Mapping Milky Way hydrogen data from Lichfield Radio Observatory (LRO-H1) to a spherical model using Easy Radio Astronomy and Rinearn3D software.

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Article for SARA Journal.

The Lichfield LRO-H1 Radio Telescope

Lichfield Radio Observatory (LRO) is located at latitude 52.6815 north, longitude -1.8255 (1.8255 west) in Staffordshire, central England, UK, north of Birmingham. The LRO-H1 Radio Telescope is composed of a Ptarmigan Triffid ex-military 4x4 dipole array, measuring 86cm x 86cm in size. The data used for this current paper was filtered using a single stage Nooelec SAWBird H1 LNA/filter. The system uses an RTL-SDR Blog V3 Software Defined Radio and data for this paper was recorded using Easy Radio Astronomy Software Suite (ezRA; Ted Cline; https://github.com/tedcline/ezRA).

The telescope is mounted on a simple wooden mount that allows variation in elevation. It points at the same azimuth constantly – data is collected using 24-hour drift scans which allow individual azimuth points to be calculated by the software during the sidereal day.

In another paper in this issue of the Journal, I have described plotting hydrogen data (1420.405MHz) collected using this telescope in three spatial dimensions. The current article considers plotting similar data on a spherical surface to give a view either like that seen from the surface of our planet or alternatively from outside the galaxy.

Plotting the Milky Way hydrogen data from LRO-H1 onto a sphere.

Revisions to the Easy Radio Astronomy Suite (ezRA) have allowed the production of CSV files compatible with Rinearn3D software (https://www.rinearn.com/en-us/graph3d/). This software allows data to be plotted in three spatial dimensions, and, using a process developed by Ted Cline, the author of Easy Radio Astronomy, the data can be plotted in two or three spatial dimensions or applied to a spherical surface and views obtained consistent with a variety of camera positions within or outside that sphere.

These plots have been produced using data from Lichfield Radio Observatory (LRO) between 29 May 2024 and 18 August 2024, processed using new functions in latest version of Ted Cline's incredible software – Easy Radio Astronomy (ezRA) (https://github.com/tedcline/ezRA) 6 January 2025.

Results.

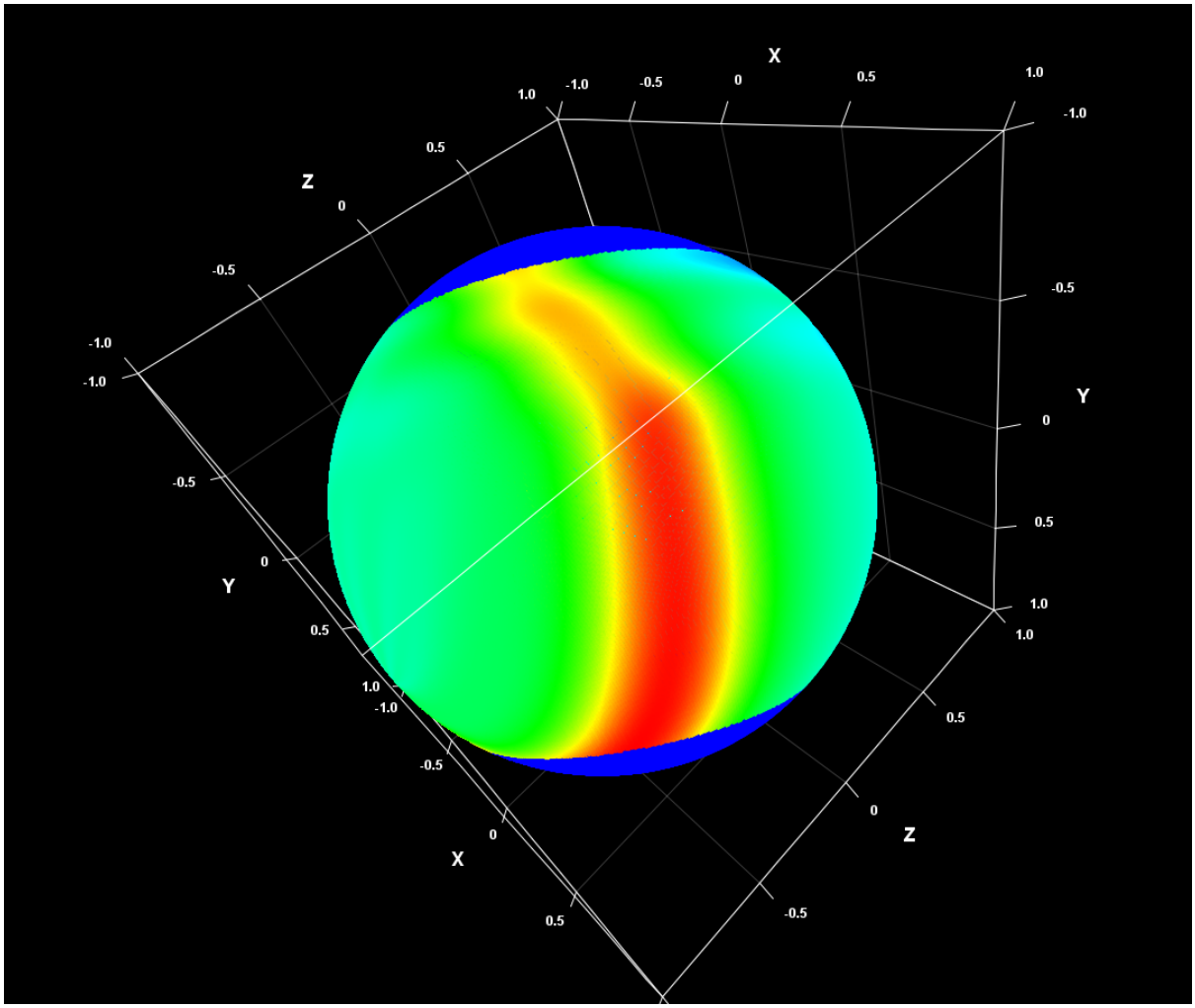
The following plots are produced using Rinearn3D, using data from LRO-H1.

