# Star formation in different environments

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## 論　文　内　容　の　要　旨

The environment in which stars are formed varies depending on the location and time of the galaxy. Furthermore, stars are closely related to the formation of galaxies and the chemical evolution of the universe. Therefore, in order to understand the history of the universe, it is necessary to clarify the star formation process. The evolution of collapsing clouds embedded in different environments is investigated using three-dimensional non-ideal magnetohydrodynamics simulations considering different metallicities ($Z/Z_\odot$) and ionization strengths ($C_\zeta$, where $C_\zeta$ is a coefficient controlling the ionization intensity). I consider 32 different star-forming environments in combination with $Z = 0, 10^{-7}, 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}, 10^{-2}, 10^{-1}\ Z_\odot$ and $C_\zeta = 0, 0.01, 1, 10$, and prepare clouds having different the mass-to-flux ratio $\mu_0$ and the ratio of rotational energy to gravitational energy $\beta_0$. I investigate the fragmentation condition in various star-forming environments. I perform 334 runs in total and it is found that 71 models show fragmentation and 15 models show a spiral structure. This study indicates that fragmentation tend to be occuered with high ionization strength, high metallicity, high $\mu_0$ ($\mu_0 \geq 10$, where $\mu_0$ means the mass-to-flux ratio normalized by the critical value), and high $\beta_0$ ($\beta_0 \geq 3.0 \times 10{-}2$).
In the collapsing cloud, fragmentation occuers when the following conditions are fullfilled; the high oblateness of core $\varepsilon_{ob} \geq 5$, $\mu \geq 0.6 - 1.0$, and $\beta \geq 1.0 \times 10^{-2}$. There are some non-fragmentation models with high $\mu_0$ and $\beta_0$. These models are likely to show fragmentation in the later phase. A closed binary system should be appeared in such models. Furthermore, if these binaries gain a lot of mass and grow into a massive star binary, it can be the origin of the binary black hole.