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Solar Wind - Mars Interactions: Energetic Neutral Atom Production ERENA FRIEDRICH, ANDREW YAU, University of Calgary, JERRY BRACKBILL, LANL, retired — We study the energetic neutral atoms (ENAs) that are formed by charge exchange between solar wind ions and neutral particles in the Martian atmosphere. Mars Global Surveyor has shown that Mars has no notable global intrinsic magnetic field. Consequently, the neutral particles in the Martian atmosphere are unshielded from the flow of energetic solar wind protons. There results extensive production of energetic neutral hydrogen atoms (H-ENAs). In our study, we use a 3D hybrid (kinetic ions, fluid electrons), quasi-neutral, particle-in-cell (PIC) plasma simulation to investigate the production of H-ENAs due to collisions with neutral oxygen (O, O) and nitrogen (N) molecules in the near-space environment of Mars. A detailed chemical model that comprises multi-species reactions, such as ionization by photons, electron recombination, particle collisions, and charge exchange, is self-consistently included in the simulation. These chemical interactions, which take place between ions, atoms, and molecules in the martian exosphere and ionosphere, control the production of the H-ENAs. What is presented is a "work in progress" highlighting the ionospheric chemical and physical model as we work towards our goal of computing the flux of escaping H-ENAs due to charge exchange.

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