

High Precision Mass Measurements of Nuclei and the Neutron Star Merger

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The origin of the synthesis of the heavy elements from Fe to U have emerged as important questions in all of physics for this century. Most of the elements above Fe in the periodic table are thought to have been produced by either the slow (s-process) or rapid (r-process) capture of neutrons in astrophysical environments. The s-process proceeds close to stability and astrophysical sites have been identified, while the r-process allows the production of nuclei much further from stability and potential sites remain mostly unresolved.

The recent observation of gravitational waves from two neutron star mergers simultaneously with the spectroscopy indicated that rare earth elements were made in this kilo nova event. The questions remain, are there enough such mergers? are mergers the only source of r-process elements ? How can precision mass measurements contribute to the discussion?

I will discuss some of our new results from the measurements of neutron rich nuclear masses and their implications towards a better understanding of the r-process and the synthesis of the heavy elements.