

Milky Way globular clusters in cosmological timescale. Probability of the interaction with the Galactic center

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The main idea of the work is to carry out the dynamic evolution of the orbits of Globular Cluster (GC) subsystems sample lookback time up to 10 Gyr. This allows us to estimate the possibility of GCs interaction with the Galactic center that dynamically changed in the past. To reproduce the structure of the Galaxy in time, we used external potentials which dynamically changed in a past and now their characteristics are similar to the physical values of the Milky Way at the present day (mass and size of disk and halo). External potentials were selected from the large-scale cosmological database IllustrisTNG-100 (TNG-TVP). In these potentials, we reproduced the orbits of 147 GCs from Gaia DR3 in 10 Gyr lookback time using our own high-order N-body parallel dynamic code phi-GPU code. To identify clusters that have interaction with the Galactic center, we used the criteria of relative distance: it must be less than 100 pc. Applying this simple criteria, we obtained statistically significant rates of close passages of the GCs with the Galactic center. We identified ten GCs, including NGC 6401, Pal 6, NGC 6681, NGC 6712, NGC 6287, NGC 6642, NGC 6981, HP 1, NGC 1904, and NGC 362, with a high probability of close passages near the Galactic center in all four TNG-TVPs, particularly the first six with a probability of around 100%.

Primary author: ISHCENKO, Marina (MAO NAS Ukraine, 2 Fesenkov Astrophysical Institute, Observatory 23, 050020 Almaty, Kazakhstan 3 Nicolaus Copernicus Astronomical Centre Polish Academy of Sciences, ul. Bartycka 18, 00-716 Warsaw, Poland)

Co-authors: Dr BERCZIK, Peter (Main Astronomical Observatory, National Academy of Sciences of Ukraine, 27 Akademika Zabolotnoho St, 03143 Kyiv, Ukraine 2 Fesenkov Astrophysical Institute, Observatory 23, 050020 Almaty, Kazakhstan 3 Nicolaus Copernicus Astronomical Centre Polish Academy of Sciences, ul. Bartycka 18, 00-716 Warsaw, Poland 4 Rudolf Peierls Centre for Theoretical Physics, Parks Road, OX1 3PU, Oxford, UK 5 Konkoly Observatory, Research Centre for Astronomy and Earth Sciences, Eötvös Loránd Research Network (ELKH), MTA Centre of Excellence, Konkoly Thege Miklós út 15-17, 1121 Budapest, Hungary); SOBOLENKO, Margaryta (Main Astronomical Observatory NAS of Ukraine, 2 Nicolaus Copernicus Astronomical Centre Polish Academy of Sciences, ul. Bartycka 18, 00-716 Warsaw, Poland)

Presenter: ISHCENKO, Marina (MAO NAS Ukraine, 2 Fesenkov Astrophysical Institute, Observatory 23, 050020 Almaty, Kazakhstan 3 Nicolaus Copernicus Astronomical Centre Polish Academy of Sciences, ul. Bartycka 18, 00-716 Warsaw, Poland)

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