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Neutrinos, Fission Cycling, and the r-process JOSHUA BEUN, GAIL MCLAUGHLIN, North Carolina State University, REBECCA SURMAN, Union College, RAPH HIX, Oak Ridge National Laboratory — Recent halo star abundance observations exhibit the presence of a consistent r-process pattern between the second, $A \approx 130$, and third, $A \approx 195$, peaks. This universal pattern is known as the "main" r-process. Using the neutrino-driven wind of the core-collapse supernova as our guide, we explore fission cycling and steady-β flow as the driving mechanisms behind production of this "main" r-process. These mechanisms robustly produce the general structure of the "main" r-process. In the core-collapse supernova environment, neutrinos play an important role as they facilitate the explosion mechanism and influence the elemental composition of the outflow. As conditions must be more neutron-rich than current wind models predict for both fission cycling and steady-β flow to occur, we examine wind environments under a variety of neutrino luminosities and effective temperatures. We find a reduction in the electron neutrino luminosity is necessary to allow for both fission cycling and steady-β flow. This reduction may result from active-sterile neutrino oscillations or other new physics.

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