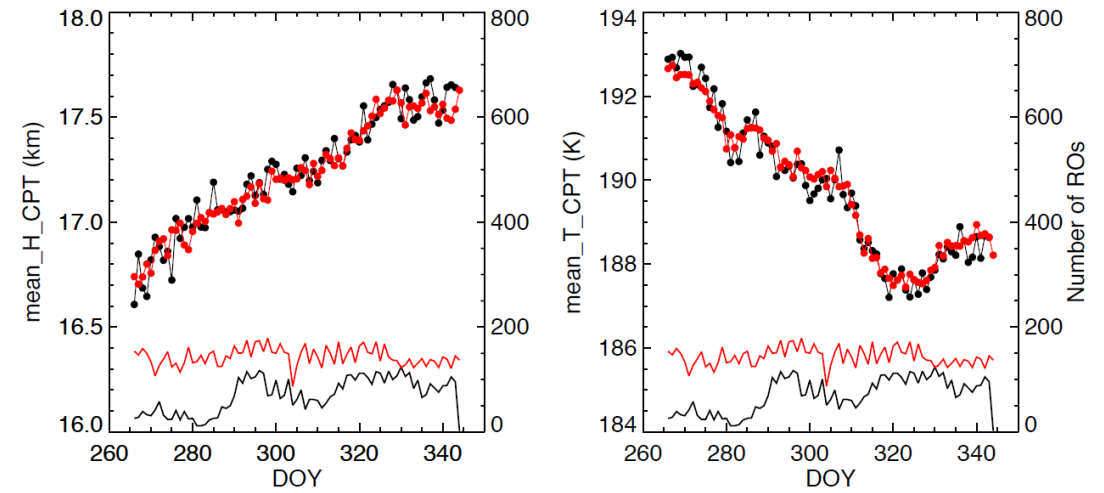
Purpose: Independently process low-level Spire measurements into retrieved quantities and investigate the scientific utility of the observations in the context of the cold point tropopause (CPT) and the planetary boundary layer (PBL)

Study Objective: Process Level 0 Spire measurements into Level 2 products and compare these observations to other RO observing systems. Additionally, scientifically evaluate the use of these observations for the measurements of the height of the PBL and the temperature and height of the CPT

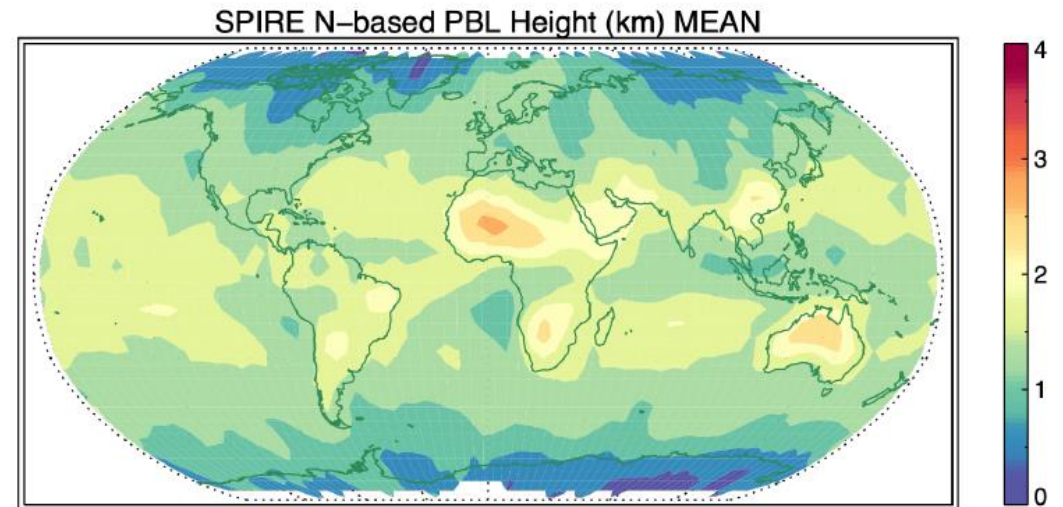
Imagery: Spire Level 1 Radio Occultation Measurements

Findings: The UCAR/COSMIC team processed level 1 data provided by Spire to NASA into level 2 neutral atmospheric products and performed scientific evaluations. The data processed span nearly 80 days and average about 566 atmospheric profiles/day after quality control. Evaluation of bending angle noise and global numerical weather prediction model comparisons are reasonable and consistent with other missions.

The scientific evaluation of the Spire data addressed the ability to observe the tropical CPT height and temperature and the PBL depth. This study of the Spire GNSS RO data found them suitable for studying the fine structures and seasonal variabilities of the tropopause. Despite having low SNR, the Spire RO have very good penetration depth and can be an important data source to study the global PBL structure and variability. However, if using Spire data for climate studies, it may be necessary to correct the impact of uneven sampling of the diurnal cycle on the climate signal.



The Tropical Cold-Point Tropopause (CPT) mean height (left) and Temperature (right), as measured by Spire and other RO observations.



Mean PBL height as detected directly from Spire data. It is noted that Spire's penetration depth exceeds heritage, making this measurement possible.