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Growth of intermediate mass black holes in the first star clusters

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We study the evolutions of eight primordial star clusters of Sakurai et al. (2017) after runaway stellar collisions and formation of massive stars and intermediate-mass black holes (IMBHs). Performing N-body simulations for ~15Myr to follow star cluster dynamics with dark matter (DM) dynamics, we find that stars intrude into the IMBH and can cause tidal disruption events. By the TDEs, the IMBHs grow to 700–2500 Msun where the diversity is due to the difference of parent halo properties. We also find that the DM can affect the cluster evolutions by stripping stars from the outer part of the clusters. The stripping is caused by motion of the DM, causing increase of the DM density within the clusters and increase of velocity of the outer stars. By stripping massive stars, the DM can decrease the TDE rates. We compare our TDE rates with those of previous works. We discuss fates of the clusters and the IMBHs. In order for the IMBHs to become supermassive as observed at z>~6, an external mass supply by galaxy major mergers or cosmic flows is necessary, otherwise the IMBHs will remain as they are.

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Talk/Poster

Talk

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