

Observation of the extreme runaway HD 271791: nucleosynthesis in a core collapse supernova

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Some young, massive stars can be found in the Galactic halo. As star formation does not occur in the halo, they must have been formed in the disk and been ejected shortly afterwards. There are several scenarios for the origin of such objects. One explanation is a supernova in a binary system. The companion is ejected and becomes a runaway star.

HD 271791 is the kinematically most extreme runaway star known (galactic restframe velocity 725 ± 195 km/s). Because its Galactic restframe velocity exceeds the Galactic escape velocity it is called a hyper-runaway star. Moreover, an analysis of the optical spectrum showed an enhancement of the alpha elements. This indicates an origin in a supernova. As such high velocities are not reached in classical binary supernova scenarios, a very massive but compact primary, probably of Wolf-Rayet type is required.

The star is a perfect candidate for studying nucleosynthesis in a core collapse supernova because of the contamination of its surface layers with supernova ejecta of its former very massive primary.

The goal of this project is to determine the abundances of a large number of elements from the alpha process, the iron group, and heavier elements by a quantitative spectral analysis of the optical and the UV with detailed star atmosphere models with deviations from the local thermal equilibrium (NLTE). We intend to verify whether core collapse supernova are a site of the r-process element production.

After we included all existing atomic data in our synthetic UV models, we are now able to determine abundances.

Here we want to state the current status of the project.