Contribution ID: **26** Type: **Talk**

Rotation and expansion in open clusters using simulations and Gaia DR3

Tuesday, 20 August 2024 11:25 (20 minutes)

Empirical constraints on the internal dynamics of open clusters are important for understanding their evolution and evaporation. High precision astrometry from Gaia DR3 are thus useful to observe aspects of the cluster dynamics. This work aims to identify dynamically peculiar clusters such as spinning and expanding clusters. We also quantify the spin frequency and expansion rate and compare them with N-body models to identify the origins of the peculiarities. We used the latest Gaia DR3 and archival spectroscopic surveys (APOGEE, GALAH, LAMOST etc.) to analyse the radial velocities and proper motions of the cluster members in 1428 open clusters. A systematic analysis of synthetic clusters is performed to demonstrate the observability of the cluster spin along with effects of observational uncertainties. N-body simulations were used to understand the evolution of cluster spin and expansion for initially non-rotating clusters. We identified spin signatures in 10 clusters (and 16 candidates). Additionally, we detected expansion in 18 clusters and contraction in 3 clusters. The expansion rate is compatible with previous theoretical estimates based on expulsion of residual gas. The orientation of the spin axis is independent of the orbital angular momentum. The spin frequencies are much larger than what is expected from simulated initially non-rotating clusters. This indicates that >1% of the clusters are born rotating and/or they have undergone strong interactions. Higher precision observations are required to increase the sample of such dynamically peculiar clusters and to characterise them.

Affliation

University of Bonn

Current Position

Postdoc

Primary author: JADHAV, Vikrant (University of Bonn)

Co-authors: Dr THIES, Ingo (University of Bonn); Dr PFLAMM-ALTENBURG, Jan (University of Bonn); KROUPA, Pavel (University of Bonn, Charles University in Prague); Mr WU, Wenjie (University of Bonn)

Presenter: JADHAV, Vikrant (University of Bonn)

Session Classification: Observational properties of dense stellar systems in different environments

Track Classification: Observational properties of dense stellar systems in different environments