# The Kelvin-Helmholtz instability induced by the magneto-rotational instability in the inner-edge region of an accretion disk

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Around protostars, gases and dusts falling to these objects form rotating disks called accretion disks. When an accretion disk has a weak magnetic field, it is well known that the magneto-rotational instability (MRI) is excited in the disks. By using the local 3-dimensional MHD simulations with CIP-MOCCT method, we study the effect of the MRI in an accretion disk. Especially, we have done modeling of the boundary region (inner-edge) between the magnetosphere of a central star and an accretion disk. And, we also have taken low ionized region (dead zone), where MRI is stable, into consideration. In this case the disk part is disturbed by MRI while the magnetospheric strong magnetic field does not allow MRI effects to propagate into the magnetosphere. As the result, large velocity shear is generated at the inner-edge, and then the Kelvin-Helmholtz instability is excited there. Actually, we observe the Kelvin-Helmholtz vortex at the inner-edge. Furthermore, we investigate the effect of the MRI in the non-linear stage to the dead zone. The flows generated by MRI go into the dead zone and cause complicated phenomenon there. Implication of this result to the planetary system formation processes is discussed.