Characterizing r-Process Sites through Actinide Production

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**Background: Actinides in Metal-Poor Stars**

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**Research Question #1**

Is the actinide-boost a nuclear effect (e.g., from fission)? If so, what choice of nuclear input can reproduce the observational actinide-boost signature?

**Method: ADM Model**

The “Actinide-Dilution with Matching” model is a Monte Carlo method that uses r-II abundances to build empirical mass distributions characterizing ejecta from r-process events.

**Conclusion #2**

There is no point at which the actinide-boost "turns on." Allowing variations in a distribution of r-process ejecta can reproduce all levels of actinide variation in metal-poor stars [4]. More detailed nuclear physics input can help constrain and characterize the r-process ejecta.

**Constraints on r-Process Ejecta**

**Fig 1.** Three examples of r-II abundance patterns with a range of Th/Eu levels, including the lowest (Ret II, [1]) and the highest (J0954+5246 [2]) measured.

**Fig 2.** Final abundance patterns using four variations on nuclear input (top) and a mixture of astrophysical conditions (Ye, bottom) compared to an actinide-boost star.

**Fig 3.** The fraction of ejected low-Ye material from an r-process event vs. increasing actinide abundance. One site can reproduce all actinide abundances yet observed.

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