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Kinetic Modeling of Electric Discharge in a Preformed Air-Plasma Channel TZVETELINA PETROVA, Naval Research Laboratory, HAROLD LADOUCEUR, Naval Research Laboratory, ANDREW BARONAVSKI, Naval Research Laboratory — Recent experimental studies of atmospheric discharges in a pre-existing plasma show that electrical breakdown occurs at relatively low electric fields (∼5.7 kV/cm). This breakdown at such low fields cannot be explained in terms of the classical Paschen theory. To understand the physical mechanism of this phenomenon an extensive self-consistent collisional-radiative model for air plasma was developed. The model is based on the electron Boltzmann equation for the electron energy distribution function self-consistently coupled with the electron balance equation. The balance equations for various nitrogen and oxygen species in ground and excited states, as well as various atomic and molecular ions are incorporated. The model includes a variety of chemical reactions and plasma processes such as direct excitation and de-excitation, quenching, dissociation, ionization, attachment and detachment, charge exchange, and radiation. This system of equations was solved in a quasi-stationary regime and the self-consistent breakdown electric field and other plasma parameters were determined as a function of the initial degree of ionization. * NRC-NRL Postdoc Supported by Office of Naval Research.

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