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Large-Scale 2D and 3D Simulations of Plasma Turbulence in the Lower Ionosphere[1] Y.S. DIMANT, M.M. OPPENHEIM, Center for Space Physics, Boston University — For five decades, radars and rockets have observed plasma turbulence in the weakly ionized, highly collisional plasma of the E-region ionosphere. This turbulence is caused by the Farley-Buneman, gradient drift, and thermal instabilities. In the high-latitude electrojet, during strong magnetospheric perturbations (storms and sub-storms), radars have observed anomalous electron heating (AEH) caused by turbulent electric fields. We will present results of recent 2D and 3D fully kinetic, particle-in-cell, simulations that reproduce many of the observational characteristics of radar signals. As predicted by theory, the 3D simulations show the development of waves having a turbulent electric field with a small component parallel to the geomagnetic field. This field component is mainly responsible for the majority of AEH. For the first time, we can now quantify this effect using accurate simulations. These simulations provide information useful in accurately modeling plasma turbulence and demonstrate the significant progress we have made simulating physical processes in E-region electrojets.

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