Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Isolating Magnetorotational Instabillity (MRI) Using Eigenmode Analysis in the Numerical Simulation of Princeton MRI Experiment[1] HIMAWAN WINARTO, Princeton University, FATIMA EBRAHIMI, ERIK GILSON, Princeton Plasma Physics Laboratory, JEREMY GOODMAN, HANTAO JI, Princeton University, YIN WANG, Princeton Plasma Physics Laboratory — The behavior of Magnetorotational Instability (MRI) in the Princeton MRI experiment can be further isolated from background effects through global eigenmodes analysis. The analysis is done by artificially changing of the vertical magnetic field B_z from the nonlinear MHD simulated flow profiles. Along the low B_z boundary of the MRI unstable region of (Ω_1, B_z) parameter space (where Ω_1 is the rotational speed of the inner cylinder), the calculated growth rate will exhibit double peaks which correspond to two competing effects: Rayleigh instability and MRI, which are comparable in strength. This eigenmode analysis will enable us to sensitively map the boundary of the MRI unstable regime. This new method can be used to optimize other experimental parameters, such as end caps inner ring speed (Ω_3), to further isolate the effect of MRI in the system.

[1]This research was supported by NSF (Grant No. AST1312463), NASA (Grant No. NNH15AB25I), and DoE (Grant No. DE-AC0209CH11466).

Himawan Winarto
Princeton University

Date submitted: 03 Jul 2019 Electronic form version 1.4