Three ancient globular clusters found in the galactic bulge

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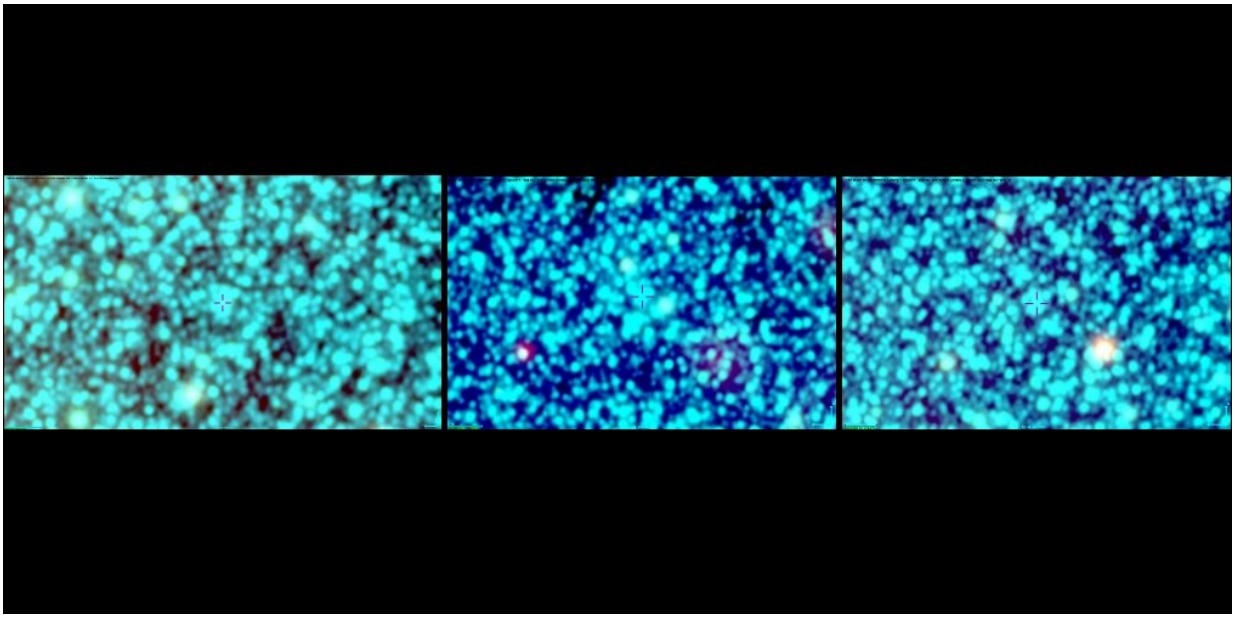

WISE multicolor images of the central regions (12.3′ × 8.0′) of the new GCs. From right to left Camargo 1107, Camargo 1108, and Camargo 1109. North is to the top and east to the left. Credit: Camargo and Minniti, 2019.

Three old and metal-poor globular clusters have been spotted in the Milky Way's bulge. The newly found clusters, designated Camargo 1107, 1108 and 1109, could offer important clues on structure and nature of the central region of our galaxy. The finding was reported in a paper published in *Monthly Notices of the Royal Astronomical Society:*

Letters in January 2019, co-authored by Denilso Camargo and Dante Minniti.

Globular clusters (GCs) are collections of tightly bound stars orbiting galaxies. Astronomers perceive them as natural laboratories enabling studies on the evolution of stars and galaxies. Given that GCs are relatively rare, as there are just over 200 such clusters so far identified in the Milky Way, the hunt for identifying new objects of this type is essential in order to improve our understanding of our home galaxy.

Recently, Denilso Camargo of the Ministério da Defesa—Colégio Militar de Porto Alegre, Brazil, and Dante Minniti of Universidad Andrés Bello in Santiago, Chile, revealed the discovery of a trio of new galactic globular clusters. These clusters turn out to be the oldest and the most metal-poor among all the GCs in the Milky Way bulge known to date. Therefore, they could provide important insights into the formation of the galactic bulge.

"These new findings could shed light on how the galactic bulge was formed, since they show that the Milky Way's inner region hosts a sub-population of primordial globular clusters with Gaia-DR2 proper motion consistent with bulge clusters. However, they are oldest and most metal-poor among previously known bulge globular clusters. Thus, we suggest that these clusters may be part of an old classical bulge built up by merging in the early Milky Way history," Camargo told Astrowatch.net.

He added that these primordial GCs can reveal how baryonic matter collapsed to form galaxies just after the Big Bang in a very young universe.

According to the study, Camargo 1107 and 1108 are about 13.5 billion years old, while the age of Camargo 1109 is estimated to be approximately 12 billion years. With a metallicity at a level of some -2.2

dex, Camargo 1107 is a special case, as its properties suggest that it may have formed just after the Big Bang.

"Since this globular cluster basically witnessed the entire history of our galaxy and the history of the universe itself, it may allow us to reconstitute the chain of physical processes experienced by the Milky Way from its origin to the present day," Camargo said.

The astronomer noted that the clusters like the newly found trio may be the remaining of a primordial class of GCs that were destroyed mainly by dynamical processes and are the source of the ancient field stars that inhabit the galactic bulge and the inner halo.

Camargo and Minniti also underlined the importance of future searches for new GCs in the central region of our galaxy. Any new findings would be fundamental for advancing our knowledge about the formation and evolution of the Milky Way. However, such observations are challenging as many faint GCs remain undetected until now due to the high extinction and stellar crowding towards the galactic bulge.

More information: D Camargo et al. Three candidate globular clusters discovered in the Galactic bulge, *Monthly Notices of the Royal Astronomical Society: Letters* (2019). DOI: 10.1093/mnrasl/slz010

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