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Kinetic simulations of meter-scale structures in Convective Equatorial Ionospheric Storms (Spread-F) YAKOV DIMANT, YANN TAMBOURET, MEERS OPPENHEIM, Boston University — We present kinetic, particle-in-cell simulations of non-linear drift wave plasma instabilities and address their possible involvement in Convective Equatorial Ionospheric Storms (CEIS - also called Spread-F). These CEIS develop in the F-region ionosphere following sunset, as a large scale, vertical density gradient drives plasma flows across the geomagnetic field. A generalized Rayleigh-Taylor instability characterizes the basic physics of large scale (100 m - 100 km) instabilities, but this mechanism predicts that small scale waves (0.1 - 10 m) should remain stable. Yet, radars measure coherent echoes from small scale irregularities that exist simultaneously with the large scale turbulence. We explore the possibility that secondary gradients produced by the large scale instabilities lead to drift wave dynamics and small scale waves. The simulations involve collisionless plasma dynamics in both the 2-D plane perpendicular to B and 3-D. One direction is non-periodic, where a steep density gradient is maintained throughout. We present an analysis of the non-linear effects leading to the development of a stable ambipolar field that negates the ion diamagnetic drift and enhances the electron drift, ultimately leading to drift waves.

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