Actinide Abundances Using Novel Uranium Lines

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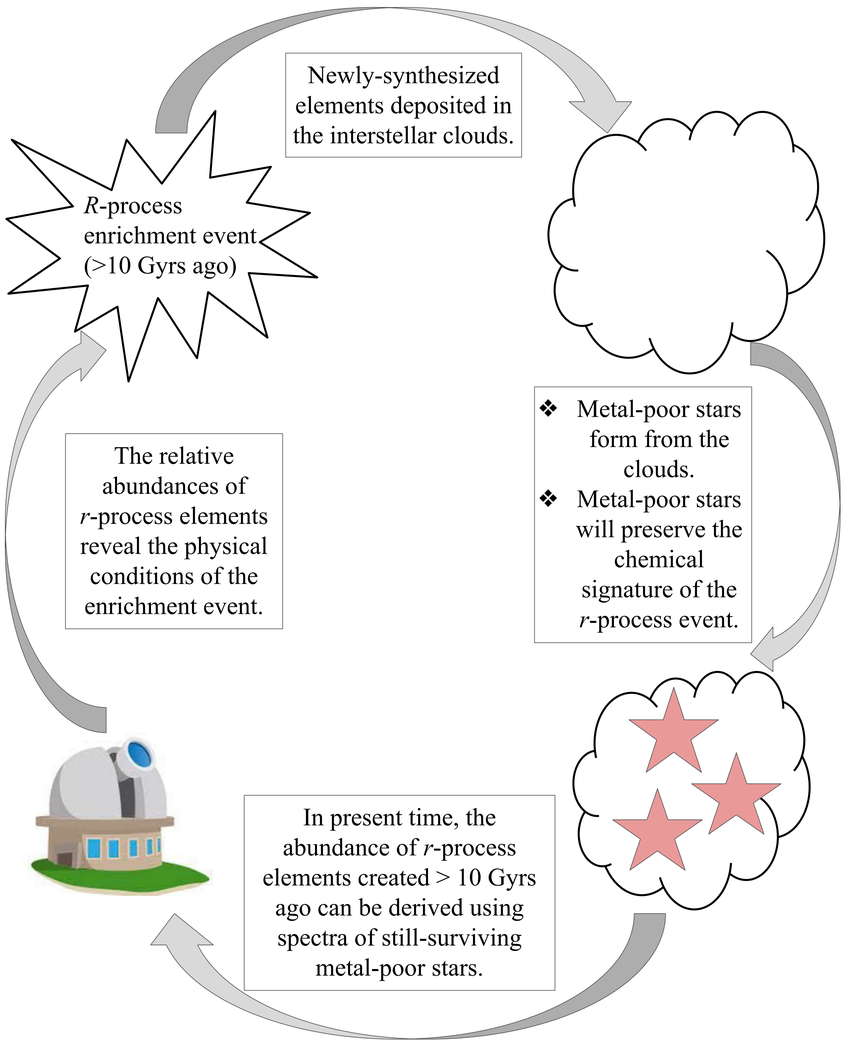
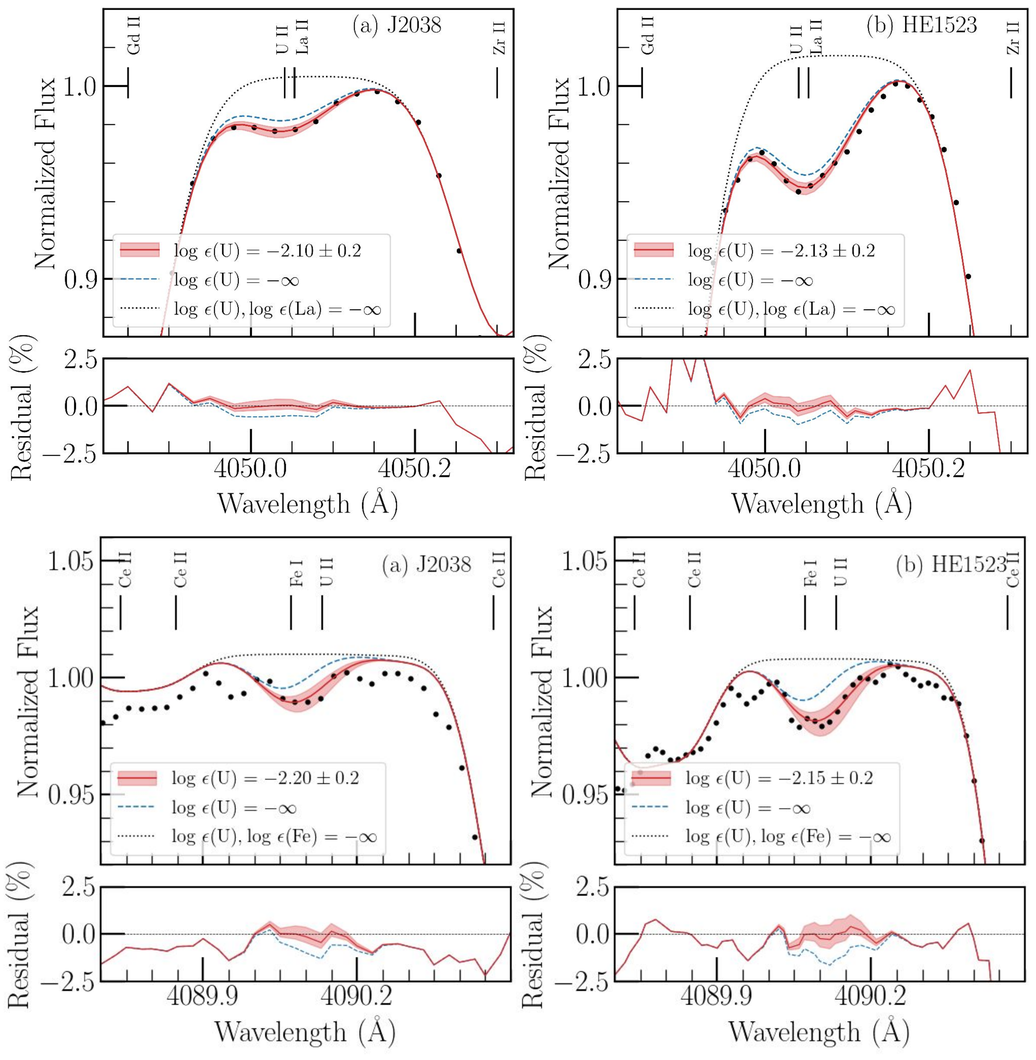


