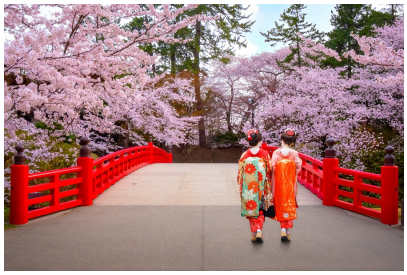

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Neutrino Mass Ordering from Early Supernova Neutrinos

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Neutrinos emitted from the core collapse supernovae (CCSNe) can be generally studied to explore both the supernova explosion mechanism and neutrino properties. One of the most interesting properties is the neutrino mass ordering (NMO). Large scale liquid scintillator (LS) detectors, i.e., with tens of kiloton scale, show superior on CCSNe neutrino detection especially benefited from the large target mass and low detection threshold. The Mikheyev-Smirnov-Wolfenstein effect in the mantle of CCSNe alters neutrino flavor composition differently under two NMO scenarios, which can be reflected in the early time profiles of flavor-sensitive channels like electron elastic scattering (eES) and inverse beta decay (IBD). Besides, the early neutronization burst dominated stage may get rid of model dependency largely compared to the latter phases. The low energy threshold of LS detectors also allows the detection of proton elastic scattering (pES). Such neutral current interaction is blind to NMO directly and will advance the precise determination of the neutronization burst time with relative high statistics, which helps to increase the NMO sensitivity remarkably. Our recent work evaluated the potential of NMO determination with CCSNe neutrinos at large LS detectors, and will be submitted to arXiv soon.

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