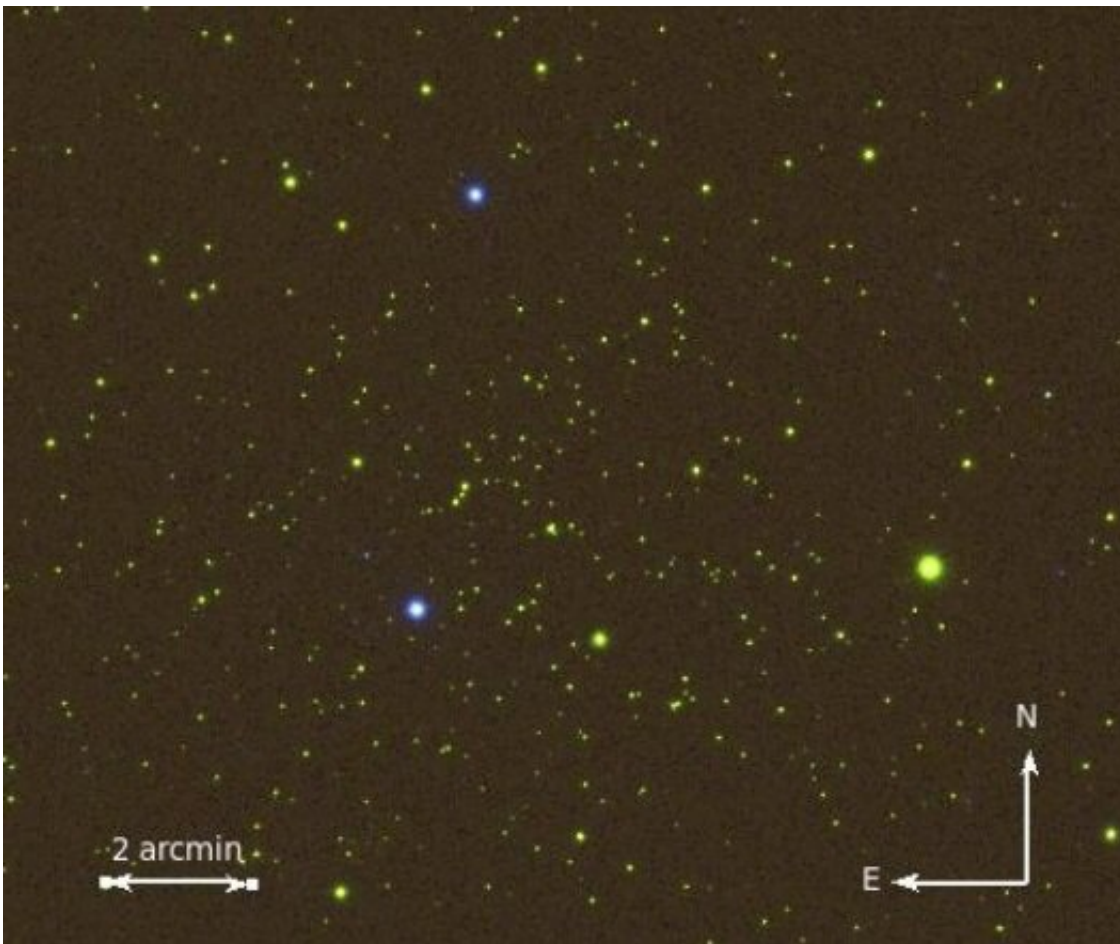


Open cluster NGC 188 explored with AstroSat

December 9 2020, by Tomasz Nowakowski



UVIT image of NGC 188 obtained by combining images in NUV (N279N) and FUV (F148W) channels. Yellow and blue color corresponds to NUV and FUV detections, respectively. Credit: Rani et al., 2020.

Indian researchers have carried out ultraviolet photometric observations of an old open cluster known as NGC 188. Results of the study, conducted with the AstroSat spacecraft, provide important information about stellar populations of this cluster. The findings are presented in a paper published December 1 on the arXiv pre-print repository.

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

Discovered in 1825, NGC 188 is an open cluster in the constellation Cepheus, located some 5,400 light years away from the Earth. It has a solar metallicity, a radius of about 11.8 light years, reddening at a level of 0.036, and its age is estimated to be 7 billion years. It is one of the oldest and well studied OCs in our galaxy.

In order to learn more about the member stars of NGC 188, a team of astronomers led by Sharmila Rani of the Indian Institute of Astrophysics in Bengaluru, India, has performed a photometric study of this cluster with the main goal of identifying its ultraviolet-[bright stars](#). For this purpose, they used AstroSat's Ultraviolet Imaging Telescope (UVIT).

"In this study, we present the results of the UV imaging of the NGC 188 in two FUV [far-ultraviolet] and one NUV [near-ultraviolet] filters using UVIT on AstroSat. We characterize the UV bright stars identified in this cluster by analysing SEDs [spectral energy distributions] to throw light on their formation and evolution," the astronomers wrote in the paper.

FUV observations detected hot and bright blue straggler stars (BSSs),

one hot subdwarf, and one white dwarf candidate. NUV imaging allowed the astronomers to identify fainter members, including 21 BSSs, two yellow straggler stars (YSSs), and one white dwarf (WD) candidate. It was noted that one of the YSSs was found to have excess flux in the UV, what may be connected to its binarity and X-ray emission.

The study presented the first NUV color-magnitude diagram (CMD) for NGC 188. This diagram suggests the presence of horizontal-branch (HB) stars in this [cluster](#), together with extreme HB (EHB), red horizontal-branch (RHB), blue horizontal-branch (BHB), and hot subdwarfs of B-type.

In general, the UV-bright [stars](#) reported in the research paper have effective temperatures between 4,750 and 21,000 K, luminosities reaching nearly 74 solar luminosities and radii from 4.0 to 12.5 solar radii (excluding the white dwarf candidate and subdwarf). The radii of the WD and subdwarf were estimated to be 0.02 and 0.19 solar radii. The data suggest that the mass of the white dwarf candidate is about 0.5 solar masses.

More information: UOCS. V. UV study of the old open cluster NGC 188 using AstroSat, arXiv:2012.00510 [astro-ph.SR]
arxiv.org/abs/2012.00510

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