Low-Energy Particle Imaging on Swarm and ePOP: A New View of the Ionosphere

David J. Knudsen[1], William Archer[1], Johnathan K. Burchill[1], Taylor Cameron[1], Alexei Kouznetsov[1], and Matthew Patrick[1]*

[1]Department of Physics and Astronomy, University of Calgary, Canada
knudsen@ucalgary.ca

Abstract

In-situ diagnostics of ionospheric plasma are made most commonly by instruments that provide only bulk properties such as electron density and temperature (by Langmuir probes), and ion temperature, flow velocity and composition (by retarding potential analyzers and ion drift meters). Instruments that measure full particle distribution functions (e.g. top-hat analyzers) typically do not function well in the ionosphere because of the low particle energies involved. Thermal Ion Imaging is a new technique that allows high-resolution, 2-D (angle-energy) imaging of plasma populations having characteristic energies in the range 0.1-100 eV. By using a charged-coupled device-based imaging detector, particle distributions are recorded with 64x64 pixel resolution, and at rates of up to 100 distribution images per second. Four TII-based instruments have been launched into orbit in the past year, three in November 2013 on the European Space Agency's Swarm satellites, and another, the Suprathermal Electron Imager, on Canada's Enhanced Polar Outflow Probe (ePOP) satellite launched in September 2013. This talk will describe the TII/SEI sensors and present results from their first year in orbit.

978-1-4673-5225-3/14/$31.00 ©2014 IEEE