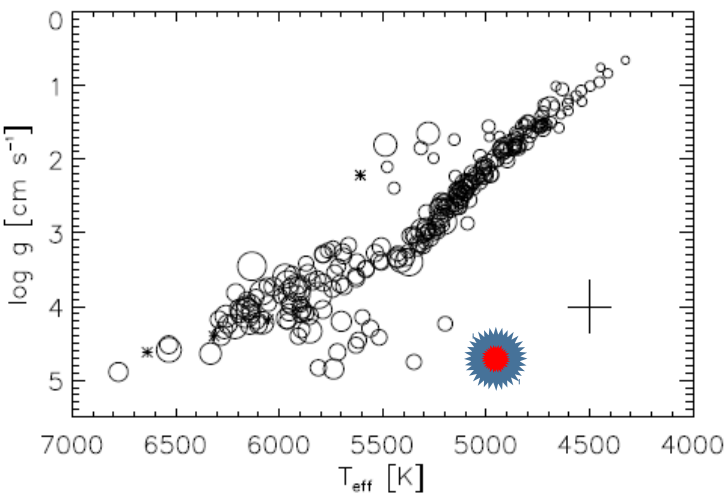
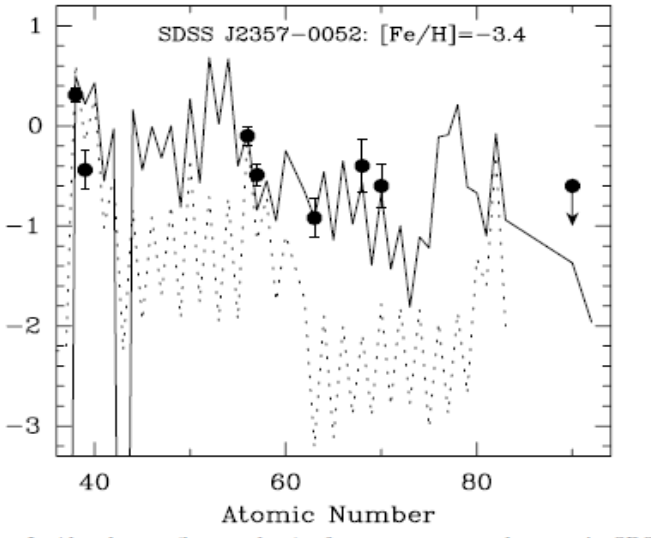
Joint Institute for Nuclear Astrophysics

Extreme Enhancements of r-process Elements in a Cool Metal-Poor Main-Sequence Star from SDSS/SEGUE



H-R diagram of a large sample of stars with available high-resolution spectroscopic determinations of elemental abundances. The newly discovered main-sequence dwarf with large r-process-element abundances is show by the red symbol. This star demonstrates that r-process enhancement is not solely an atmospheric phenomenon.



Abundances of neutron-capture elements in SDSS J2357-0052 (dots). The solid and dotted lines indicate the abundance patterns of the r- and s-process components in solar system material, normalized at Ba.

Aoki et al. (2010) have recently report the discovery of a cool metal-poor, main-sequence star exhibiting large excesses of r-process elements. This star is one of the two newly discovered cool subdwarfs (effective temperatures of 5000 K) with extremely low metallicity ([Fe/H] < −3) identified from follow-up high-resolution spectroscopy of metal-poor candidates from the Sloan Digital Sky Survey. SDSS J2357−0052 has [Fe/H] = −3.4 and [Eu/Fe]= +1.9, and exhibits a scaled solar r-process abundance pattern of heavy neutron-capture elements. This is the first example of an extremely metal-poor, main-sequence star showing large excesses of r-process elements; all previous examples of the large r-process-enhancement phenomena have been associated with metal-poor giants. Such objects help place constraints on the likely astrophysical origin of r-process elements in the early Universe.

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See the published work: Aoki et al. (2010) ApJ, 723, L201

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