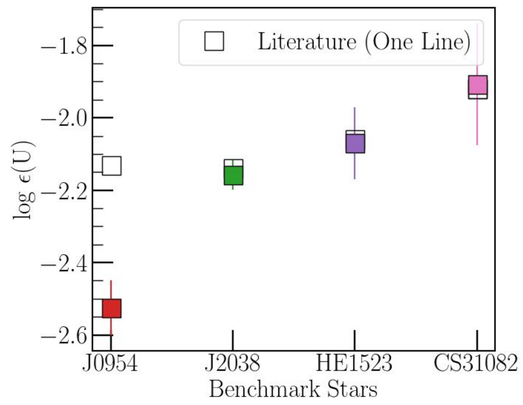
Uranium: An important *r*-process element, but difficult to detect!

- ❖ Uranium (U) is the heaviest stable element produced in the universe and belongs to the actinide group of elements.
- ❖ It's yield in an *r*-process enrichment event is sensitive to the physical conditions of the event.
- ❖ Additionally, U is radioactive offering the opportunity to estimate the age of the enrichment event through radioactive-dating.
- ❖ However, of the ~100 *r*-process enhanced stars discovered so far, U has been detected in only ~6.
- ❖ The canonical absorption line used at 3859 Å is heavily blended.

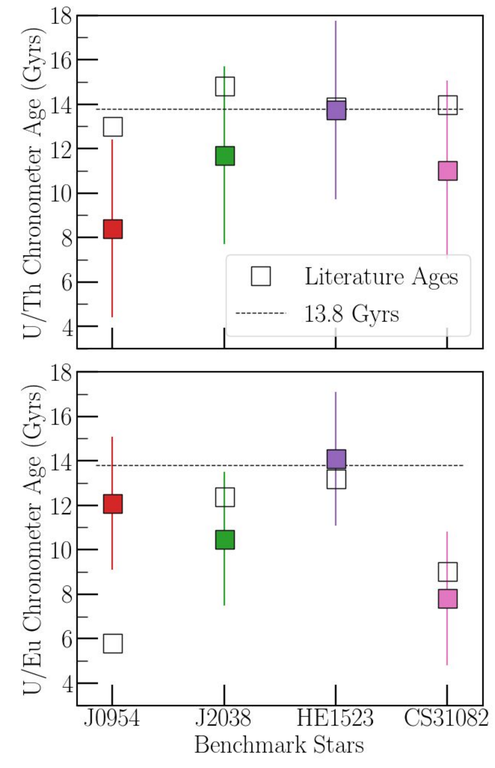
We derive uranium abundance for 4 benchmark *r*-process enhanced stars with spectral synthesis of novel U II absorption lines at 4050.04 Å (top) and 4090.31 Å (bottom).



Sample Stars: J0954+5246, J2038-0023, HE1523, CS31082
Instrument: Keck/HIRES, MIKE/Magellan, UVES/VLT, UVES/VLT
Resolving Power: > 60,000
Signal-to-Noise Ratio: > 150
Radiative transfer code: MOOG (Sneden) (https://github.com/alexji/moog17scat)
Model Atmosphere: 1D ATLAS9 (Castelli and Kurucz 2004)
Linelist: linemake (https://github.com/vmplacco/linemake)
Spectroscopic analysis: Spectroscopy Made Harder (https://github.com/eholmbeck/smhr-rpa)



Mean U abundances of the stars using 3859, 4050 and 4090 Å absorption lines are comparable to literature abundances from 3859 Å line.



Age estimates of the stars using radioactivity of U and Th. First age-estimates using multiple U lines!

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