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Improving Ionospheric Specification and Forecasting: Making the Next Steps

Abstract:
The Department of Defense has stated goals for ionospheric specification and forecasting. However, validation of ionospheric specification by current state-of-the-art operational ionospheric specification indicates how difficult these goals are to meet. Current state-of-the-art operational ionospheric specification uses data assimilation of ionospheric measurements but these ionospheric measurements are relatively sparse both spatially and temporally, so accuracy is limited in part because the models are data starved, especially over the open ocean. Additionally, the physics in the models is somewhat lacking. Assimilative ionospheric models incorporating more of the relevant physics are a step toward forecasting improvement on time periods of the order of hours. But how can we improve forecasting accuracy to longer periods, of order of days? A recent study by Hsu et al. [J. Geophys. Res., doi: 10.1002/2014JA020390, 2014] shows that the key driver required to improve ionospheric forecasting for time scales on the order of days is better knowledge and specification of the neutral thermosphere. We present a concept for improving global ionospheric specification and forecasting ability by adding key measurements of both the thermosphere and ionosphere on both global and regional scales. This concept relies on space-based assets in both low-Earth orbit and at geosynchronous altitudes.