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Constraining the energy and statistics of neutron star mergers by simulating R-process element production in ultra faint dwarf galaxies

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We perform cosmological zoom-in simulations with the goal of studying the energy and statistics of the neutron star mergers in order to explain the
high observed abundances of R-process elements in local ultra faint dwarf (UFD) galaxies. We model our star formation in a stochastic fashion in order to resolve the stellar
mass content the UFDs. We perform zoom simulations on two different halos at $z \sim 6$ with mass $\sim 10^8 M_\odot$ and model a single neutron star merger (NSM)
in the start formation history of these systems. We explore the Injected energy range of $10^{50} - 10^{51}$ erg and coalescence time scale of 1-20 Myr for the NSM event. We find
the the distribution of the stars in [Eu/H] vs. [Fe/H] is mostly sensitive to the amount of R-process mass that is ejected into the ISM (M_r) per NSM event. We find that $M_r = 10^{-3} M_\odot$ explains the observed abundance of R-process elements in the local UFDs and lower (higher) values of M_r will heavily under(over) predict the [Eu/H] of the stars which is in not supported by the observations requiring only one such events to have taken place in the star formation history of the UFDs.

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