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Full-Orbit Ultraviolet Ionospheric Tomography and Applications

Abstract:

Ultraviolet remote sensing of the Earth's ionosphere from satellites in low Earth orbit has been demonstrated as a means of sensing both the altitude and horizontal distributions of electrons in the ionosphere. The Special Sensor Ultraviolet Limb Imager (SSULI) and Special Sensor Ultraviolet Spectrographic Imager (SSUSI) operate aboard the Defense Meteorological Satellite Program Block 5D3 series satellites perform space situational awareness environmental sensing but these measurements have largely been used as separate measurements. Combining simultaneous observations from these complementary sensors improves measurement resolution and signal-to-noise and enables full-orbit atmospheric and ionospheric reconstructions. High fidelity ionospheric reconstructions can accurately characterize atmospheric gradients to constrain DoD operational global ionosphere data assimilation models and increase the accuracy of slant-TEC values important for various ray-tracing applications. We present comparisons of ultraviolet-derived tomographic retrievals with various ionosphere models and measurements and discuss the results with respect to relevant applications. We also discuss how the next generation of ionospheric sensors can provide enhanced ionospheric specification.