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Gaia Spectroscopic Orbits Validation with external Radial Velocity Surveys

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The recently published Gaia DR3 catalog of 181,327 spectroscopic binaries (SB) includes the Keplerian elements of each orbit, but not the measured radial velocities (RVs) and their epochs themselves. In this work, we used two external sources to validate the orbits - LAMOST DR6 and GALAH DR3 stars with measured RVs that have Gaia-SB orbits.

We compared the expected RVs, based on the Gaia orbits, with the LAMOST and GALAH measurements. Finding some orbits that are not consistent with these measurements, we constructed a function that estimates the probability of each of the Gaia orbits to be correct, using the Gaia period and robustness parameters. Choosing a working point that allows for an order of 20% contamination, we put up a 'clean' catalog consisting of almost 90K orbits, which does not include any short-period binaries with high eccentricity. The clean SB1 sample can be used for a thorough study of the statistical features of short-period binaries. As a first step, we point to two possible emerging features - a circularized main-sequence sub-sample, and a paucity of short-period low-mass primary binaries. One should find out whether these features are genuine, or might come from some observational biases.

Presenter: BASHI, D.

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