Multi-Mission GNSS Radio Occultation Climate Data Records at the Jet Propulsion Laboratory

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Both the IPCC and the 2017 US Decadal Survey for Earth Science and Applications have recognized atmospheric profiling as an immediate priority, as proper representation of the Earth’s vertical atmosphere is imperative to close gaps in our understanding of processes that impact severe weather, air quality, and climate change. Radio Occultation (RO) techniques have been recognized for their uniqueness to provide reference datasets, triggering a growing interest in using RO for Climate and Weather applications.

At the NASA Jet Propulsion Laboratory (JPL), physical parameters such as refractivity and derived atmospheric products (temperature, pressure, moisture) are obtained by applying inversion methodologies on the atmospheric delay induced on the occulted signal. Such multi-mission retrieval system has generated nearly two decades of observations and allowed the generation of Global Navigation Satellite Systems Radio Occultation (GNSS-RO) monthly gridded data for climate model evaluation and other applications (Obs4MIPS).

We present an overview of data and methodology involved in producing Obs4MIPS GNSS-RO data, and show current improvements in the legacy products by comparison against the next generation of JPL’s monthly gridded data (Level 3) products. Also, we evaluate the performance of the products against reanalysis datasets, and demonstrate its capability to detect climate signals and to improve our understanding of weather processes. Additionally, we will discuss ongoing activities associated with the incorporation of the recently launched COSMIC-2 data into our system.