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Measuring Th, U and Pb abundances in the ancient r-process star HE1523-0901, and neutron-star mergers as the site of the r-process

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Some old metal-poor Galactic stars formed from material enriched in the hehaviest elements made in the r-process, enabling stellar age measurements. In the case of star HE 1523-0901, an age of 13.2 Gyr was previously derived from multipe abundance ratios involving Th, U and other heavy stable elements. A new measurement of the total produced Pb strongly constraints the various Pb production channels in the r-process that occur in addition to the decay component by the Th and U decay. We find good agreement with current "waiting point" models for the production of elements in the actinide region. These observational constraints will improve r-process modelling of the heaviest n-rich nuclei. Together with results of the "r-process galaxy" Reticulum II (Ji et al. 2016), constraint are now available on neutron-star mergers as the site of the r-process. It remains to be seen if halo r-process stars like HE1523-0901 share the same nucleosynthetic origin