

petitSat - A 6U CubeSat to examine the link between MSTIDS and ionospheric plasma density enhancements

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The mid- and low-latitude ionosphere is home to a variety of plasma density irregularities, including depletions (bubbles), enhancements (blobs), and small-scale scintillation, which result in the distortion of radio wave propagation. Recent observations from the C/NOFS satellite suggest that multiple mechanisms are responsible for forming plasma density enhancements, with wave action in the thermosphere as a significant driver of the enhanced densities. Indeed, statistical analysis of enhancements observed from satellites resembles the statistics of Medium-Scale Traveling Ionosphere Disturbances (MSTIDs) with respect to seasonal variability and solar activity. In order to investigate the link between these two phenomena, both in-situ data of the plasma enhancement and remote data of the MSTID at the magnetic footpoint are required. petitSat is a CubeSat mission designed to provide in situ measurements of the plasma density, 3D ion drift, as well as ion and neutral composition. The instrument suite includes a combined retarding potential analyzer and cross-track drift meter and an ion neutral mass spectrometer. This instrument suite will provide comprehensive information about the fluctuations in plasma, as well as changes in the neutral profile. petitSat will launch into a 51 deg inclination orbit at 400 km (consistent with an International Space Station deployment), allowing for numerous conjunctions with the Boston University All-Sky Imager network and GPS receivers from the International Global Navigation Satellite Systems (GNSS) Service (IGS) network over the mission lifetime.

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