Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

PEM26-15 Room:302 Time:May 24 14:15-14:30

Gas accretion and particle acceleration during collisionless magnetorotational instability

HOSHINO, Masahiro[1*]

[1]University of Tokyo

Enhanced angular momentum transport and efficient particle acceleration during the magnetorotational instability (MRI) in a collisionless accretion disk are studied using three-dimensional particle-in-cell (PIC) simulation with a pitch-angle isotropization model. It is well known that the magnetic reconnection plays an important role on the nonlinear saturation of MRI, and we find that the plasma pressure anisotropy inside the channel flow with $p_\| > p_\perp$ induced by active magnetic reconnection during the nonlinear stage of MRI suppresses the onset of subsequent reconnection, which in turn leads to high magnetic field saturation and enhancement of Maxwell stress tensor of angular momentum transport. Meanwhile, during the quiescent stage of reconnection the plasma isotropization progresses in the channel flow, and the anisotropic plasma with $p_\perp > p_\|$ due to the dynamo action of MRI outside the channel flow contributes to rapid reconnection and strong particle acceleration. This efficient particle acceleration and enhanced angular momentum transport in a collisionless accretion disk may explain the origin of high energy particles observed around massive black holes.

Keywords: accretion disk, magnetorotational instability, angular momentum transport, particle acceleration, magnetic reconnection, turbulence