X24a Simulation of giant molecular cloud formation in the barred galaxy M83

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Star formation is one of the key processes governing the evolution of galaxies. Many observations of nearby disk galaxies indicate an empirical relation, the Kennicutt-Schmidt relation, between the gas surface density and the star formation rate surface density. Recent observations shows a dispersion of the SFR among different galaxies. This dispersion indicates different star formation activity inspite of the same gas surface density. With the advance of higher resolution observations, it has been seen that barred galaxies show different star formation activity between bar and arm regions, even if the gas surface density is comparable in both areas. Momose et al. (2010) observed the barred galaxy NGC 4303, and showed that the star formation activity is higher in the arm region than in the bar region. What is the physical process that creates this difference? Nimori et al. (2012) ran a 2D hydrodynamical simulation of the nearby barred galaxy M83 (NGC5236). They estimate the SFR and SFE by applying the turbulent star formation model of Krumholtz & McKee (2005). Their results show that the SFE in the bar region is three times smaller than in the disk region and suggested that the turbulent star formation model can explain this property. In order to consider feedback processes from star formation, 3D numerical simulations are needed to model the destruction of molecular clouds and the expansion of gas by heating from the newly formed stars and supernovae. We present a 3D hydrodynamical simulation of M83 using Enzo, an adaptive mesh refinement code, and focus on the properties of the giant molecular clouds in the bar and arm region.