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**R-Process Nucleosynthesis in the Neutrino Pair Heated Collapsar MHD Jet**[1] GRANT MATHEWS, UND, KO NAKAMURA, SASUMU SATO, SEIJI HARIKAE, TOSHITAKA KAJINO, NAOJ — The collapsar scenario is a model for long-duration gamma ray bursts (GRBs). It is also a possible site for r-process nucleosynthesis. We present numerical r-process calculations in the context of a MHD + neutrino pair heated collapsar simulation. This model begins with relativistic magnetohydrodynamic simulations including ray-tracing neutrino transport to describe the development of the black hole accretion disk and the heating of the funnel region to produce a relativistic jet. The late time evolution of the jet then utilizes axisymmetric special relativistic hydrodynamics to follow the temperature, entropy, electron fraction, and density for representative test particles flowing with the jet from temperatures of $9 \times 10^9$ to $3 \times 10^8$ K. The evolution of nuclear abundances from nucleons to heavy nuclei for representative test particle trajectories was solved in a large nuclear reaction network. We show that a robust $r$-process successfully occurs within the collapsar jet outflow and argue that sufficient mass is ejected within the flow to account for the observed r-process abundance distribution along with the large dispersion in r-process elements observed in metal-poor halo stars.

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