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Wave-Particle Interactions in the Turbulent Plasmaspheric Boundary Layer[1] EVGENY MISHIN, Air Force Research Laboratory — A wealth of wave activity around the plasmasphere's boundary enhances during substorm injection events. A turbulent plasmaspheric boundary layer forms initially near the pre-substorm plasmapause due to interactions between the injected and plasmaspheric populations. The free energy for plasma instabilities driving lower hybrid/fast magnetosonic turbulence and broadband hiss-like VLF waves come from substorm-injected hot plasma particles impacting the cold plasmasphere. In particular, the hot electron diamagnetic drift and the highly anisotropic hot ion distribution drive the modified two-stream and ion-ring instabilities in the entry layer and the central part, respectively. The diamagnetic drift of hot ions dominates near the inner edge. Enhanced plasma turbulence leads to heating of the cold plasma and to acceleration of suprathermal electron tails, thereby enhancing the downward heat transport and concomitant heating of the ionospheric electrons. Broadband, hiss-like VLF waves have amplitudes sufficient to provide rapid precipitation of the radiation belt electrons thereby shaping the outer radiation belt boundary. In addition, the hot ions penetrating inside the plasmasphere satisfy the orbit chaotization condition and become demagnetized. These results can also be helpful for understanding impulsive penetration at the magnetopause.

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Evgeny Mishin
Air Force Research Laboratory

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