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Using Langmuir Probe and faceplate current measurements to validate Swarm Electric Field Instrument bulk ion drifts

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The 3D ion drift measurements from the Electric Field Instruments (EFI) of the European Space Agency's Swarm mission provide excellent opportunities for multi-satellite and ground-conjunction investigations of ionospheric and auroral physics. Ion drifts are derived from estimates of low-energy (<10 eV) ion energy/angle distributions obtained by Thermal Ion Imagers. In practice, the EFI datasets exhibit sometimes large and often time-varying offsets in the ion drift vector components. Measurements parallel to the satellite velocity vector typically have the greatest uncertainty, with significant contributions from uncertainties in spacecraft-to-plasma potential and ion atomic mass, as well as other sources. Here we present initial findings of an investigation into the feasibility of using simultaneous estimates of ion flux from the EFI Langmuir probes and faceplate current measurements to validate the Swarm along-track ion drifts. Under certain conditions a comparison of TII ion drifts with LP-derived drifts can reveal variations in the mean ion atomic mass in the topside F region ionosphere.

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