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Long term simulation of supernovae for multi-messenger astronomy

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A star more than eight times the mass of the sun undergoes a massive explosion called a supernova at the end of its life. Supernova explosions, including the emission of neutrinos, gravitational waves, and beyond SM particles, are ideal targets for multi-messenger astronomy. One issue in the study of supernova explosions is that research has mainly focused on the first second of the explosion. Based on observations of SN 1987A, it is known that neutrinos with durations of over 10 seconds are detected when a supernova explosion occurs in the Milky Way. Therefore, it is not possible to compare theory and observation in the next case of a supernova explosion within our galaxy. In the presentation, the calculation of supernova explosions for future galactic events in the context of multi-messenger astronomy is reported, including the calculation of neutrinos from multiple progenitors and the estimation of gravitational wave frequencies based on neutron star asteroseismology.

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