Astronomers perform a comprehensive study of young open cluster NGC 1960

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Open cluster NGC 1960. Credit: 2MASS/UMass/IPAC-Caltech/NASA/NSF.

Indian astronomers have conducted a comprehensive photometric, kinematic and variability study of a young open cluster known as NGC 1960. Results of the research shed more light on the properties of this cluster and its member stars. The study was detailed in a paper published January 13 on arXiv.org.

Formed from the same giant molecular cloud, open clusters are groups of stars loosely gravitationally bound to each other. So far, more than 1,000 of them have been discovered in the Milky Way galaxy, and scientists are still looking for more, hoping to find a variety of these stellar groupings. Expanding the list of known galactic open clusters and studying them in detail could be crucial for improving the understanding of the formation and evolution of the Milky Way.

Located some 4,300 light years away in the Auriga constellation, NGC 1960 (also known as Messier 36 or M36) is an open cluster estimated to be about 25 million years old. Given that the cluster was discovered in 1654, it has been a subject of numerous observations in the past. However, despite all the studies, there are still large uncertainties regarding the cluster parameters, as many stars in the field of NGC 1960 lack membership confirmation.

To resolve these uncertainties, a team of astronomers led by Yogesh Joshi of Aryabhatta Research Institute of Observational Sciences (ARIES), India, has carried out a detailed study of NGC 1960 using mainly the 104-cm Sampurnanand Telescope (ST) at Manora Peak, Nainital, India. "A detailed analysis of our photometric, kinematic and variability studies of the cluster NGC 1960 is presented here," the paper reads.

The study confirmed the cluster membership of 262 stars out of 3,871 candidates in the field of NGC 1960. The astronomers noted that this number is relatively low in comparison of the total number of stars found in the target field.

The variability study revealed 76 variable stars with V-band magnitudes from 9.1 mag to 19.4 mag. Out of this sample, 72 stars are periodic variables with periods ranging from 41 minutes to 10.74 days. The researchers added that majority of these stars are short-period variables with periods shorter than one day.

From 72 periodic variables, 20 were identified as cluster members, which allowed the team to obtain their parameters, in particular, their masses, effective temperatures and bolometric luminosities. The results suggest that two of them may be delta Scuti stars, three could be gamma Doradus type stars, five were identified as possible rotational variables, two as slowly pulsating B-type stars, and two as non-pulsating B stars. The rest belong to a field star population lying in the direction of the cluster.

When it comes to the parameters of NGC 1960, the research found a mean cluster parallax of about 0.86 mas and mean proper motions of approximately -0.143 mas/year in the direction of right ascension, and -3.395 mas/year in the direction of declination. The total cluster mass was calculated to be about 417 solar masses, while a mean stellar mass was estimated to be 1.6 solar masses. Reddening of the cluster was found to be 0.24 mag in the optical bands and the cluster's age was estimated to be around 27.5 million years. The study revealed that NGC 1960 is located most likely 3,800 light years away, therefore nearer than previously thought.

More information: Photometric, kinematic and variability study in the young open cluster NGC 1960, arXiv:2001.04068 [astro-ph.SR]

arxiv.org/abs/2001.04068