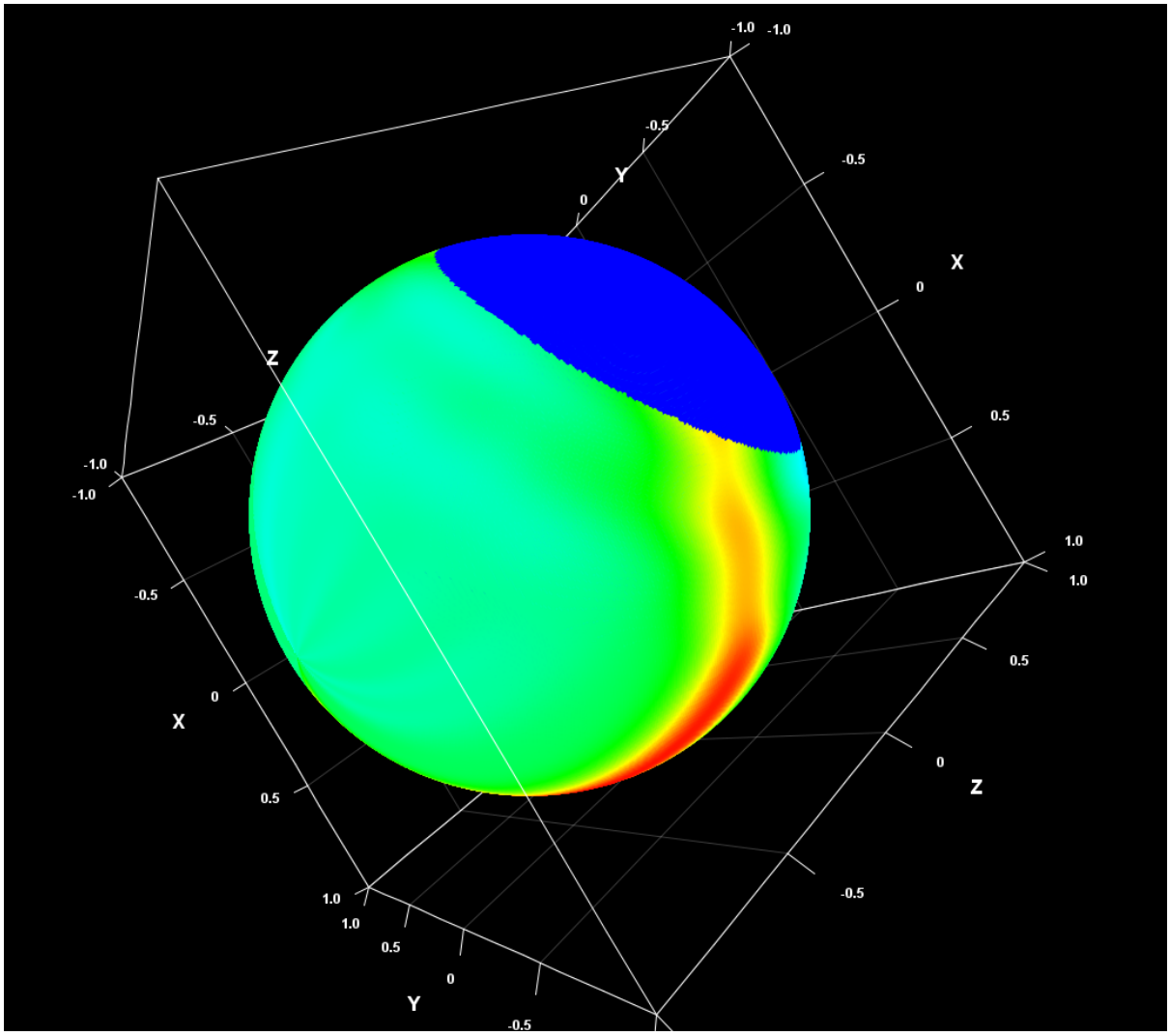
The plots show the Milky Way as it would be seen from surface of the Earth (inside plots) and from a position outside the galaxy looking back at Earth (outside plots).

