# P11a　3D MHD simulation of magnetized cloud fragmentation

○工藤哲洋 (国立天文台)、Shantanu Basu(University of Western Ontario)、尾形陽一（東工大、工)、矢部孝（東工大、工）

We study the self-gravitational instability of a magnetized gaseous layer by performing a 3-dimensional magnetohydrodynamic (MHD) numerical simulation with ambipolar diffusion.

When the strength of the magnetic field is weaker than the critical value, the gaseous layer is fragmented by the instability in a free-fall time of the cloud. On the other hand, when the magnetic field is stronger than the critical value, the gaseous layer is gravitationally stable because magnetic field prevents the contraction of the cloud. However, because the molecular cloud contains a lot of neutrals as well as some ions, ambipolar diffusion occurs in the cloud. Due to this effect, the gravitational instability develops gradually over the diffusion time.

We extend the previous 2-dimensional study of Basu & Ciolek (2004), which assumed a thin-disk, to a 3-dimensional model by including the finite thickness of the self-gravitationally stratified disk that is bounded by hot external gas. We confirm the 2-dimensional result that the infall velocity is subsonic when the magnetic field is stronger than the critical value. We also find that the spatial distribution of plasma $\beta$ (gas pressure/magnetic pressure ratio) in the fragmented cloud strongly depends on whether the magnetic field is stronger than the critical value or not: the cores have a higher $\beta$ than the surroundings for the strong field case, and vice versa.