



First-year Results from a Space-based Sporadic E Detector

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Sporadic E (E_s) is a phenomenon where thin layers of charged particles coalesce to create a highly localized, anomalous layer of ionization in Earth's E-region ionosphere, typically at an altitude somewhere between 90 km and 160 km. HF signal propagation is significantly impacted by E_s , which creates an unexpected source of refraction for radio frequencies up to the VHF region of the spectrum. Regions of E_s are characterized by a high concentration of metal ions, primarily Mg^+ and Fe^+ , that are deposited by meteor ablation in the atmosphere. The metal ions converge in thin layers as the result of wind shears at low and mid-latitudes. The U.S. Naval Research Laboratory (NRL) has developed a new experiment for E_s detection through remote sensing of ionospheric Mg^+ from a space-based, CubeSat-compatible sensor.

The Triple Magnesium Ionospheric Photometer (Tri-MIP) has been developed as a 1U CubeSat compatible sensor to detect a mid-ultraviolet (MUV), Mg^+ doublet emission near 280 nm as a tracer of E_s . [1] The initial flight of Tri-MIP is on the Slingshot-1 spacecraft that launched into a circular orbit at an altitude of 500 km and an inclination of 45°. Paired with a 1U scanning ultraviolet mirror (SUV) on the Slingshot-1 spacecraft, Tri-MIP provides altitude profiles of Mg^+ airglow emissions through limb scans of Earth's ionosphere along the wake direction of the orbit. Tri-MIP is especially well-suited for E_s detection and may allow for the observation of faint signatures of E_s that are otherwise not visible with other commonly used, remote plasma detection methods, such as ground-based ionosondes or GPS radio occultation experiments. This presentation will show the data reduction approach that is being applied to the observations as well as a summary of results from the first year of operations on orbit.

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References

- [1] A. C. Nicholas, K. F. Dymond, S. A. Budzien, A. W. Stephan, B. A. Fritz, C. M. Brown, and T. T. Finne, "Triple Magnesium Ionospheric Photometer (Tri-MIP) Instrument Overview" Proc. SPIE 11832, CubeSats and SmallSats for Remote Sensing V, **118320A**, 2 August 2021, doi: 10.1117/12.2594905.

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