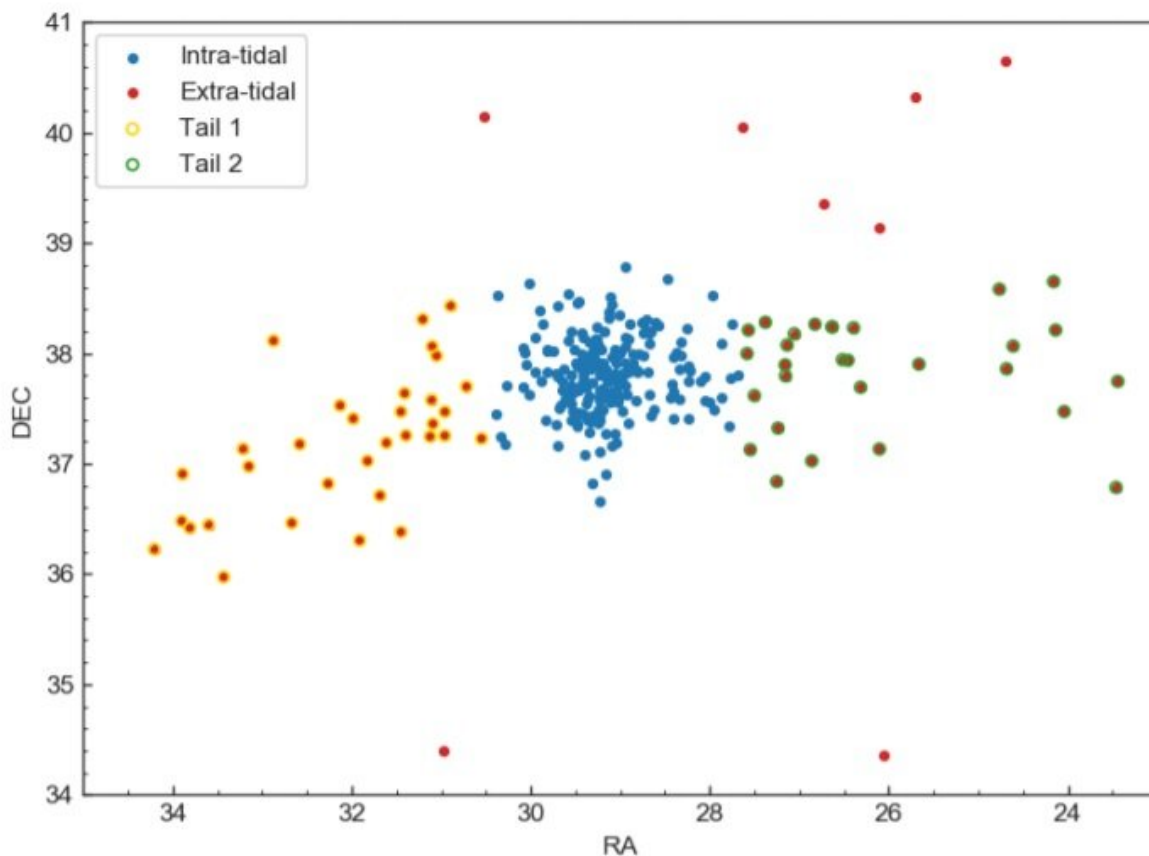


Tidal tails detected in the open cluster NGC 752

May 19 2021, by Tomasz Nowakowski



Spatial distribution of the identified members in NGC 752 with the intra-tidal (blue), extra-tidal (red), Tail 1 (encircled in yellow) and Tail 2 (encircled in green) members marked. Credit: Bhattacharya et al., 2021.

Indian astronomers have detected tidal tails in a disintegrating open cluster known as NGC 752. The newly found features extend on either side of the cluster's denser central region. The findings were presented in a research paper published May 13 on the arXiv pre-print repository.

Tidal tails are thin, elongated regions of stars and interstellar gas extending into space. They are formed as a result of gravitational interactions between galaxies and star clusters. The observations show that some interacting objects have two distinct tails, while other systems have only one [tail](#).

Studying tidal tails offers clues on the tides experienced by the cluster and its internal dynamics. Such studies can also reveal essential information about the evolution of a cluster and could shed new light on the lumpiness of dark matter distribution in a galaxy. However, to date, only a handful of clusters with tidal tails have been detected in the Milky Way galaxy.

Now, a team of Indian astronomers led by Souradeep Bhattacharya of the Inter University Centre for Astronomy and Astrophysics, reports the detection of tidal tails in the nearby [open cluster](#) NGC 752 (also known as Caldwell 28). It is an intermediate age (about 1.5 billion years old) cluster located some 1,470 [light years](#) in the constellation Andromeda.

"We utilize the robust membership determination algorithm, ML-MOC, on the precise astrometric and deep photometric data from Gaia Early Data Release 3 within a region of radius 5 degrees around the center of the intermediate-age galactic open cluster NGC 752 to identify its member stars. We report the discovery of the tidal tails of NGC 752, extending out to ~ 35 pc on either side of its denser central region and following the cluster orbit," the researchers wrote in the paper.

According to the study, one of the tidal tails of NGC 752 extends out to

about 111 light years from the center of the cluster, while the other one reaches approximately 119 light years. The tidal radius of NGC 752 was calculated to be around 31 light years, which allowed the team to divide the cluster into four sub-regions: intra-tidal, extra-tidal, Tail 1 and Tail 2.

The research found that the mass function of NGC 752 with a slope is at a level of approximately -1.26. This value suggests that it is a dissolving cluster undergoing significant mass segregation. The astronomers assume that NGC 752 is a descendent of a young massive cluster (with mass above 10,000 solar masses) that has lost some 95.2–98.5 percent of its mass to the galactic field. They estimate that its current mass is about 297 solar masses.

"The mass-segregation of NGC 752, evident from the negative value of its mass function slope, and extended tidal features mark NGC 752 as a telltale sign of its dissolution. Environmental effects like tidal shocks due to close interactions with [giant molecular clouds](#), spiral arms, the galactic disc and, in general, interactions with the galactic tidal field or internal dynamical effects like two-body relaxation lead to mass-loss in an open [cluster](#)," the scientists explained.

Therefore, the researchers noted that NGC 752 is the newest addition to a growing list of dissolving open clusters exhibiting tidal features.

More information: Tidal tails in the disintegrating open cluster NGC 752, arXiv:2105.06108 [astro-ph.GA] arxiv.org/abs/2105.06108

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