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Surface Currents during a Major Disruption[1] P. BOLGERT, Princeton Plasma Physics Laboratory, C.S. NG, University of Alaska Fairbanks, J. BRESLAU, A. BHATTACHARJEE, Princeton Plasma Physics Laboratory — Understanding the surface current on the plasma-vacuum interface during a disruption event is important for predicting the subsequent evolution of the instability and its interaction with the wall, with serious implications for ITER. Even in the linear regime, these surface currents are controversial and poorly understood, with disagreements over both their nature and sign. Previously, most analytical studies have used step-function background plasma profiles, for example, the linearized reduced MHD disruption model of Strauss et al. (PoP 17, 082505 (2010)). In this study we extend that model by replacing step-function profiles with more realistic profiles characterized by a strong but finite gradient along the radial direction. It is found that the resulting "surface current" is localized in the region of strong gradient but can also have an internal structure with peaks of both signs. We benchmark our results using the M3D code, finding quantitative agreement in the structure of the currents as well as the kink mode growth rate. The role of plasma resistivity in these simulations is explained. We also present preliminary M3D results showing the nonlinear evolution of these surface currents.

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P. Bolgert
Princeton Plasma Physics Laboratory

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