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S-Process Nucleosynthesis in and from AGB Stars

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The nucleosynthetic s-process occurring in AGB stars from 1-6 M is responsible for creating half of the heavy elements in the universe. The s-process can be traced directly through AGB stars, or indirectly through their binary companions (Ba, CEMP-s, CH stars), as AGBs will dredge s-process material to the surface and deposit this material onto the companion.

We present data for 30 stars including AGB, CEMP-s, Ba, and CH stars. We derive atmospheric parameters using ATHOS and compute 1D LTE abundances with MOOG, focusing on elements created by thermally pulsing AGB stars (C, Sr, Y, Zr, Mo, Ba, La, Ce, Nd, Pb), and Eu. We monitor RVs to investigate binary properties.

Comparing our abundances to FRUITY yields we estimate masses of AGB stars, and we investigate correlations in abundance space. With detailed modelling of orbits using the ELC program, we estimate dynamical masses and orbital parameters. For our systems and data from Hansen+ 2019 and Placco+ 2014, we investigate efficiencies of AGB wind mass transfer and stellar mixing processes by simulating binary accretion using the STARS code. Our results show correlations between AGB and companion masses from abundance patterns and dynamical masses. This work has implications for galactic chemical evolution.

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