Assimilative Model Bias Correction Schemes for Global Ionospheric Modeling

Yang-Yi Sun[1,2,3] , Tomoko Matsuo[1,2], Naomi Maruyama[1,2], Eduardo A. Araujo-Pradere[1,2], and Jann-Yenq Liu[3]

[1]Cooperative Institute for Research in Environmental Sciences, University of Colorado at Boulder, Boulder, Colorado, USA.

[2]Space Weather Prediction Center, National Oceanic and Atmospheric Administration, Boulder, Colorado, USA.

[3]Institute of Space Science, National Central University, Chung-Li, Taiwan.

The balance between plasma production, loss, and transport processes determines the distribution of the ionospheric plasma density, and thermospheric parameters such as neutral wind, temperature, and composition significantly influence these processes. The discrepancy between the modeled and observed ionospheric plasma density often results from inadequately specified thermospheric drivers. Global observations of the thermospheric parameters remain scarce, while plasma density measurements become relatively abundant thanks to radio occultation missions like the FORMOSAT-3/COMSIC (F3/C). The objective of this study is to infer meridional thermospheric winds from the F3/C F2 layer peak height (hmF2) observations for improving global plasma density distribution in a physics-based ionosphere and plasmasphere model. In mid-latitudes, variations in the hmF2 are almost exclusively controlled by neutral winds along a geomagnetic field line. We explore the usage of the F3/C-observed hmF2 to infer global meridional thermospheric winds among other neutral parameters. The inferred winds are further used to drive the global ionosphere and plasmasphere model, and improvements of the F3/C hmF2 on the global simulated plasma density are further estimated.