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Formation of magnetic presheaths by electron collecting probes in magnetized ExB drifting plasma and current collection JONATHON HEINRICH, DAVID COOKE, Air Force Research Laboratory — A fundamental and unanswered question in the field of probe theory is “what is the current limit of electron collecting probes in magnetized ExB drifting plasma?” The question can be reduced to “what are the associated electron energization and acceleration processes or how does the plasma couple to the probe?” Work in the 1990’s speculated plasma coupling to positive probes in ExB drifting plasma included the formation of a magnetic presheath, a heated presheath, and whistler wings. We report on the results of three-dimensional electromagnetic particle-in-cell simulations of electron collecting probes in magnetized ExB drifting plasma. Distinct regions developed around the probe: a quasi-trapped electron region encircling the probe and an electron depletion wing that extended along the magnetic field due electron collection by the probe. We present observations of electron heating and energization in the quasi-trapped region, a whistler pulse preceding the electron depletion wing, and electron acceleration by a magnetic presheath associated with the electron depletion wing and the impact of these processes on the probe’s current collection.

Jonathon Heinrich
Air Force Research Laboratory

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