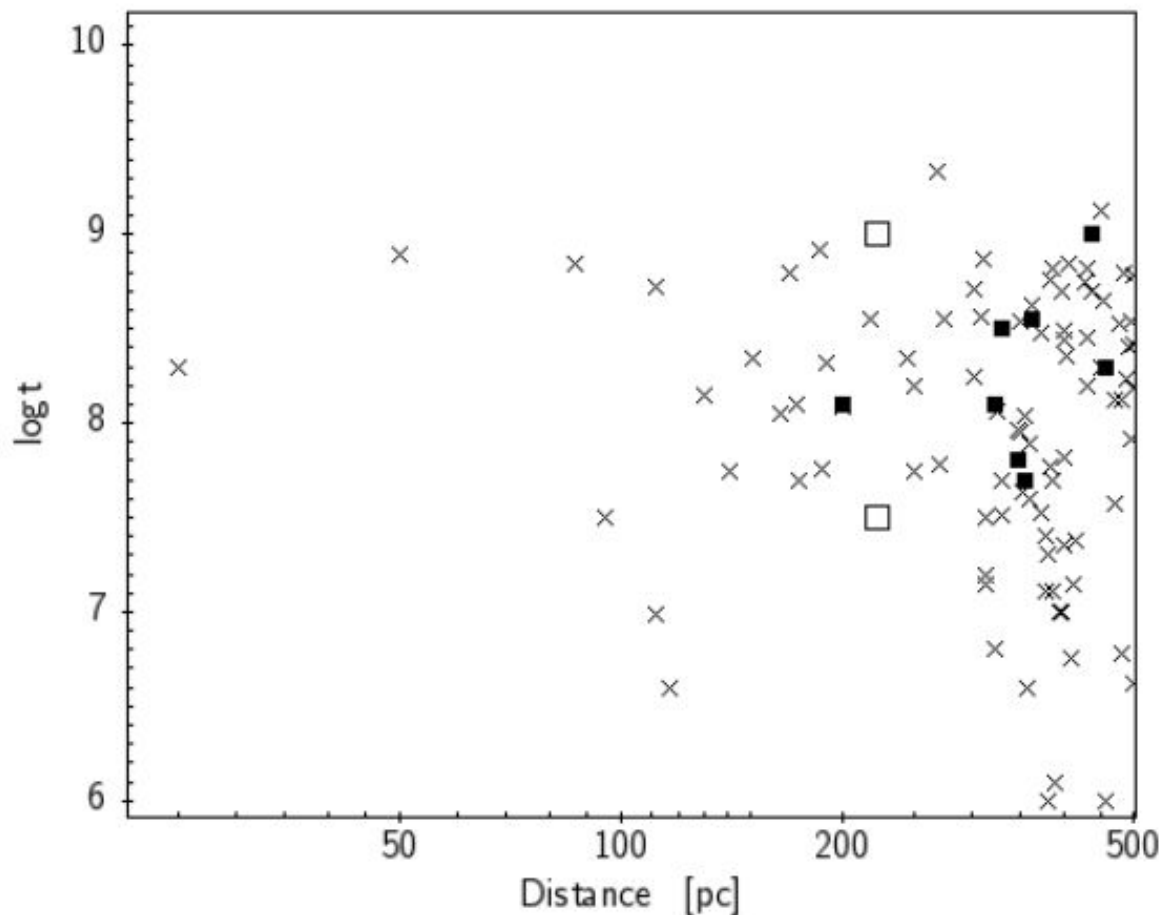


Nine new open clusters found in the Sun's neighborhood

August 16 2016, by Tomasz Nowakowski



Distances and ages of the newly found clusters within 500 pc. (The new clusters are shown as black squares, whereas the MWSC clusters (Kharchenko et al. 2013) are shown as crosses. The open squares mark the age spread of the cluster RSG9. Credit: arXiv:1608.02704 [astro-ph.SR])

(Phys.org)—Astronomers from Heidelberg University in Germany and the Observatory of Strasbourg in France have detected nine new open star clusters within 1,500 light years from the sun. The discovery, presented in a paper published Aug. 9 on arXiv.org, improves our knowledge of star cluster population in the vicinity of our solar system.

