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3D Simulations of Farley-Buneman Turbulence Demonstrates Anomalous Electron Heating[1] MEERS OPPENHEIM, YAKOV DIMANT, Boston University — Field aligned currents flow from the magnetosphere to the E-region ionosphere where they drive auroral electrojets. These currents often cause Farley-Buneman (FB) instabilities to develop and become turbulent. These irregularities substantially affect ionospheric conductivity, temperatures, and VHF and UHF radio wave propagation. Many of the observed characteristics of radar measurements of this region result from the nonlinear behavior of this unstable plasma. Supercomputers now allow Particle-In-Cell (PIC) codes, to run simulations with enormous meshes in either 2-D or 3-D. This talk will present recent 3-D PIC simulations showing anomalous electron heating due to FB turbulence, a phenomenon clearly observed by radars. The resulting temperatures can rise over an order of magnitude. These simulations also show the saturated amplitude of the waves; coupling between linearly growing modes and damped modes; the evolution of the system from shorter to longer wavelengths; and phase velocities close to the acoustic speed. These simulations reproduce many of the observational characteristics of type-1 radar echoes. As predicted by theory, the 3-D simulations show the development of modes with a small electric field component parallel to the geomagnetic field and this field causes the majority of the anomalous electron heating.

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