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Reduced Vlasov Simulations of Auroral Transition Layers[1]
NARESH SEN, DAVID L. NEWMAN, MARTIN V. GOLDMAN, University of Colorado at Boulder — The existence of *transition layers* (including *laminar double layers*) in the auroral downward current region is now observationally well established by satellites such as FAST. Understanding the structure of such transition layers perpendicular to the geomagnetic field **B** requires simulations in at least two spatial dimensions. While the phase-space dynamics parallel to **B** is typically very complex and requires solution of the full Vlasov equations, the perpendicular dynamics can often be modeled using *reduced* algorithms, thereby relaxing computational demands. Here, we assume the electrons are strongly magnetized and the ions are weakly magnetized. The perpendicular ion dynamics are modeled using a ring of modes in the transverse velocity plane. The radius $v_\perp$ of the ring is the nominal perpendicular thermal velocity. Preliminary results show agreement with the results of kinetic linear theory. Nevertheless, the method precludes transverse heating due to $v_\perp$ being a constant. Electrostatic ion Bernstein waves propagating perpendicular to the magnetic field at the ion cyclotron frequency and its harmonics are observed, consistent with observations. The effects of varying perpendicular ion temperature and ion magnetization on the structure of the double layers are considered.

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