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Meteor Plasmas in the E-Region Ionosphere[1] Y.S. DIMANT, M.M. OPPENHEIM, Boston University — Every day billions of tiny meteoroids impact the Earth's atmosphere at hypersonic speeds, creating dense plasmas between 80 and 130 km altitude. In this part of the E-region ionosphere electrons are magnetized by the geomagnetic field while ions are largely unmagnetized due to their frequent collisions with neutral atmosphere. This discrepancy leads to a variety of inhomogeneous, unstable, and nonlinear plasma phenomena. Among them is the formation of field-aligned irregularities in the slowly diffusing dense meteor plasma trails which are important for radar observations of mostly optically invisible meteors. We will present a quantitative model of the evolution of a plasma trail density and its ambipolar electric fields. Our theory predicts that plasma trail diffusion induces electric currents through a large volume of the background ionosphere with important consequences for plasma trail diffusion. Also, strong electric fields propagate long distances along the magnetic field lines from the dense plasma trail deep into the tenuous ionosphere and create significant disturbances of the background density. This may explain radar and rocket observations of extensive nighttime E-region density structures.

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