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The hunt for peculiar Eu and Ba abundances in metal-poor stars using *Gaia* and GALAH surveys

The lanthanide-rich ejecta observed in the spectroscopic follow up of the neutron-star merger and gravitational wave event **GW170817** has shed light on a possible r-process nucleosynthesis site. However, abundances of r-process elements measured in metal-poor stars suggest that neutron-star mergers are not the only site for this kind of nucleosynthesis. Metal-poor stars provide information about the early Galaxy's chemical enrichment. In this regard, the **GALAH** survey is an important source of information: it provides chemical abundances for more than 340 000 stars. In particular it includes abundances of Eu (which is mostly an r-process element) and Ba (mostly an s-process element). Thanks to *Gaia*, an astrometric mission that is obtaining parallaxes and proper motions for more than 10^9 stars, our Galaxy's early merger history has been unfolded in the recent years. Helmi et al. (2018) have shown that the Galactic halo harbours a stellar population with retrograde motion that possibly originated in a major merger event (**of a possible dwarf galaxy now called *Gaia* Enceladus**). In this work, we aim to find metal-poor stars with peculiar Eu and Ba abundances in the cross-match between *Gaia* DR2 and **GALAH** DR2. **Such peculiar stars are important to help in isolating the nucleosynthetic contribution of each neutron-capture process**. Using these data, and limiting the sample to stars with [Fe/H] ≤ -1.0, $\sigma_\pi \leq 20\%$, $T_{\rm eff} \geq 4000$ K, and $\log\ g$ between 2.0 and 5.0, we identified 18 possibly peculiar stars. We further computed kinematic and orbital parameters to associate the stars to distinct halo components. Five of these stars were initially selected for further investigation and confirmation using the UVES spectrograph. **Four out of these five stars have possible origin in the *Gaia* Enceladus merger**.

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