

# Two of Milky Way's globular clusters found to have halo stars

June 27 2016, by Tomasz Nowakowski

---



Mount Lemmon SkyCenter image of Messier 3. Credit: Adam Block/Mount Lemmon SkyCenter/University of Arizona

(Phys.org)—Australian astronomers have uncovered evidence of halo stars in two globular clusters residing in the Milky Way galaxy.

According to a new study published on June 21 on the arXiv pre-print server, the globular clusters known as Messier 3 and Messier 13, have extratidal halo stars. The new findings suggest that both clusters could be surrounded by extended stellar halos.

Messier 3 and Messier 13, containing 500,000 and 300,000 [stars](#) respectively, are among the best known [globular clusters](#). However, previous studies focusing on finding extratidal stars in these clusters haven't delivered any promising results so far. Now, a team of researchers led by Colin Navin of the Macquarie University in Australia have analyzed the available data about the two clusters in order to reveal new insights on their structure.

For their research, the scientists used data from the Large Sky Area Multi-Object Fibre Spectroscopic Telescope (LAMOST) survey of the Northern hemisphere, which utilizes the Xinglong Observatory in China to obtain the spectra of about 10 million objects, including stars, galaxies and quasars. They chose LAMOST, as this survey covers a number of Northern hemispheric globular clusters and therefore has potential to search for extratidal stars.

"We find candidate extratidal stars in wide halos around the globular clusters Messier 3 and Messier 13 in the LAMOST Data Release 1," the researchers wrote in the paper.

First, the team identified the characteristics of globular clusters that were likely to have member stars in the Data Release 1 Catalog. Spatially, they had to be within the survey area of LAMOST; then, the researchers chose to use globular clusters that had relatively high heliocentric radial velocities. After eliminating clusters that only had small numbers of candidate stars, they were left with Messier 3 and Messier 13 as likely candidates to search for extratidal stars.

Finally, they found eight candidate extratidal cluster halo stars in Messier 3 at distances up to about 10 times the tidal radius, and in Messier 13, they identified 12 candidate extratidal cluster halo stars at distances up to approximately 14 times the tidal radius.

The scientists noted that if the status of these stars is confirmed, they would support previous studies that both clusters are surrounded by a halo of extratidal stars or exhibit tidal tails. However, in order to validate their status, high-resolution spectroscopic observations of the chemical abundances are required.

"High-resolution spectroscopic observations of the candidate extratidal cluster halo stars would be valuable in confirming their origin, and hence provide constraints for theoretical studies," the paper reads.

According to previous studies, a significant fraction of stars in the bulge and halo of the Milky Way originated in globular clusters. It is believed that a minimum of 17 percent of the present-day mass of the stellar halo originally formed in globular clusters. Notably, the tidal debris of globular clusters also act as indicators of a host galaxy's gravitational potential as the extratidal stars spread out in a stream that traces the orbit of its progenitor.

The researchers hope to find more candidate extratidal stars in Messier 3 and Messier 13, and possibly in other globular clusters, as the dataset grows. Meanwhile, they recommend that future observations focus on known photometric members of clusters.

**More information:** New halo stars of the Galactic globular clusters M3 and M13 in the LAMOST DR1 Catalog, arXiv:1606.06430 [astro-ph.GA] [arxiv.org/abs/1606.06430](https://arxiv.org/abs/1606.06430)

## Abstract

M3 and M13 are Galactic globular clusters with previous reports of surrounding stellar halos. We present the results of a search for members and extratidal cluster halo stars within and outside of the tidal radius of these clusters in the LAMOST Data Release 1. We find seven candidate cluster members (inside the tidal radius) of both M3 and M13 respectively. In M3 we also identify eight candidate extratidal cluster halo stars at distances up to  $\sim 9.8$  times the tidal radius, and in M13 we identify 12 candidate extratidal cluster halo stars at distances up to  $\sim 13.8$  times the tidal radius. These results support previous indications that both M3 and M13 are surrounded by extended stellar halos, and we find that the GC destruction rates corresponding to the observed mass loss are generally significantly higher than theoretical studies predict.

© 2016 Phys.org

Citation: Two of Milky Way's globular clusters found to have halo stars (2016, June 27) retrieved 4 April 2024 from <https://phys.org/news/2016-06-milky-globular-clusters-halo-stars.html>

<p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p>
--