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Three dimensional global General Relativistic Radiative Magnetohydrodynamical simulations to test stability of thin disk around black hole

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The stability of geometrically thin radiation pressure dominated accretion disks around black holes remained under debate. Analytical work concludes that such disks should be thermally unstable. Newtonian shearing box simulations in the past show that these disks may be thermally stable. In last few years other pseudo-Newtonian shearing box simulations showed that the disks are thermally unstable. So basic question arises what is actual fate of the geometrically thin radiation pressure dominated accretion disk? In order to give better understanding we first time performed three dimensional global General Relativistic Radiative Magnetohydrodynamical (3D GRRMHD) simulations of geometrically thin and radiation pressure dominated accretion disks around black hole. We found that indeed radiation pressure dominated geometrically thin disks are thermally unstable. We treated the disk as optically thick to have strong interaction with radiation.

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