The plain blue areas represent parts of the sky that were not or unable to be sampled using the Ptarmigan ex-military dipole array at LRO (LRO-H1 Radio Telescope). Red areas represent highest

signal at 1420.405MHz (hydrogen) and hence represent the band of the Milky Way. Light blue indicates low signal strength, and yellow an intermediate level of signal.

Views from camera positions outside the spherical model:

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Z
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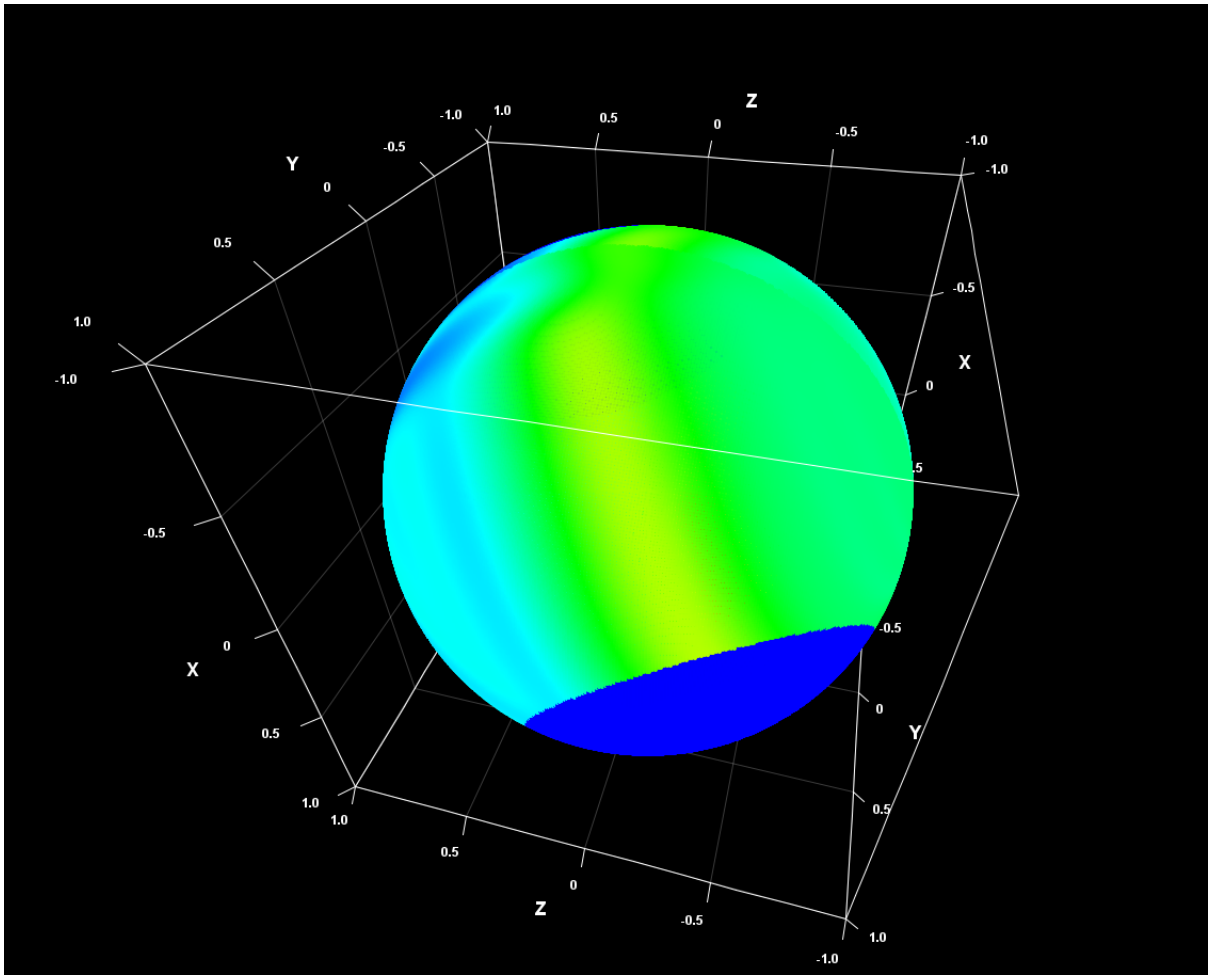
