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Detailed Nucleosynthesis Calculations from Pair-Instability Supernovae

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With the advent of high-cadence, full-sky surveys, the number of observed transient events has increased at an astonishing rate.
Though the majority of these events display light curves and spectra that fit within the normal classification schemes, a growing number require further explanation.
Pair-instability supernovae (PISNe), the disruption of very high-mass (>100Msolar) stars by explosive oxygen burning, present a possible explanation for many of these objects.
Given the large progenitor masses, PISNe should have occurred more frequently in the past, and the signatures of these objects may be found in the atmospheres of old, metal-poor stars.
In this talk, I will show the results of our multi-dimensional hydrodynamic explosion models of PISNe, including results from the first-ever-published, three-dimensional model.
The reliability of synthetic light curves, spectra, and chemical signatures used in the investigation of PISNe is tied directly to the accuracy of the nucleosynthetic products of our explosion simulations.
For computational efficiency, our multi-dimensional explosion models use small nuclear reaction networks that may accurately capture the bulk properties of the explosion, but do not necessarily produce reliable chemical abundances.
To solve this problem, we use the technique of particle post-processing using a large nuclear reaction network.
I will show and discuss discrepancies between the chemical abundances produced in the outer ejecta of our explosion models and the abundances produced by post-processing, and the possible effects these may have on produced synthetic light curves, spectra, and chemical signatures of PISNe.

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