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Migration of Massive planets in isothermal discs with various viscosity prescriptions

It is predicted by standard models that the planets massive enough to open a clear gap in proto-stellar disks will undergo an inward migration due to disk-planet interactions with a time scale comparable to the viscous diffusion time scale of the disk, which is called standard type II migration. Although it is slower than the type I migration for low mass planets, it's still too rapid to be consistent with the observed orbital distribution of exoplanets, mechanisms to slow it down need to be found. Some recent studies have suggested that the migration speed could be faster or slower than the viscous diffusion speed due to the effective corotation torques if the gap was not totally clear. Here we study the dependency of migration rate on various disk viscosity distribution for Jovian planets with relatively deep gap embedded in 2-D isothermal disks. We find that with inefficient corotation torques, the migration rate is dominated by differential Lindblad torques and can be distinguished by different disk structures, with more negative radial gradient of local surface density for slower migration rate. Taking advantage of this dependency, some specific locations with sharp radially decreasing of the surface density, like the outer edge of MRI dead zone region in disks, could become a potential barrier to slow down or even stall the migration of massive proto-planets.