BD+44:493 A Ninth Magnitude Messenger from the Early Universe

During the course of follow-up high-resolution observations of metal-poor stars from SDSS/SEGUE with the Subaru 8m telescope, JINA researchers and colleagues obtained a high-resolution spectrum of the bright star BD+44:493. This star turned out to be quite a surprise, as the new spectrum established that this is *the most metal-deficient star yet discovered ([Fe/H] = -3.7) brighter than 12th magnitude.*

This star, which also exhibits strong over-abundances of carbon ([C/Fe] = +1.3) and oxygen ([O/Fe] = +1.6), does *not* exhibit a large abundance of s-process elements, such as Ba, that would be expected if its progenitor were related to the late-stage evolution of an asymptotic branch star, as do most carbon-enhanced stars. Instead, it fits the profile of a so-called CEMP-no star (a carbon-enhanced metal-poor star that does not exhibit neutron-capture elements).

The distinctive abundance pattern indicates that the star may be associated with ejecta from a so-called "faint supernova", where extensive mixing and fall-back of processed material may have occurred.

This star is also remarkable in that its brightness enabled a strong upper limit to be measured for the element beryllium (Be). Beryllium is thought to be exclusively produced by the spallation products of cosmic rays, hence its abundance places constraints on the flux of cosmic rays in the early Universe. This star will soon be proposed to be observed with the recently repaired STIS instrument on the Hubble Space Telescope, in hopes of obtaining a detection of Be, and to search for additional distinct abundance patterns that may yield insight into the nature of the progenitor of this unique star.

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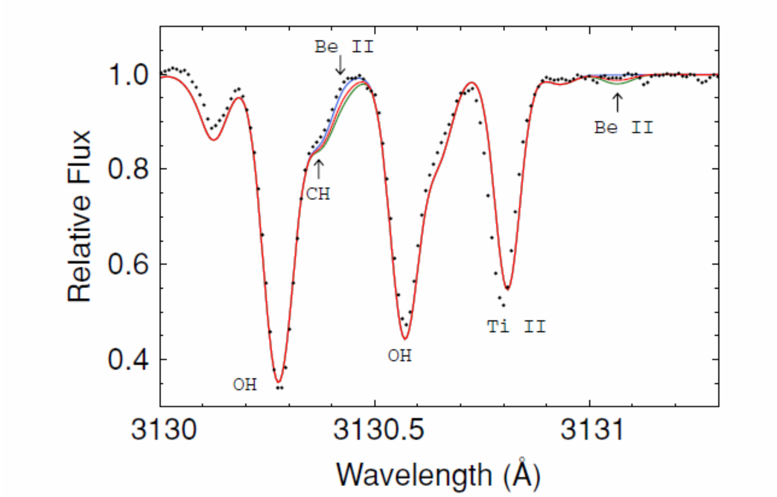
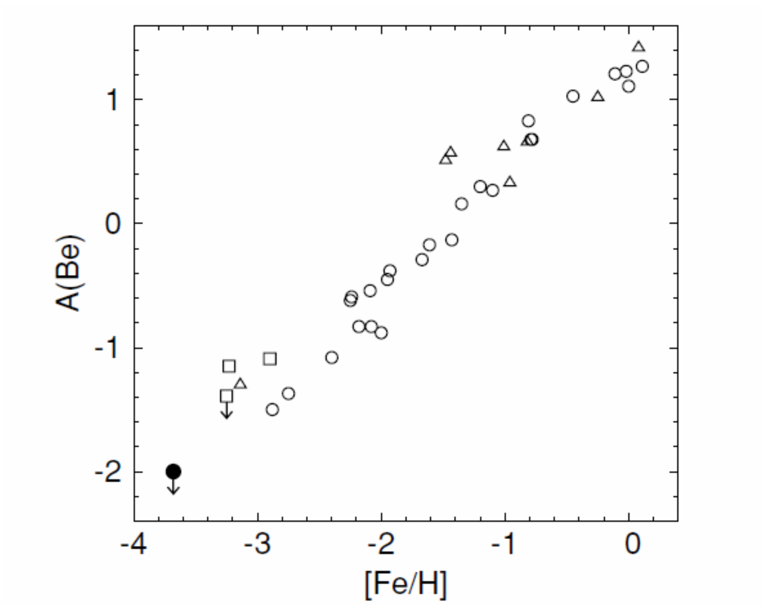


The OH and Be lines at 3131 Å. Assumed abundances are A(Be) = −2.8 (blue line), −2.0 (red line), and −1.8 (green line).



A(Be) vs. [Fe/H]. Our result is the filled circle. The hard lower limit removes the possibility that there exists a plateau of Be abundances at low [Fe/H].

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See the published work: Ito et al. 2009, ApJ, 696, L1