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The planetary boundary layer (PBL) height (PBLH) is a key physical parameter of the PBL affected by numerous physical processes within the boundary layer. Specifically, the terrestrial PBLH exhibits large spatial and temporal variation across different geographical regions. In this study, GNSS radio occultation (RO) from COSMIC/FORMOSAT-3 and high-resolution radiosonde profiles from 2007 to 2013 were analyzed to estimate the diurnal cycle of the PBLH over the Southern Great Plains (SGP) in the US. Large variations in PBLH derived from radiosonde temperature, moisture, and refractivity are observed on seasonal scales. COSMIC RO captures the diurnal and seasonal variations in the terrestrial PBLH over the SGP region well. Annual mean diurnal amplitude of approximately 250 m in the terrestrial PBLH was observed with a distinct peak at around 15:00 (LST, Local Solar Time) in both the co-located radiosondes and COSMIC RO data. Seasonal changes in the PBLH diurnal amplitude ranging from approximately 100 m to 400 m were also observed. The global characterization of PBLH diurnal variations from GNSS RO can be further incorporated into PBL parameterizations to help improve weather and climate model prediction.

Presentation file

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