3D-processing of three days data using latest ezCon250124b.py script in ezRA suite & using meshes/matrix data tables in Rinearn 3D.

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Presenting hydrogen line data.

Amateur radio astronomers have successfully measured hydrogen intensity within the Milky Way using a range of equipment, both self-made and available off the shelf. This data has a major "Wow" factor when we show it to the public at large. However, they find it difficult to comprehend, and such issues extend even to members of the wider amateur astronomy community. The need to produce new methods of displaying data, to make it easier to interpret, extends to ourselves as amateur radio astronomers – particularly those of us with an engineering, physics or telecommunications background often find the results of our radio astronomy experiments unfathomable!

A new script in Easy Radio Astronomy Suite (ezRA).

Ted Cline's free Easy Radio Astronomy Suite (ezRA, https://github.com/tedcline/ezRA) is a popular option for collecting a processing Milky Way hydrogen line data. Many of us have large data sets available which will benefit from a new method of presenting this data. Rinearn 3D is another free software package, which can be used to present the data in a more accessible picture form. However, Rinearn 3D is limited in the amount of data it can process due to the processing and RAM requirements for 3D interpretation of large data sets. Rinearn 3D can use two alternative types of data, both presented as CSV files. The usual method produces much larger data sets, but there is an alternative which stores the data within the CSV file as a matrix, leading to a file size up to ten times smaller than the first storage format. The use of this method allows much larger data sets to be processed by Rinearn 3D.

There is now a new script available for ezRA (ezCon250124b) which will process ezCol data sets (ezRA's data collection programme) and create a matrix CSV file capable of being processed in Rinearn 3D.

Relief maps.

The ability to process such data sets in this way allows the production of relief graphs of the Milky Way, emphasising where higher levels of hydrogen-line signal can be detected. If the plot is completely flattened and contour lines added in Rinearn 3D, then a heat map is generated. Such maps are like those which are experienced in everyday life – from world maps showing the relief of mountain ranges to meteorological charts.

Lichfield Radio Observatory (LRO) data.

Latitude (52.6815 Longitude, -1.8255 Lichfield) is a cathedral city and civil parish in Staffordshire, England. One of eight civil parishes with city status in England, Lichfield is situated roughly 16 miles (26 km) north of Birmingham.

Lichfield Radio Observatory (LRO) is a small private observatory located within the town. There are three hydrogen line radio telescopes, LRO-H1 based on an ex-military 86cm x 86cm dipole array, LRO-H2, built around an 150cm parabolic solar cooker dish, and LRO-H3, the aerial of which was built by Alex Pettit of SARA, and is a multi-element Patch Yagi tuned to 1420MHz.

Results of processing data from LRO.

