NUCLEOSYNTHESIS OF LIGHT NEUTRON-CAPTURE ELEMENTS: CLUES FROM STARS AND SIMULATIONS

Carla Fröhlich[1], Oindree Banerjee[1,2], Camilla Juul Hansen[3]

[1] *Department of Physics, North Carolina State University, Raleigh, NC, USA*
[2] *Department of Physics, Ohio State University, Columbus, OH, USA*
[3] *Landessternwarte, ZAH, Heidelberg, Germany*

The origin of the elements heavier than iron is a long standing open question.
While several nucleosynthesis processes have been identified, many aspects about the site, the detailed mechanism, and the number of processes required remain unsettled.
Observations of old stars require two different environments for the synthesis of nuclei beyond iron: a main r-process for nuclei with A>130 and a weak r-process/Lighter Element Primary Process for nuclei with 64<A<130.
Recent hydrodynamical simulations of (neutrino-driven) core-collapse supernovae exhibit a low entropy, proton-rich neutrino wind.
The detailed conditions in this wind depend on the nuclear and neutrino physics included and on the exact explosion mechanism.
Here, we present results from a comprehensive study of the elements between zinc and barium (light neutron-capture elements) using both observational abundance data from metal-poor stars as well as simulations of neutrino-wind nucleosynthesis.
We have analyzed abundance data for the elements Ni, Cu, Zn, Sr, Y, Zr, Mo, Ag, Pd, Ba, La, and Eu in a sample of ~550 metal-poor dwarfs and giants.
Correlations between different elements and trends with metallicity have been identified and analyzed.
These results are juxtaposed with detailed nucleosynthesis calculations for a wide range of possible neutrino-wind conditions.
From the combined results, we draw conclusions on the origin of these elements and on the conditions in the neutrino-driven wind.