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Abundant moisture in the lower troposphere can lead to errors in the data retrieved via the GNSS radio occultation (RO) technique. A standard GNSS RO bending angle and refractivity retrieval requires the assumption of a local spherically symmetric atmosphere. Errors in refractivity retrieval may be introduced by the presence of horizontal inhomogeneity (HI) often observed inside the moist planetary boundary layer (PBL). The radiosonde data from the Marine ARM GPCI Investigation of Clouds (MAGIC) field campaign clearly show the presence of significant horizontal inhomogeneity demonstrated by the increase in PBL height from ~1 km adjacent to the California coast to over 2 km near Hawaii. A simple three-segment refractivity model based on adjustable key PBL climatological parameters (e.g., longitude, SST, PBL height, minimum refractivity gradient, etc.) is created to simulate a 2D refractivity field with a horizontally inhomogeneous PBL. The 2D refractivity model is validated by the MAGIC data.
A series of multiple-phase-screen (MPS) forward simulations will then be performed, each resulting in a GNSS RO retrieval through a 2D refractivity model which contain varying degrees of PBL inhomogeneity. The impact of the horizontal inhomogeneity on the RO retrieval and its PBL observation will be presented.
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