

Children of the First Stars: Birth from a Population III Supernova

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We present evidence for triggered star formation following a supernova of a metal-free (Population III) star, providing a direct connection between a single Population III star and a subset of extremely metal-poor stars. We simulate the formation and ensuing radiative and supernova feedback of several Population III stars in a cosmological volume with the adaptive mesh refinement code, Enzo. In the vicinity of one of the stars at redshift 15, the blastwave from a 3×10^{52} erg supernova passes a molecular cloud of mass $770 M_{\odot}$. Existing only 11 pc from the star, the cloud survives the blast and is not completely photo-evaporated. After the star explodes, the blastwave rapidly shock-heats the diffuse gas, increasing the external pressure, crushing the cloud into collapse. At the end of the simulation, 374 kyr after the SN, the cloud is gravitationally unstable and resolved with a maximum resolution of 4 AU. The inner $550 M_{\odot}$ of the cloud exceeds the Bonnor-Ebert mass suggesting it will continue to collapse and form stars. We confirm the blastwave induces the collapse by performing another simulation without a supernova. As the photo-evaporative flow does not abate, the cloud is not pressure confined and continues to expand.

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Poster

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