Release notes

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Galaxy Map
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References at end.

Map production details

Several of these maps are generated using Blender renders of density isosurfaces derived from hot star data files provided to me by Ronald Drimmel (*Drimmel 2023*, OB stars based on Gaia DR3, OBstars_v1_good.fits and missing_bright_Obs.csv files).

The star data files were converted to point clouds bounded within a cylinder of radius 6 kpc and height +/- 400 parsecs from the galactic plane.

The longitude values for the star data were randomly "jittered" within a range of 2.5 degrees to reduce spikes / "fingers of god".

The star count values were binned to a 3D grid with elements of size 4x4x4 parsecs for the 6 kpc map and a bin of 1x1x1 parsecs for the smaller maps. The data was then gaussian smoothed using bandwidths that varied depending on the density values.

The marching cubes algorithm as implemented by the vtkSliceCubes function in the Python VTK binding is used to generate the density isosurfaces.

The images use a traditional terrestrial cartography colour palette as it is a well proven and familiar colour scheme for maps.

For simplicity in presentation, the isosurfaces are rendered using a top down orthographic projection above the galactic plane and layered with the higher density isosurfaces on top of the lower density isosurfaces.

The result resembles a terrestrial elevation map.

In reality the denser isosurfaces are located inside the less dense isosurfaces.

HII region positions are determined by known ionizing stars and clusters with sizes estimated using Douglas Finkbeiner's H-alpha Full Sky Map (*Finkbeiner 2003*) and distances taken from *Bailer-Jones 2021*. Thank you to several astronomers who helped add to the list of ionizing stars including Alec Thomson, Alex Hill, Eric Mamajek and Robert Benjamin.

Individual map notes

12 kpc

The 3D model of the Milky Way was constructed in Blender by Stefan Payne-Wardenaar (Twitter: @StefanPWinc).

Image of the Sgr A* black hole from the Event Horizon Telescope (EHT) Collaboration.

Gaia hot star density map out to 6 kpc computed from data derived from *Drimmel 2023*.

Maser locations determined from *Reid 2019* and *Hyland 2023*.

3 kpc

Gaia hot star density map out to 3 kpc computed from data derived from *Drimmel 2023*.

Dust concentrations from *Vergely 2022*.

Open clusters are selected from *Hunt 2024* and include all Messier open clusters and other clusters with high membership and density. Clusters within 1 kpc are unlabelled to avoid clutter (and because they can be seen on the 1 kpc map).

1 kpc

Gaia hot star density map out to 1 kpc computed from data derived from *Drimmel 2023*.

Dust concentrations from the 2 kpc extinction grid provided by *Edenhofer 2023*.

Open clusters are selected from *Hunt 2024* and include all Messier open clusters and other clusters with high membership and density.

Luminous stars with absolute magnitude (Mg < -4) selected from Gaia EDR3 (*BailerJones 2021*) and Hipparcos (*Van Leeuwen 2007*). Hipparcos magnitudes converted to Gaia G equivalent before computing Mg. Star names and spectral types determined from SIMBAD.

400 pc

Gaia hot star density map out to 400 pc computed from data derived from *Drimmel 2023*.

Dust concentrations from the 2 kpc extinction grid provided by *Edenhofer 2023*.

Open clusters selected from *Hunt 2024.* All Messier open clusters shown and other clusters with high membership and density.

Luminous stars with absolute magnitude (Mg < -3.2) selected from Hipparcos (*Van Leeuwen 2007*). Hipparcos magnitudes converted to Gaia G equivalent before computing Mg. Star names and spectral types determined from SIMBAD.

250 pc

Gaia hot star density map out to 250 pc computed from data derived from *Drimmel 2023*.

Dust concentrations from the 2 kpc extinction grid provided by *Edenhofer 2023*.

Open clusters selected from *Hunt 2024.* All Messier open clusters shown and other clusters with high membership and density.

Luminous stars with absolute magnitude (Mg < -2.5) selected from Hipparcos (*Van Leeuwen 2007*). Hipparcos magnitudes converted to Gaia G equivalent before computing Mg. Star names and spectral types determined from SIMBAD.

100 pc

Gaia hot star density map out to 100 pc computed from data derived from *Drimmel 2023*.

All star density structures including the Hyades, Coma cluster, Ursa Major moving group, Tucana-Horologium association, 32 Orionis group and the Eta Cha association computed from the Gaia Catalogue of Nearby Stars (*Smart 2021*).

Luminous stars with absolute magnitude (Mg < -0.75) selected from the Gaia Catalogue of Nearby Stars (*Smart 2021*). Star names and spectral types determined from SIMBAD.

50 pc

All star density structures including the Hyades, Ursa Major moving group, and the Tucana-Horologium association computed from the Gaia Catalogue of Nearby Stars (*Smart 2021*).

Hydrogen clouds within 10 parsecs illustrated by NASA as well as hydrogen ionized by white dwarfs based on research by J. Linsky and S. Redfield (*Linsky 2015* and *Linsky 2019*).

Luminous stars with absolute magnitude (Mg < 0.5) selected from the Gaia Catalogue of Nearby Stars (*Smart 2021*). Star names and spectral types determined from SIMBAD.

25 pc

Ursa Major moving group density computed from the Gaia Catalogue of Nearby Stars (*Smart 2021*).

Hydrogen clouds within 10 parsecs illustrated by NASA as well as hydrogen ionized by white dwarfs based on research by J. Linsky and S. Redfield (*Linsky 2015* and *Linsky 2019*).

Luminous stars with absolute magnitude (Mg < 3) selected from the Fifth Catalogue of Nearby Stars (CNS5, *Golovin 2023*). Star names and spectral types determined from SIMBAD.

10 pc

Hydrogen clouds within 10 parsecs illustrated by NASA as well as hydrogen ionized by white dwarfs based on research by J. Linsky and S. Redfield (*Linsky 2015* and *Linsky 2019*).

All known stars, brown dwarfs and exoplanets within 10 parsecs from *Reylé 2021*.

Starfield map notes

This map series also includes two additional maps created using data from the Starfield video game by Bethesda Game Studios. This game uses real stars although usually changes their names to something more interesting than their boring catalog ids.

The first map is simply the 100 pc map with an extra circle showing the location of the Starfield game stars.

The second map shows the Starfield stars (white labels) along with luminous stars in the same region left out of the game (yellow labels), presented using the same top-down orthographic projection as the other maps in this series. The Starfield star data is extracted from a csv file included in the game files. It appears to be based on pre-Gaia data, possibly from Hipparcos or the Gliese Catalogue of Nearby Stars.

References

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