

44th SYMPOSIUM ON SAFETY AND QUALITY IN SPACE ACTIVITIES (D5)
Space Weather Prediction and Protection of Space Missions from Its Effects (3)

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A MICRO-SATELLITE MISSION FOR THE STUDY OF IMPACT OF SPACE WEATHER EFFECTS
IN THE AURORAL THERMOSPHERE (ISWEAT)

Abstract

We present the development of the Impact of Space Weather Effects in the Auroral Thermosphere (ISWEAT) micro-satellite mission, for the study of ionospheric space weather effects in the auroral thermosphere: specifically the connections between electrical currents and ionospheric irregularities in geomagnetic storms (space storms) and auroral substorms, and the heating of the thermosphere and resulting anomalous satellite drag and other related space weather effects in the upper atmosphere. The ISWEAT mission will use university class micro-satellite bus design, and carry a payload of 3 instruments: an Atmospheric Neutral Analyzer (ANA), and a dual-frequency Global Positioning System (GPS) receiver (DGR) and a fluxgate magnetometer (FMG). The ANA will measure the composition and detailed velocity distributions of neutrals, and detect non-thermal neutral populations in the auroral thermosphere. The DGR will measure the satellite position and velocity to a precision of cm and cm/s, respectively, as well as ionospheric total electron contents (TEC). FMG will measure perturbations in the Earth's magnetic field from which to infer sub-km-scale field-aligned current structures in storms and substorms. To enhance the mission return, if resources permit, the payload will carry two additional instruments: an accelerometer (ACC) and an automatic dependent surveillance receiver (ADS). The measured I-SWEAT data set will be used for quantitative study of the cause-and-effect relationship between magnetic storms and substorms, thermospheric heating, and anomalous satellite drag and other space weather effects.