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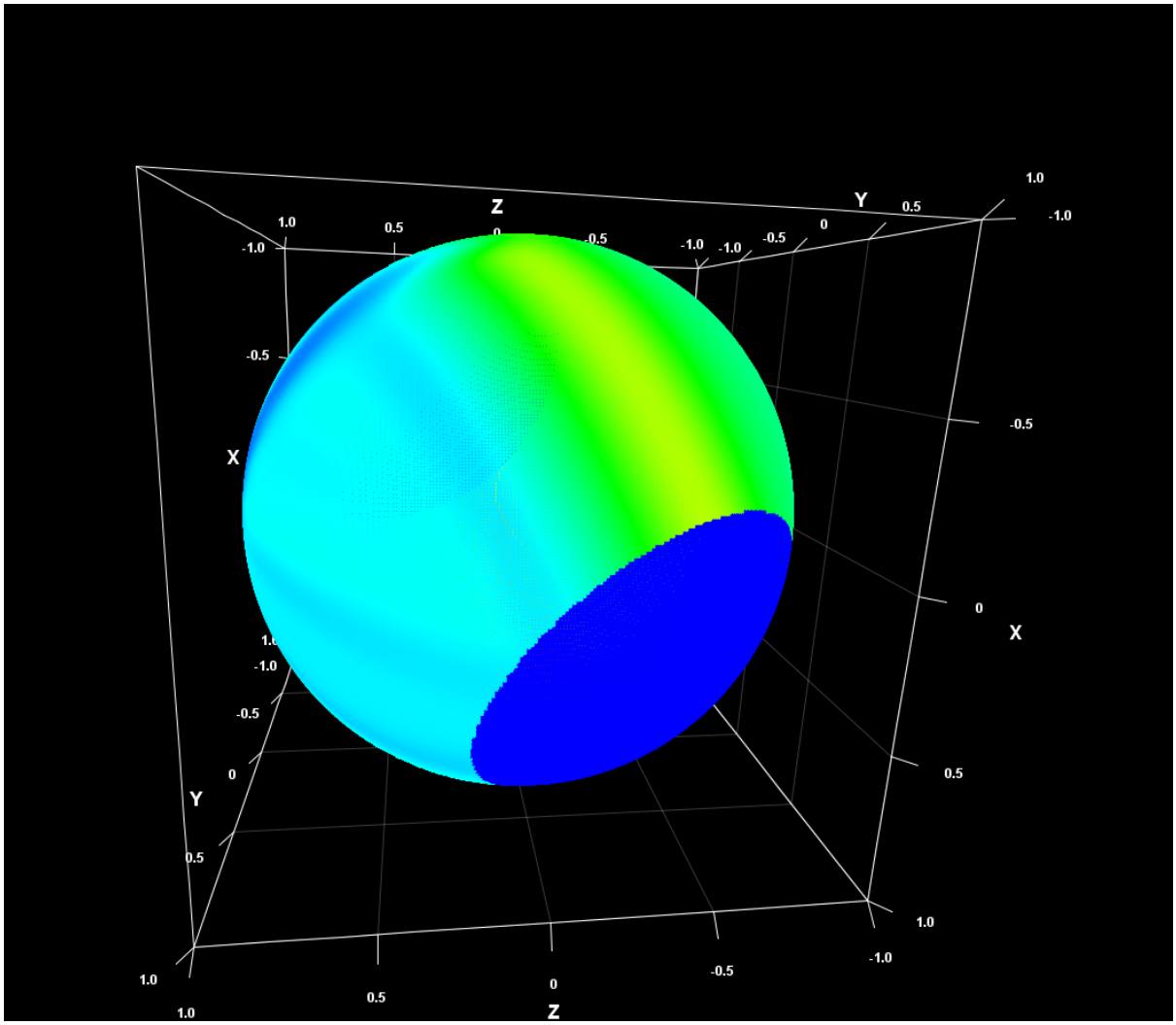
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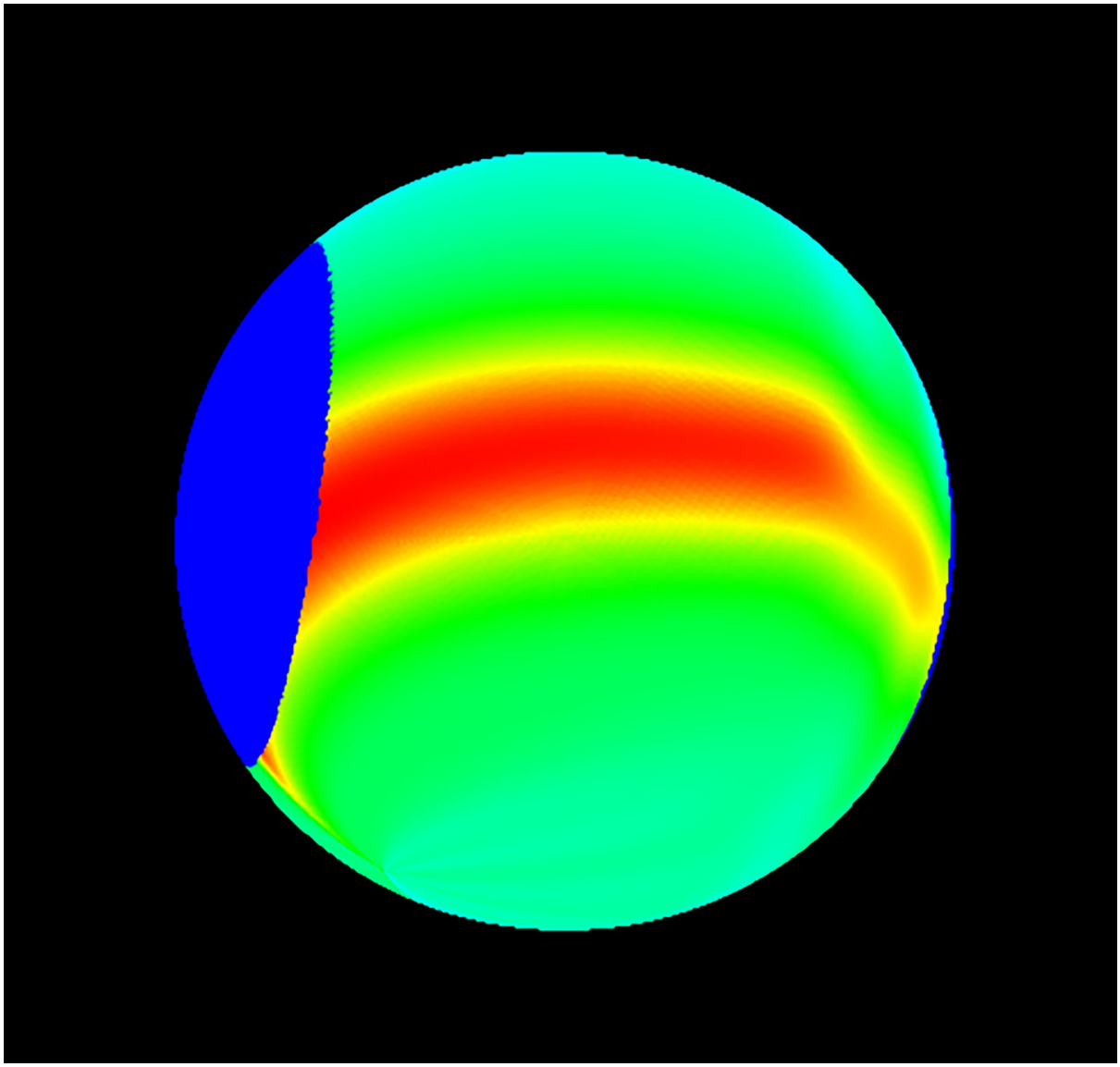
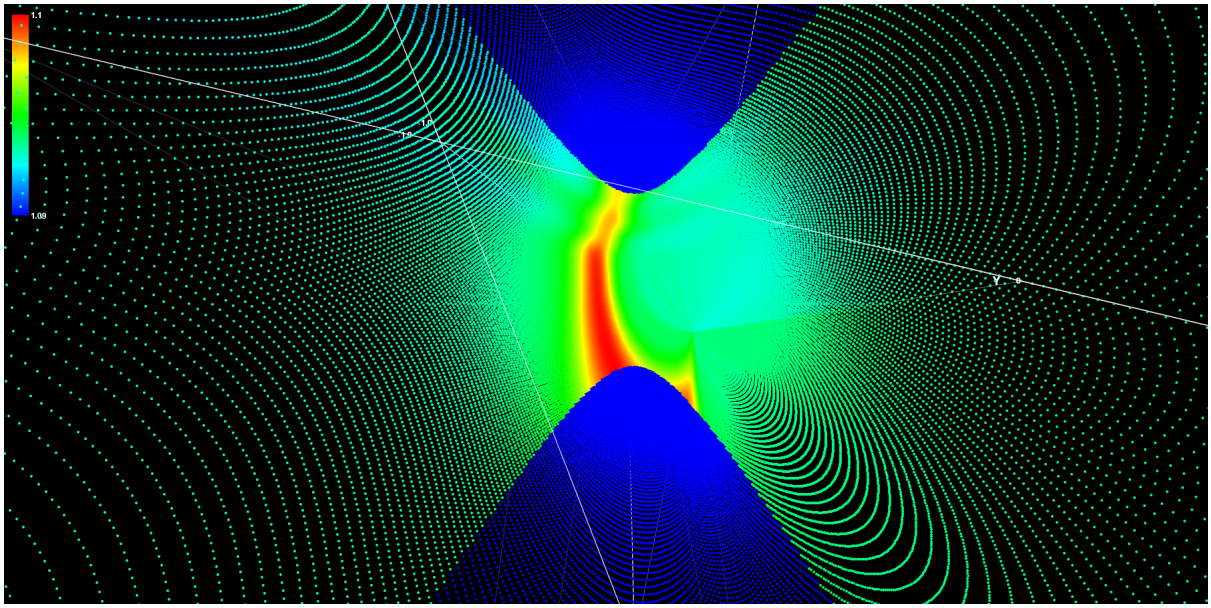