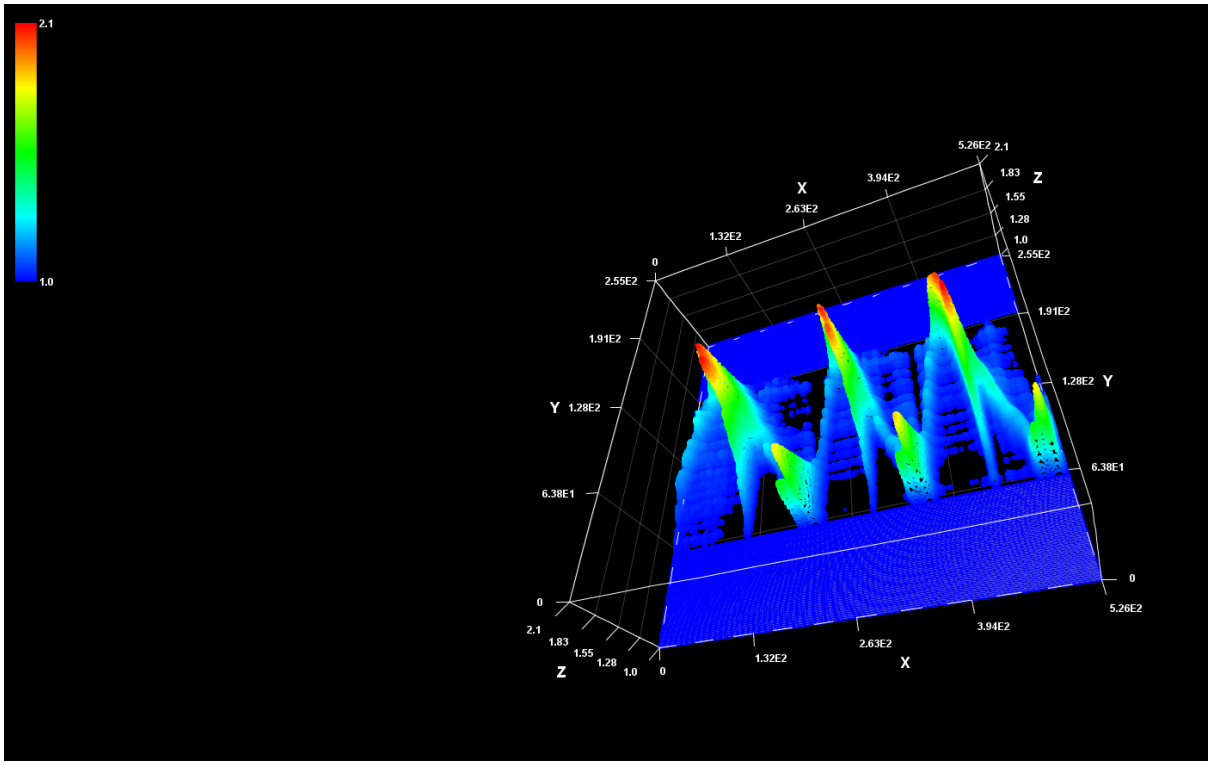
The plots below are produced from three days of data collected in January 2025 from the LRO-H1 (Ptarmigan) radio telescope.

Some of the plots show the full three days. These plots demonstrate a repeating pattern – each repeat representing one day. Other plots have concentrated on only part of the data set, and these do not include a repeating pattern.

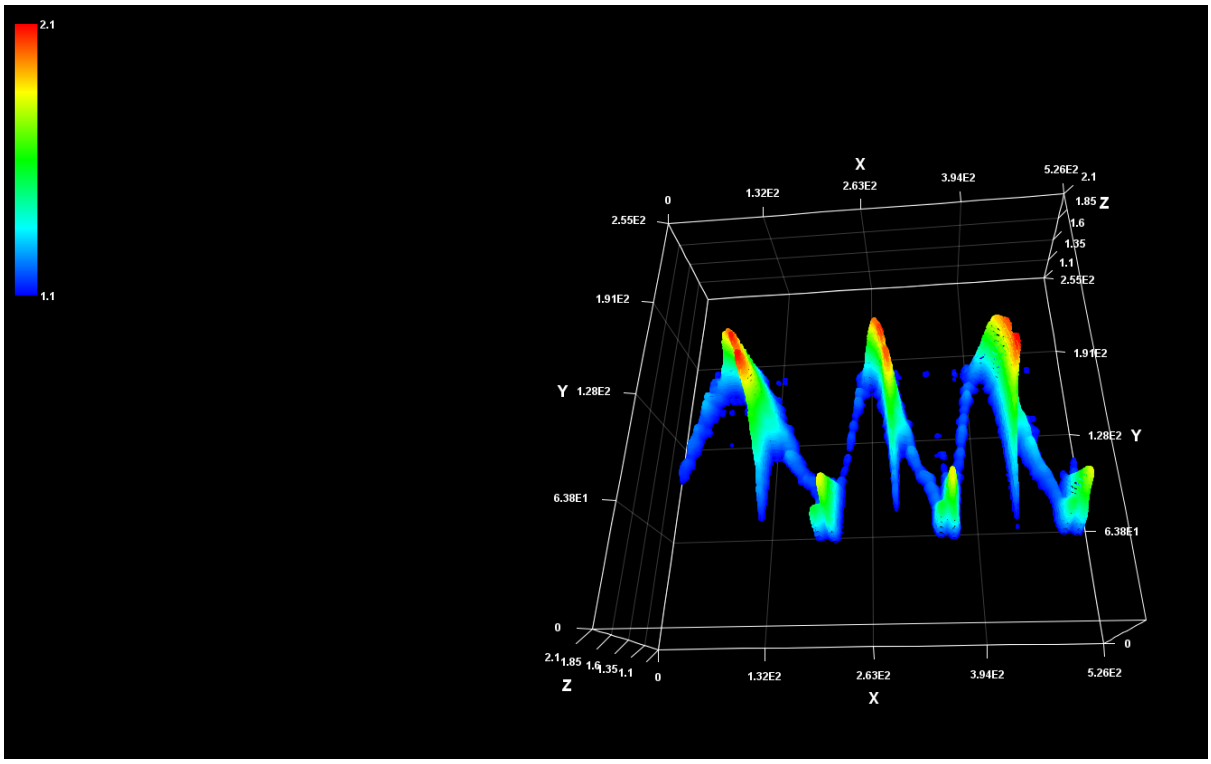
There are also plots, where the data has been flattened in time direction to emphasise relationship between frequency and intensity of signal detected.

