Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Boundary conditions for flowing magnetized plasmas at material surfaces. ADIL HASSAM, IAN ABEL, University of Maryland, College Park, YI-MIN HUANG, Princeton University — At the edge of confined magnetized plasmas, field lines intersect material surfaces. In tokamaks, field lines in the SOL strike diverter plates; in smaller experiments (LAPD, MCX), field lines intersect conducting vacuum vessels or insulators. In these cases, ExB flows and MHD stability can be strongly affected depending on the material. We study flows in the vicinity of both conductors and insulators. The general boundary condition for all materials is that the tangential electric field is continuous across the surface. For perfect conductors, this results in "line-tied" boundary conditions on the magnetic field. Thus, the field line is effectively anchored to the immobile conductor. Effects that break frozen-in, such as resistivity, result only in very small flows. In the case of insulators, field lines are not frozen into the insulator, thus allowing freer flow. However, no-slip boundary conditions on the tangential mass flow require relative motion between ions and the ExB flow. This difference can be actualized via resistivity or by Hall physics. We will show that the latter gives more slippage. Finally, in the case of centrifugal plasmas, the exponential drop in density may effectively decouple the core and the material boundary, allowing freer flow.

Adil Hassam
University of Maryland, College Park

Date submitted: 03 Jul 2019 Electronic form version 1.4