Views from camera location inside the spherical model (mimicking positioning the camera on surface of Earth):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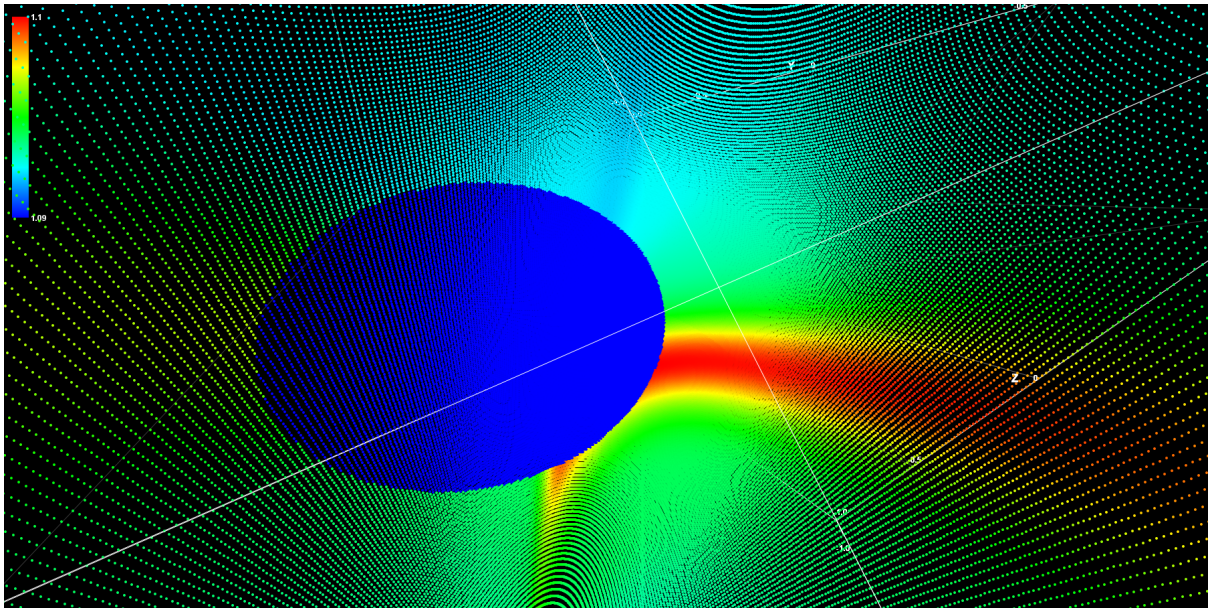
1.09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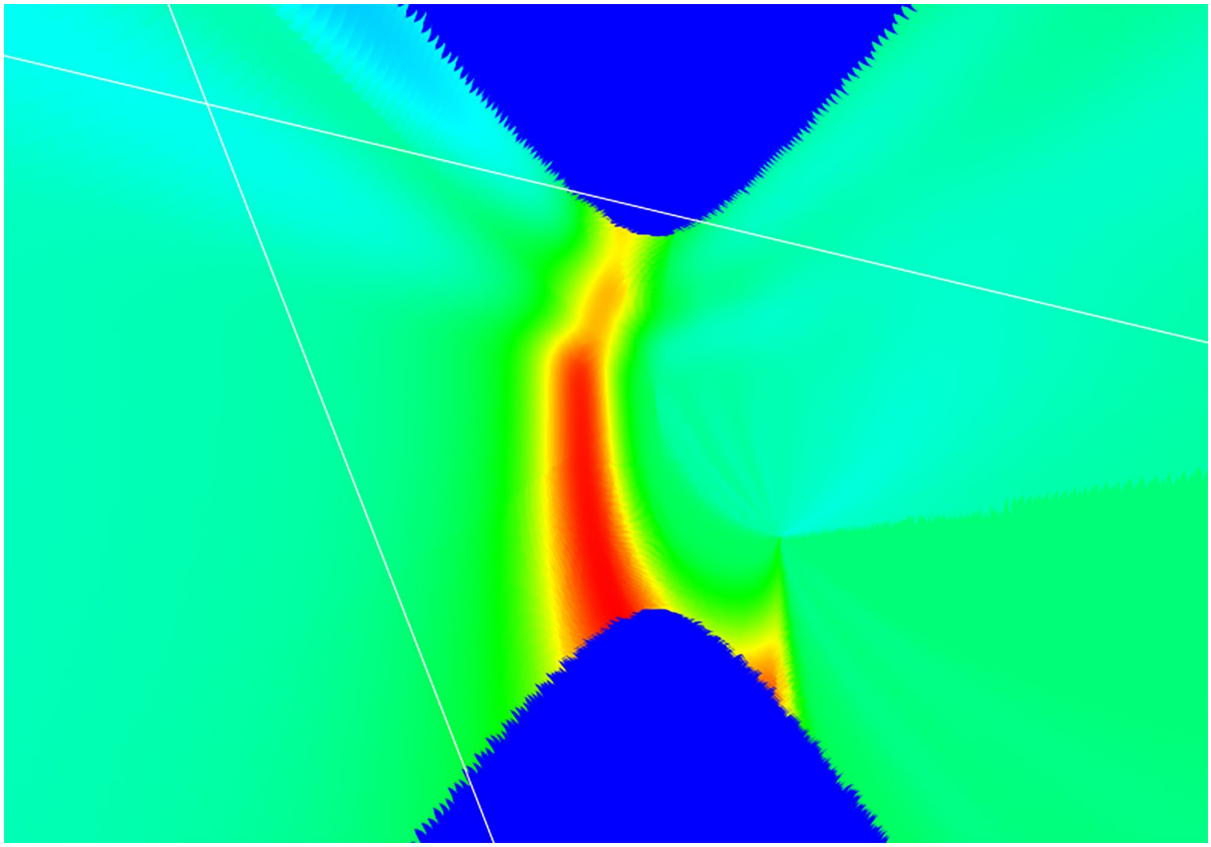

