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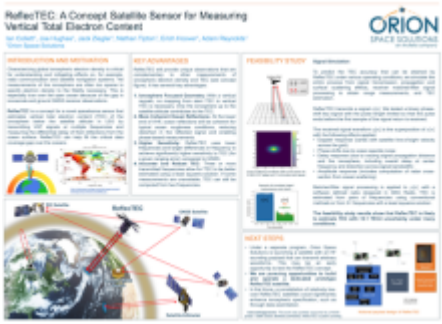
Poster
Characterizing global ionospheric electron density is critical for understanding and mitigating effects on, for example, radio communication and satellite navigation systems. Yet measurements of the ionosphere are often too sparse to specify electron density to the fidelity necessary. This is especially true over the open ocean because of the gap in ionosonde and ground GNSS receiver observations. To help fill this critical data coverage gap, we have developed the concept for a novel spaceborne sensor called ReflecTEC. ReflecTEC estimates vertical total electron content (TEC) of the ionosphere below the satellite altitude by transmitting VHF signals at multiple frequencies and measuring the differential delay of their reflections from the ocean surface. The signal frequency and measurement geometry make ReflecTEC highly complementary to existing measurement types. VHF signals are more sensitive to TEC and are more coherently reflected from the ocean. Furthermore, in this measurement geometry, vertical TEC can be measured directly (rather than approximated from slant TEC) and combining the vertical rays with the typically near-horizontal TEC rays of GNSS radio occultation will improve the results of data assimilation or tomographic inversion. Here, we present the results on our initial feasibility study of ReflecTEC, which involved a simulation study of signal transmission, propagation and surface scattering effects, receiver signal processing, and TEC estimation. Additionally, we share a notional system design and comment more specifically on how ReflecTEC measurements could be used to improve electron density specification.



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