Building-up Pop III IMF in the Milky Way-like galaxies

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We study the initial mass function (IMF) of the Population III (Pop III) stars in the Milk Way-like galaxies with ~ $10^{12} M_{\odot}$ at z = 0. We perform high resolution cosmological simulations in $(16 \,\mathrm{Mpc} \,h^{-1})^3$ volume from redshift z = 127 to 0 with resolving the minimum halo mass (about $10^5 \,\mathrm{M_{\odot}} \,h^{-1}$) by 20 N-body particles. Then we obtain updated merger trees compared with the previous work [1] and model the Pop III star formation by adopting a dependence of stellar masses on host halo properties [2], without assuming existing IMFs.

The distribution of host halo properties show different trends to the previous sample [3], which results in different shape of the Pop III IMF. One of the significant changes is that about half the population of stellar masses are distributed around a lower-mass side peak of the bimodal distribution, ~ 15 M_{\odot}. These low-mass Pop III stars form in low-mass minihalos at low-redshift. We discuss their formation condition and where they exist in the Milky Way-like galaxy at z = 0.

 T. Ishiyama, K. Sudo, S. Yokoi, K. Hasegawa, N. Tominaga, and H. Susa (2016), ApJ, 826 (9)

[2] S. Hirano, T. Hosokawa, N. Yoshida, H. Umeda, K. Omukai, G. Chiaki, and H. W. Yorke (2014), ApJ, 781 (60)

[3] S. Hirano, T. Hosokawa, N. Yoshida, K. Omukai, and H. W. Yorke (2015), MNRAS, 448 (568)