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Integrated Miniaturized Electrostatic Analyzer (iMESA): Characterizing the Ionosphere and Ionizing Dose in Low Earth Orbit. PATRICK GRESHAM, IAN MOFFETT, RICHARD BALTHAZOR, GABRIEL WILSON, JACOB HARLEY, MATTHEW MCHARG, United States Air Force Academy — Everyday life depends on satellite constellations, which provide essential navigation and communication capabilities to both private companies and government agencies. The continual operation of these satellites requires mitigation of space hazards such as radiation effects, charging, and signal scintillation. The first is caused by ionizing dose from the sun and interstellar space, and the latter two are a result of plasma in the ionosphere. In low earth orbit, the bulk of radiation effects occur in the South Atlantic Anomaly – a region of unusually high ionizing dose – and the polar regions, while the ionospheric effects are hard to prevent due to poor understanding of density variations in the ionosphere. The iMESA constellation aims to ameliorate these deficiencies in two ways: by monitoring ionizing dose rate to help define the edges of the South Atlantic Anomaly, and by gathering data determining plasma density and temperature, which can be integrated into ionospheric models to allow for forecasting of space weather conditions. Both results would be of great benefit to spacecraft operators.

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