ICEHAP Seminar

July 18th, Friday, 3pm, 2014

place: Fac. of Sci. Bldg 2, 3F, room No.308

Dr. Shigenobu Hirose,

(JAMSTEC)

"Convection causes enhanced magnetic turbulence in accretion disks in outbursts"

Abstract

We present the results of local, vertically stratified, radiation magnetohydrodynamic (MHD) shearing box simulations of magneto-rotational instability (MRI) turbulence appropriate for the hydrogen ionizing regime of dwarf nova and soft X-ray transient outbursts. We find two stable thermal equilibrium tracks in the effective temperature versus surface mass density plane, in qualitative agreement with the S-curve picture of the standard disk instability model. We find that the large opacity at temperatures near 10^4 K, a corollary of the hydrogen ionization transition, triggers strong, intermittent thermal convection on the upper stable branch. This convection strengthens the magnetic turbulent dynamo and greatly enhances the time-averaged value of the stress to thermal pressure ratio alpha, possibly by generating vertical magnetic field that may seed the axisymmetric MRI, and by increasing cooling so that the pressure does not rise in proportion to the turbulent dissipation.
These enhanced stress to pressure ratios may alleviate the order of magnitude discrepancy between the alpha-values observationally inferred in the outburst state and those that have been measured from previous local numerical simulations of magnetorotational turbulence that lack net vertical magnetic flux.