Contribution ID: **264** Type: **Invited**

Neutron-Capture Processes in the Early Galaxy

Friday 30 June 2006 12:00 (30 minutes)

High resolution spectroscopy for very metal-poor stars have revealed that some fraction of objects have large excesses of neutron-capture elements, whose abundance patterns agree very well with that of the r-process component of solar-system material (e.g. Sneden et al. 1996, ApJ, 467, 819). However, recent abundance studies show the existence of objects that have quite different abundance patterns.

One is the class of objects that have very large enhancement of light neutron-capture elements. Although the nucleosynthesis process responsible for such chemical composition is still unknown, observational studies for this process have made substantial progresses in the past few years: (1) Such objects appear even in the extremely low metallicity range ([Fe/H]˜<-3.0), while the stars having large excesses of heavy neutron-capture elements appear in the metallicity range of [Fe/H]>˜-3.0. (Aoki et al. 2005, ApJ 632, 611). A large excess of the light neutron-capture element Sr is found even in the most iron-deficient star HE1327-2326 (Frebel et al. 2005, Nature 434, 871). (2) An evidence of this process is found in metal-poor globular cluster stars (Otuski et al. 2006, ApJL, in press). These observational facts indicate that the process was efficient in general in the very early Galaxy. (3) The detailed elemental abundance pattern (Sr-Yb) was determined for the metal-poor star HD122563, a star that might well preserve the yields of this process (Honda et al. 2006, ApJ, in press). The abundances of elements between the 1st and 2nd abundance peaks of neutron-capture elements continuously decrease in this object. This result provides strong constraints on modeling the process responsible for production of light neutron-capture elements in the early Galaxy, which is presumably related to early generation supernovae.

Another is the class of carbon-enhanced metal-poor stars that exhibit large excesses of Eu as well as s-process elements (e.g. Ba, Pb). Although contributions of nucleosynthesis in AGB stars are assumed because of the excesses of s-process elements, standard s-process models cannot explain the Eu enhancement. Our recent study determined the abundances of Os and Ir for one star in this group (CS31062-050), confirming the excesses of r-process elements. Discovery of such objects and measurements of their detailed abundance patterns have impact on the studies of the origins of r-process elements.

Author: AOKI, Wako (National Astronomical Observatory of Japan)

Presenter: AOKI, Wako (National Astronomical Observatory of Japan)

Session Classification: 15 Galactic and stellar evolution

Track Classification: Element production, stellar evolution and stellar explosions