Tracing The Origins of The Orphan Stellar Stream: A Chemo-Dynamical and Chemical Tagging Approach

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We focus on establishing an extended chemo-dynamical study of the Orphan stellar stream with photometric, astrometric, and spectroscopic data from SDSS and Gaia EDR3, utilising RR Lyrae and non-variable stars. 74 potential stream components are included. Their spatial and kinematic coherence from the APOGEE and SEGUE catalogues are used to infer the stream's enrichment history using medium-resolution abundance data, with a particular emphasis on important ratios like [α/Fe], [C/Fe], and [Ba/Fe]. We also constrain the star formation period and initial mass function of the stream by modelling its chemical development with one-zone exponential infall models with delayed Type IA supernova enrichment. Our goal in this work is to find any correlation between the Orphan stream and the surrounding dwarf galaxies or Milky Way halo stars in terms of chemical imprints.