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Recent scientific findings based on high-resolution core plasma imaging of the ionosphere with Swarm and ePOP

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The Thermal Ion Imagers on Swarm A-C, and the Suprathermal Electron/Ion Imager on ePOP (now "Swarm-E") provide a unique view of charged particle distribution functions in the ionosphere at high time resolution (up to 100 images/s). Through high resolution, CCD-based imaging (~3000 pixels/image), ion drift velocity is derived from these images at a resolution of 20 m/s or better, and in general agreement with velocities derived from ground based radars [1] and an empirical convection model [2]. This talk reviews recent scientific applications of this technique, which are wide-ranging and include mechanisms of ion heating and upflow [3,4], M-I coupling via Alfven waves [5,6], electron acceleration and heating by Alfven waves [7,8, 9], intense plasma flows associated with "Steve" [10,11], and electrodynamics of large-scale FAC systems[12], among others. In addition, future opportunities made possible by these data will be discussed.

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