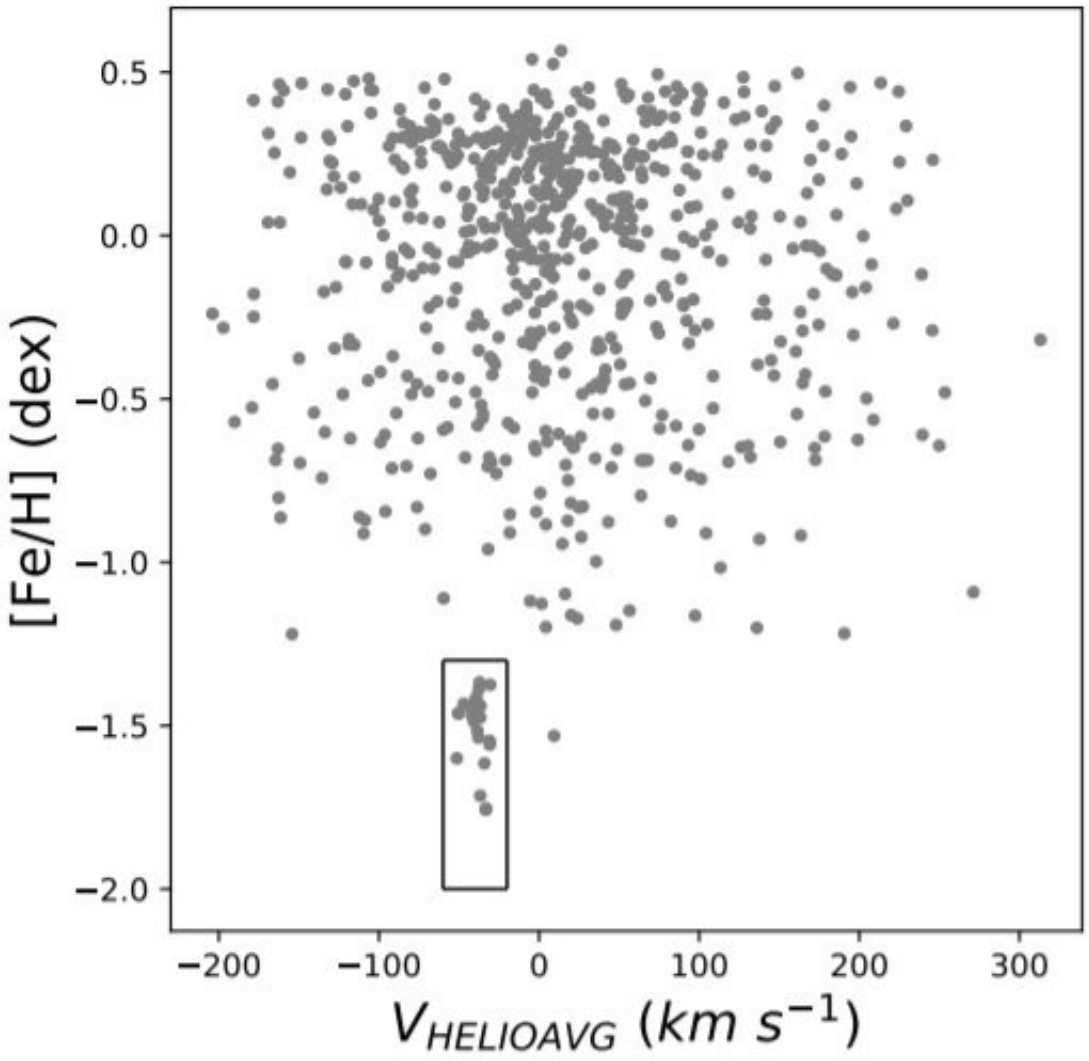
Study inspects chemical composition of NGC 6544

April 20 2021, by Tomasz Nowakowski



Heliocentric radial velocity versus [Fe/H] for all the APOGEE targets within 45 arcmin from the center of NGC 6544. Credit: Gran et al., 2021.

An international team of astronomers has conducted a chemical study of 23 stars in the globular cluster NGC 6544 as part of the APOGEE survey. The research, published April 12 on the arXiv pre-print server, delivers essential information about chemical composition of this cluster.

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. In particular, globular clusters could help researchers to better understand the formation history and evolution of early-type galaxies as the origin of GCs seems to be closely linked to periods of intense star formation.

At a distance of some 8,150 light years, NGC 6544 is a poorly studied galactic GC of medium density. It lies about 326 light years from the galactic plane, which makes it one of the closest GCs to the galactic plane so far detected. Although NGC 6544 is located relatively close to the sun, very little is known about its internal chemical composition.

Therefore, a group of astronomers led by Felipe Gran of the Pontifical Catholic University of Chile in Santiago, Chile, has carried out a high-resolution spectroscopic study of NGC 6544. By analyzing the data from the APO galactic Evolution Experiment (APOGEE), they selected 23 member stars of this cluster in order to characterize the chemical properties of NGC 6544 and to compare it with other GCs.

"Cluster members were selected from the DR16 of the APOGEE survey, using chemo-dynamical criteria of individual stars. A sample of 23 members of the cluster was selected. An analysis considering the intra-cluster abundance variations, known anticorrelations is given," the researchers wrote in the paper.

The research found that the analyzed red giant branch (RGB) stars of

NGC 6544 have mean metallicity of about -1.44 and alpha-element abundances at a level of 0.2. When it comes to the asymptotic giant branch (AGB) stars, these values were measured to be -1.66 and 0.25, respectively.

According to the research, 14 out of 23 investigated stars of NGC 6544 showcase distinct chemical patterns, which indicates that they are so-called second-generation stars. In general, multiple populations (MPs) within GCs refer basically to a first (FG) and second generation (SG) of stars. Studies show that the FG of stars pollutes the SG with processed material, creating different sub-populations in GCs. The composition of the SG stars varies almost at an individual cluster level.

The study also found that the member stars of NGC 6544 described in the paper show a significant spread in metallicity and aluminum to iron ratio that is larger than expected. Finally, by analyzing the datasets from the APOGEE survey, the astronomers noted that the cluster lacked extra tidal and chemically peculiar (CP) stars. More data, especially from wide-field multi-object spectroscopic surveys, are needed in order to make detections in this field.

More information: APOGEE view of the globular cluster NGC 6544, arXiv:2104.05865 [astro-ph.GA] arxiv.org/abs/2104.05865

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