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Meteor Plasma Trails in E-Region Ionosphere: Diffusion, Electric Fields, and Disturbances[1] Y.S. DIMANT, M.M. OPPENHEIM, Boston University — Meteoroids penetrating the Earth's ionosphere frequently leave behind trails of dense plasma in the region between 130km and 75km. We will present the first quantitative model of the fields and density evolution which accounts for both the geomagnetic field and the background plasma. Using both simulations and 2D analytical theory, we can accurately model trail evolution for a broad range of conditions. Ambipolar diffusion of trails gives rise to polarization electric fields, which generate electron density disturbances and may drive plasma instabilities, both in the trail and in a vast area in the background ionosphere. In addition, the strong electric fields typically found in the equatorial and high-latitude E-region electrojets will polarize the highly conducting meteor trail resulting in substantial spatial redistribution of the electric potential around the trail. A 3D analytical theory shows that the electric field in the near-trail region can be drastically amplified, which may result in strong electron heating and associated effects. Combining our theory with radar observations yields useful information about meteor trails and the surrounding atmosphere.

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