Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Development of a Swirling Gas/Plasma Experiment for Studying Angular Momentum Transport in Accretion Disks ENRIQUE MERINO, Princeton Plasma Physics Laboratory, WILLIAM BERRIOS, Canada College, SAMUEL GREESS, Carnegie Mellon University, HANTAO JI, Princeton Plasma Physics Laboratory — Fast angular momentum transport in accretion disks is a lasting problem in astrophysics. Classically estimated viscosity of neutral fluid is too small to account for the fast accretion rate accompanied by angular momentum transport. Magnetorotational instability (MRI) and nonlinear hydrodynamic instabilities are proposed to be responsible mechanisms to generate the required turbulence. In addition to ongoing experiments using water, liquid metals and plasmas, a new experimental scheme is being developed at Princeton. High-speed gas is injected tangentially to the large radius in a cylindrical container. The gas gradually spirals-in and is pumped out from the container's center. This principle was successfully tested on a small scale prototype. To overcome large viscous forces, a 2nd generation prototype has been built. To provide information on the rotation profile of this swirling gas, a fog cloud is introduced. Motion is recorded by a hi-speed camera and using Particle Imaging Velocimetry, radial profiles of rotation speeds can be measured. Other improvements in this new device include addition of a three-axis translation mechanism, high-power heater and high-flow gas system. Technical designs and preliminary results will be presented and discussed, including near-future plans.

Enrique Merino
Princeton Plasma Physics Laboratory

Date submitted: 12 Jul 2013 Electronic form version 1.4