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Simulations of Atmospheric Plasma Arcs[1] JACOB PEARCY, NIRBHAV CHOPRA, MICHAEL JAWORSKI, Princeton Plasma Physics Laboratory — We present the results of computer simulation of cylindrical plasma arcs with characteristics similar to those predicted to be relevant in magnetohydrodynamic (MHD) power conversion systems. These arcs, with core temperatures on the order of 1 eV, place stringent limitations on the lifetime of conventional electrodes used in such systems, suggesting that a detailed analysis of arc characteristics will be crucial in designing more robust electrode systems. Simulations utilize results from NASA's Chemical Equilibrium with Applications (CEA) program to solve the Elenbaas-Heller equation in a variety of plasma compositions, including approximations of coal-burning plasmas as well as pure gas discharges. The effect of carbon dioxide injection on arc characteristics, emulating discharges from molten carbonate salt electrodes, is also analyzed. Results include radial temperature profiles, composition maps, and current-voltage (IV) characteristics of these arcs.

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Jacob Pearcy
Princeton Plasma Physics Laboratory

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