Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

Angular momentum transport and state transitions in magnetized black hole accretion disks[1] EDISON LIANG, GUY HILBURN, Rice University, SIMING LIU, HUI LI, LANL, CHARLES GAMMIE, University of Illinois —
Black hole accretion disks exhibit multiple spectral states with distinct spectra and dynamical behaviors. While the origin of such spectral states remains a mystery, one likely cause is variation in the effective viscosity that transports angular momentum and drives the accretion flow. MHD turbulence driven by the magneto-rotational instability (MRI) is currently the favored candidate of viscosity. Saturation of the MRI instability regulates the accretion flow, but its effect on global spectral states remains an open question. Using MHD simulations and semi-analytic accretion disk models, we have studied the role of magnetic fields in accretion disk emissions and dynamics. In this paper we first review observational data of black hole spectral states and their implications for accretion disk structure, evolution and viscosity. We then report new results of the spectral-temporal manifestations of MRI-driven accretion flows, including the effects of radiative cooling (cyclo-synchrotron, bremsstrahlung, Compton), electron heating by MHD turbulence and strong ordered seed fields.

[1]work partially supported by NSF AST0406882.

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Date submitted: 19 Jul 2007

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