Studying star clusters is crucial for our understanding of star formation and of the history of our Milky way galaxy. Open clusters, formed from the same giant molecular cloud, are groups of stars loosely gravitationally bound to each other. So far, more than 1,000 of them have been discovered within the Milky Way, and scientists are still looking for more, especially within the larger solar neighborhood, hoping to find a variety of these stellar groupings.

However, recent observations and studies have shown that old open clusters are very rare within about 3,000 [light years](#) from the sun. This under-density was subject of an investigation by a team of astronomers led by Siegfried Röser of the University of Heidelberg. The researchers have analyzed Tycho-2 and URAT1 astronomical catalogs in order to look for target objects.

Tycho-2 is an astrometric reference catalog containing positions and proper motions as well as two-color photometric data for the 2.5 million brightest stars in the sky. In order to test what proper motions, more precise than those of Tycho-2, can do for open [cluster](#) studies, the scientists have also used the URAT1 catalog containing positional data on about 228 million stars with a magnitude ranging from 3.0 to 18.5.

"We derived proper motions from a combination of Tycho-2 with URAT1. (...) We detected nine hitherto unknown open clusters in the vicinity of the sun with ages between 70 million years and 1 billion years, and distances between 200 and 500 parsecs," the researchers wrote in the paper.

The newly found clusters were designated RSG1 to RSG9. According to the study, RSG2 is the nearest cluster, only 650 light years away, with the largest proper motion. The most distant is RSG7, located some 1,490 light years from the sun. With an age of about one billion years, RSG3 is the oldest cluster of all nine.

The team noted that it was not their intention to determine the most accurate astrophysical parameters of these clusters as they are expected to be provided by European Space Agency's (ESA) Gaia astrometric space observatory. Launched in 2013, Gaia aims to create the largest and most precise 3D space catalog ever made, containing approximately one billion astronomical objects. Röser and his colleagues rather wanted to prove that even a moderate progress in the precision of proper motions allows to reveal previously unknown open clusters in the solar neighborhood.

"Our results show that with highly precise proper motions and carefully selected search parameters it is still possible to reveal hitherto unknown [open clusters](#) even in the closer neighborhood of the sun up to 500 parsecs," the paper reads.

The scientists also underlined that the findings contribute substantially to our current knowledge of the nearby open cluster population, including old clusters.

"Although we could only search on 67 percent of the sky, our results increase the total number of clusters within 500 parsecs by 10 percent. (...) RSG3 adds one more cluster to this old cluster generation," the researchers concluded.

More information: Nine new open clusters within 500 pc from the Sun, arXiv:1608.02704 [astro-ph.SR] arxiv.org/abs/1608.02704

Abstract

One of the results of the Milky Way Star Clusters (MWSC) survey by Kharchenko et al. (2013) was the detection of a slight under-density of old (ca. 1 Gyr) clusters within the nearest kilo-parsec from the Sun. This under-density may be due to an ineffectiveness in the detection of larger structures with lower surface brightness. We report on our attempts to reveal such clusters. We derived proper motions from a combination of Tycho-2 with URAT1, and obtained a mean precision of about 1.4 mas/y per co-ordinate for 1.3 million stars north of -20 degree declination. We cut the sky into narrow proper motion slices and searched for spatial over-densities of stars in each slice. In optical and near-infrared colour-magnitude diagrams stars from over-densities were then examined to determine if they are compatible with isochrones of a cluster. We estimated the field star contamination using our data and the Besancon Galactic model. We detected 9 hitherto unknown open clusters in the vicinity of the Sun with ages between 70 Myr and 1 Gyr, and distances between 200 and 500 pc.

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Citation: Nine new open clusters found in the Sun's neighborhood (2016, August 16) retrieved 19 April 2024 from <https://phys.org/news/2016-08-clusters-sun-neighborhood.html>

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