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The first supernovae and the origins of metal-poor stars

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Metals from Population III (Pop III) supernovae led to the formation of less massive Pop II stars in the early universe, altering the course of evolution of primeval galaxies and cosmological reionization. There are a variety of scenarios in which heavy elements from the first supernovae were taken up into second-generation stars, but cosmological simulations only model them on the largest scales. In this talk, we present small-scale, high-resolution simulations of the chemical enrichment of a primordial halo by a nearby supernova after partial evaporation by the progenitor star. We find that ejecta from the explosion crash into and mix violently with ablative flows driven off the halo by the star, creating dense, enriched clumps capable of collapsing into Pop II stars. Metals may mix less efficiently with the partially exposed core of the halo, so it might form either Pop III or Pop II stars. Both Pop II and III stars may thus form after the collision if the ejecta do not strip all the gas from the halo. The partial evaporation of the halo prior to the explosion is crucial to its later enrichment by the supernova.

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Talk/Poster

Talk

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