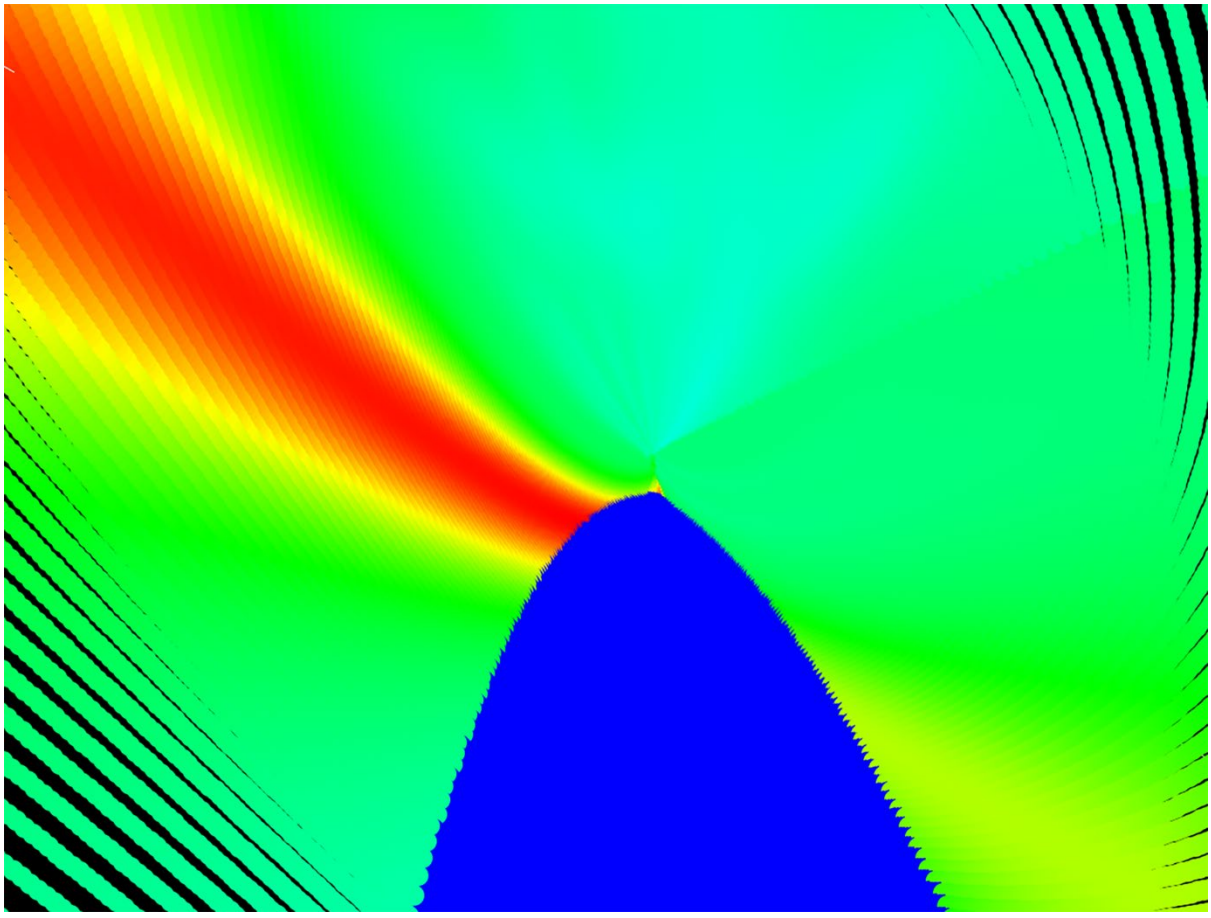

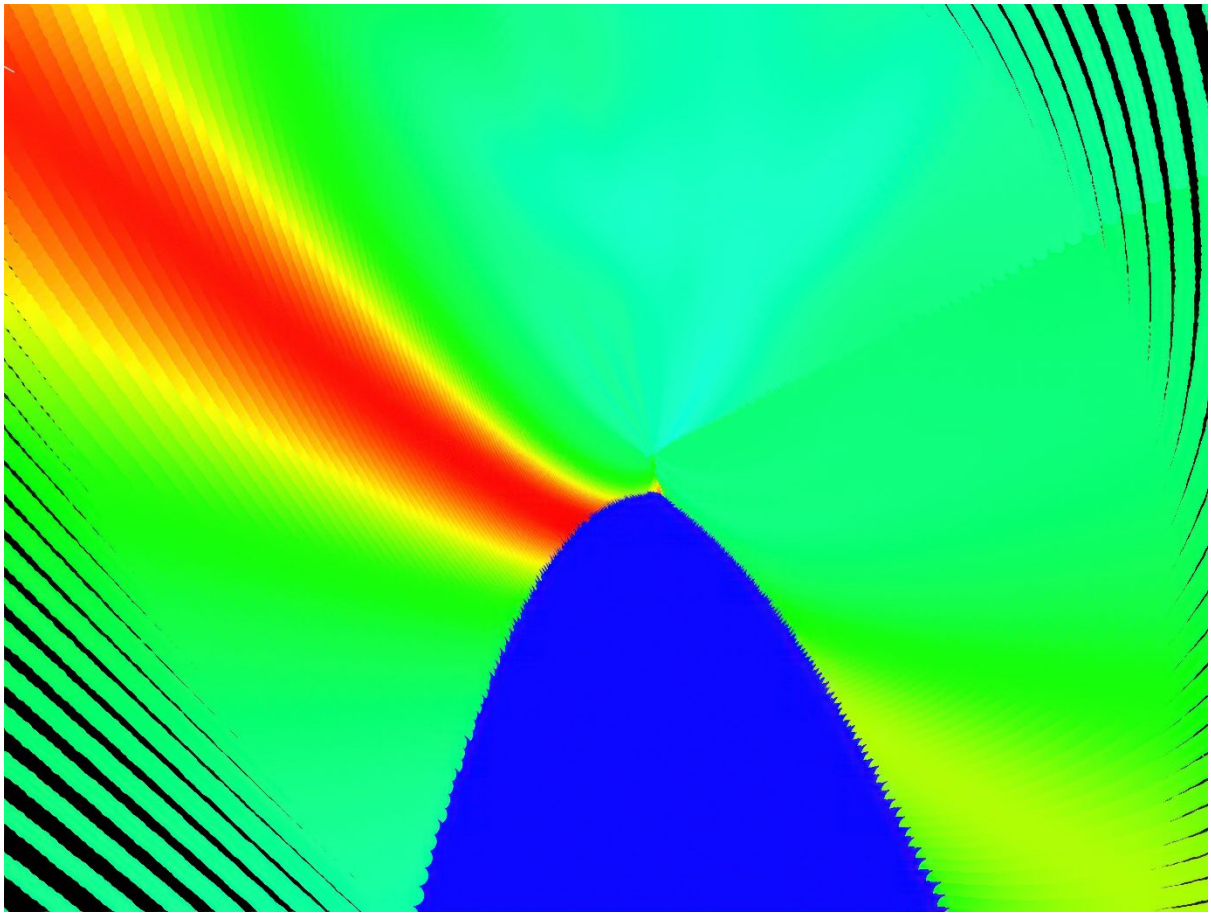

Further information.

Further information about this project is available on the www.astronomy.me.uk website or by contacting me using the “contact us” page on that website.