SOME NOVEL FEATURES OF CASSIOPE/EPOP INSTRUMENTS AND EXPERIMENTS

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The objectives of the enhanced Polar Outflow Probe (e-POP) experiment are to quantify the micro-scale characteristics of plasma outflow and related micro- and meso-scale plasma processes in the polar ionosphere, explore the occurrence morphology of neutral escape in the upper atmosphere, and explain the effects of auroral currents on plasma outflow and those of plasma microstructures on radio propagation. The eight-instrument e-POP payload is scheduled to be launched into a high-inclination low-earth orbit in 2010 using the Canadian small satellite CASSIOPE.

Three of the eight e-POP instruments will image the velocity distribution functions of electrons, ions and neutral particles. The Neutral Mass Spectrometer (NMS) will realize the new technique of ionizing rammed neutral particles that are subsequently imaged as in a charged-particle detector. The Imaging and Rapid-scanning ion Mass spectrometer (IRM) will be one of the first detectors to image ions in three dimensions, using electric-field deflection on its entrance aperture to provide the additional spatial directionality. With the Suprathermal Electron Imager, the three instruments will provide comprehensive data sets characterizing the most important species participating in polar outflows.

The Magnetic Field instrument (MGF) will have a double detector design that, through analysis, nulls out interfering fields from the spacecraft, with the goal of sub-nanoTesla precision. Applied in coordinated studies with data from the Fast Auroral Imager aboard e-POP, this combination will provide improved resolution of the spatial relation of optical auroral features and associated field-aligned currents. The simultaneous operation of the VHF-UHF beacon CERTO and the GPS dual-frequency receivers in the GAP instrument will lead to improved two-dimensional maps of electron density contours in the ionosphere. In addition, the measurement with the Radio Receiver Instrument of parameters of ionospheric HF propagation, particularly direction of propagation and delay of signals from ground sources, will widen our view of ionospheric inhomogeneities.

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