For most of the plots, x axis = frequency, y axis = time, z axis = signal intensity; although there are some (3-day plots) where x and y are reversed.

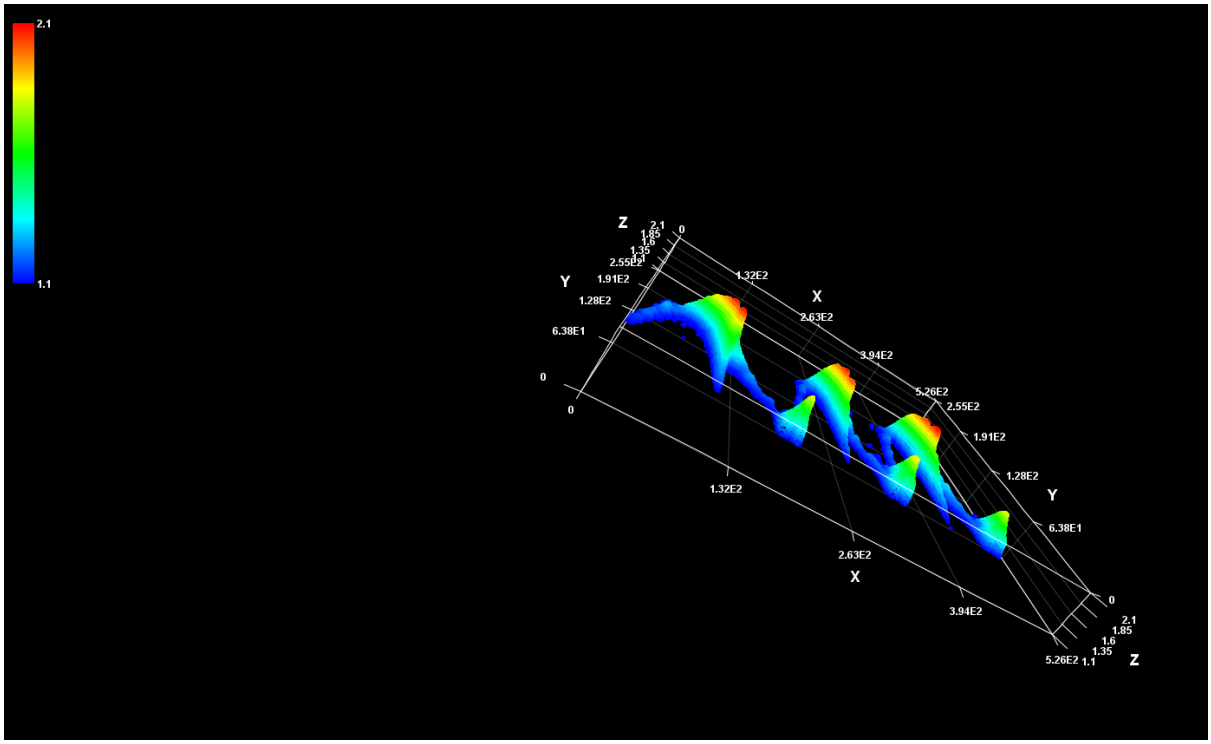
Plot of Milky Way over 3 days in 2 spatial dimensions with power on 3rd access:



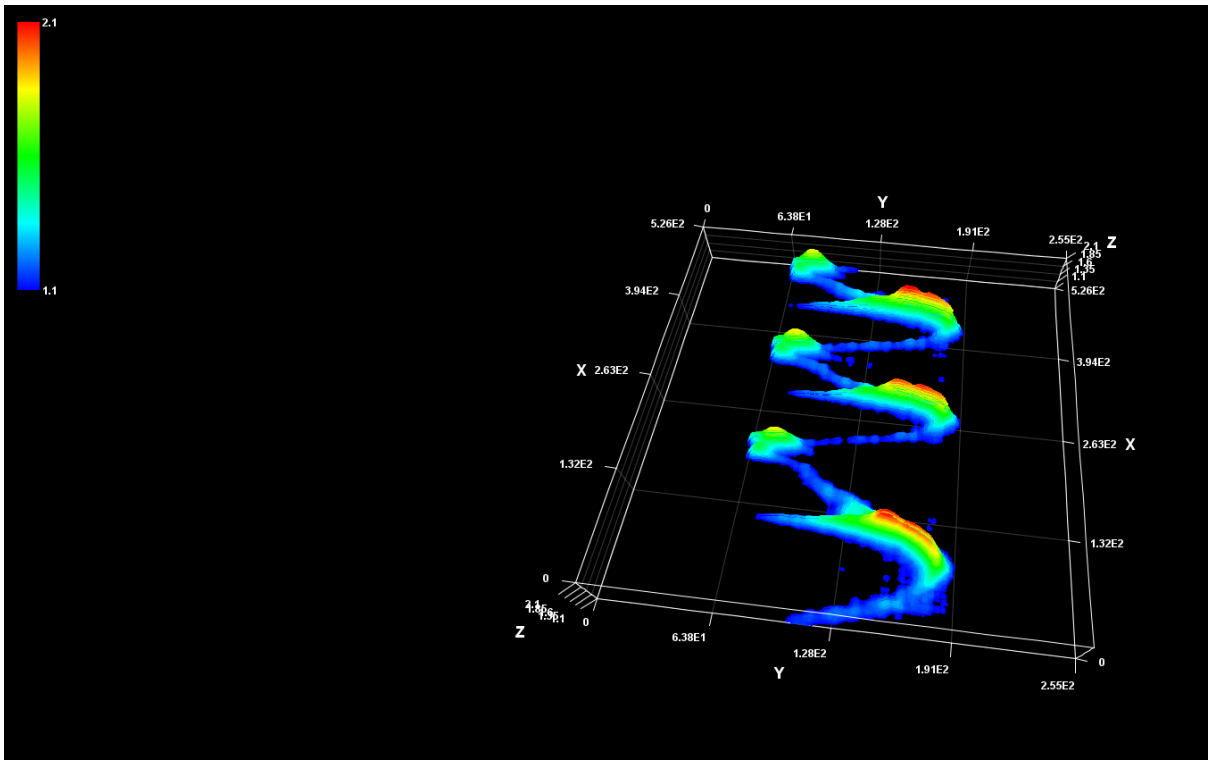
Plot of Milky Way over 3 days in 2 spatial dimensions with power on 3rd access – different perspective:



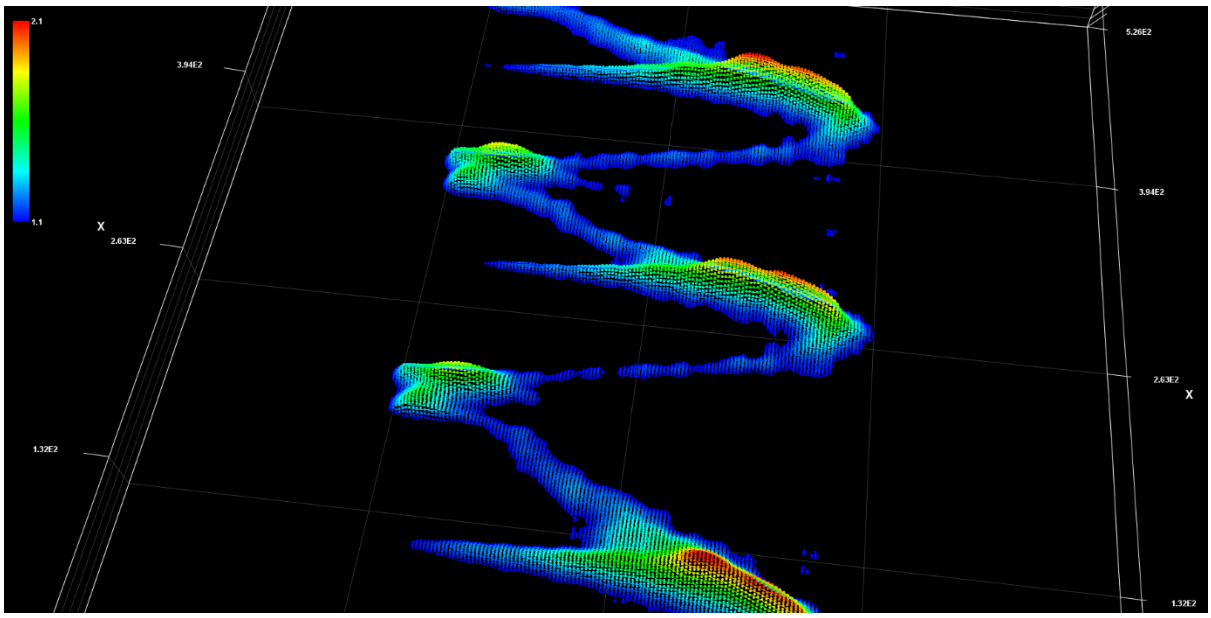
Plot of Milky Way over 3 days in 2 spatial dimensions with power on 3rd access – altering angle of view:



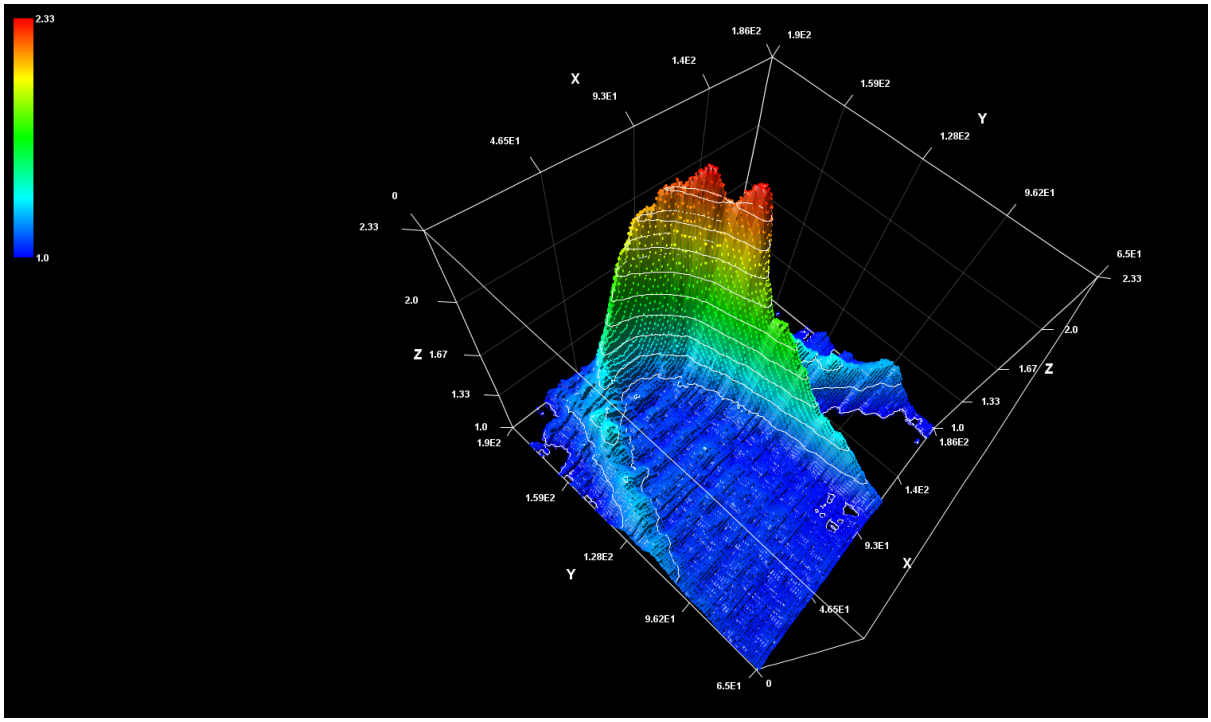
Plot of Milky Way over 3 days in 2 spatial dimensions with power on 3rd access – altering angle of view:



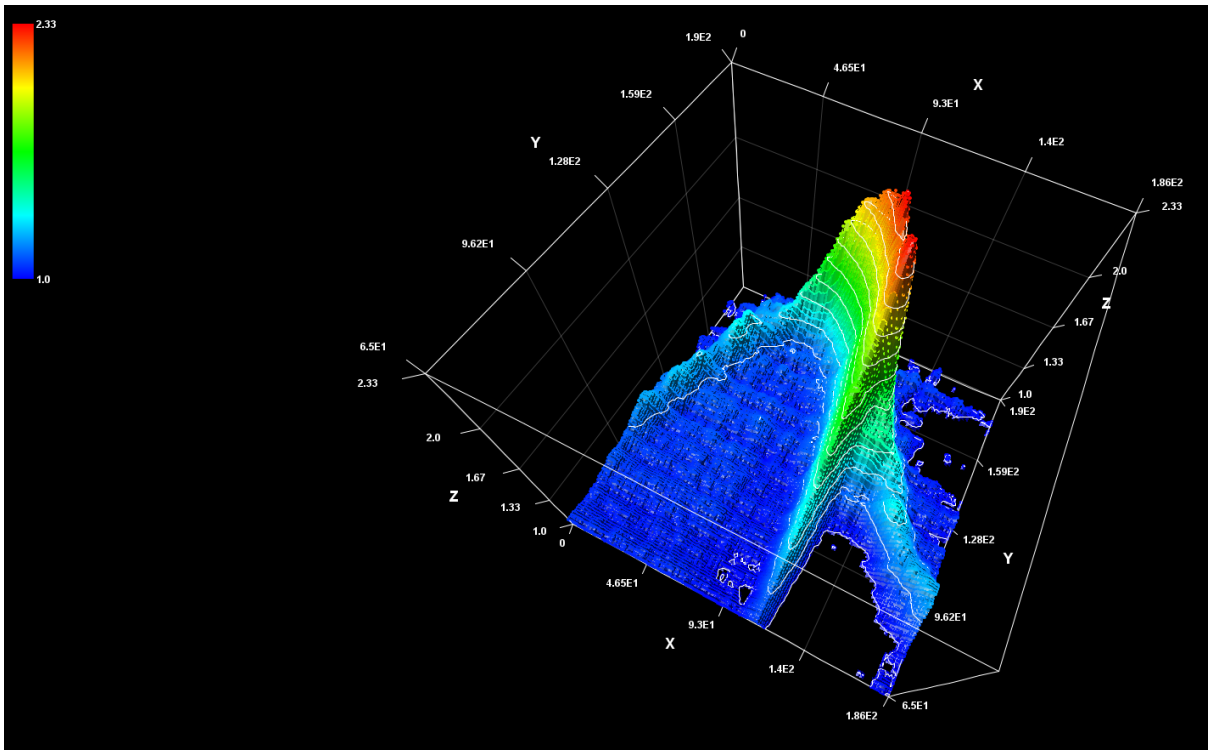
Plot of Milky Way over 3 days in 2 spatial dimensions with power on 3rd access – altering angle of view:



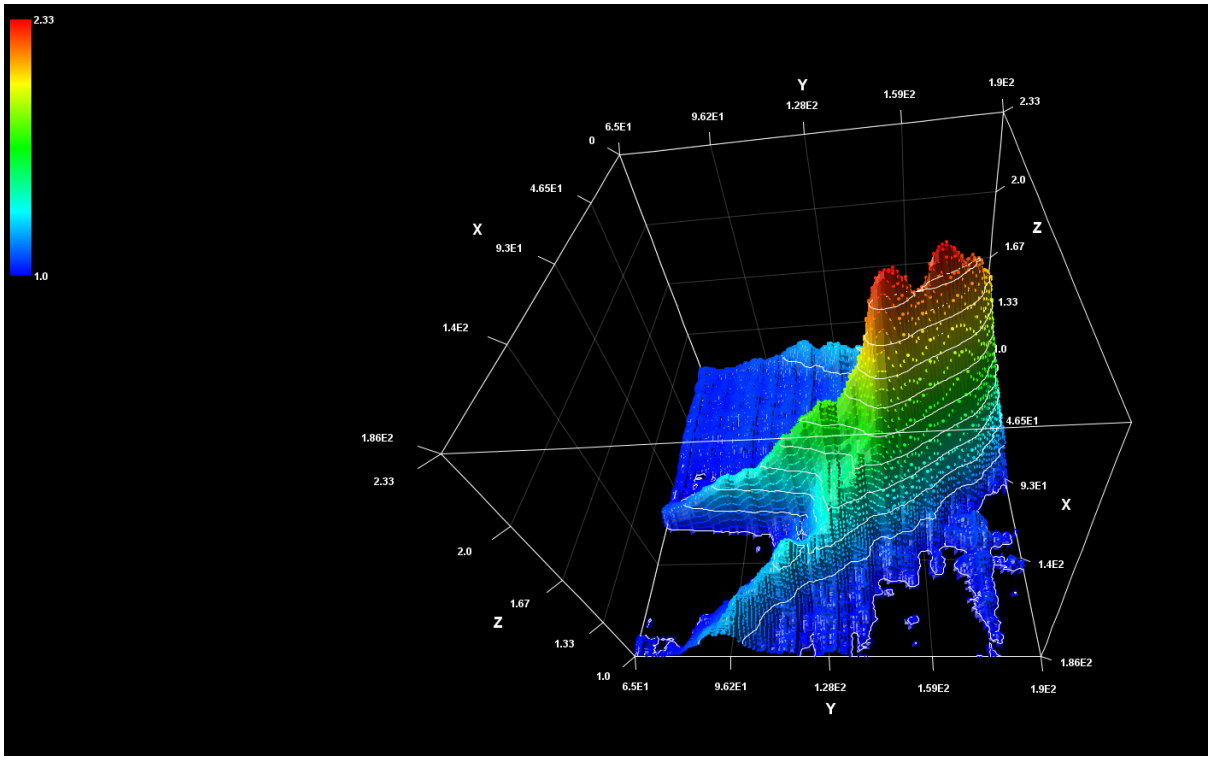
Plot of Milky Way over 3 days in 2 spatial dimensions with power on 3rd access – altering angle of view:



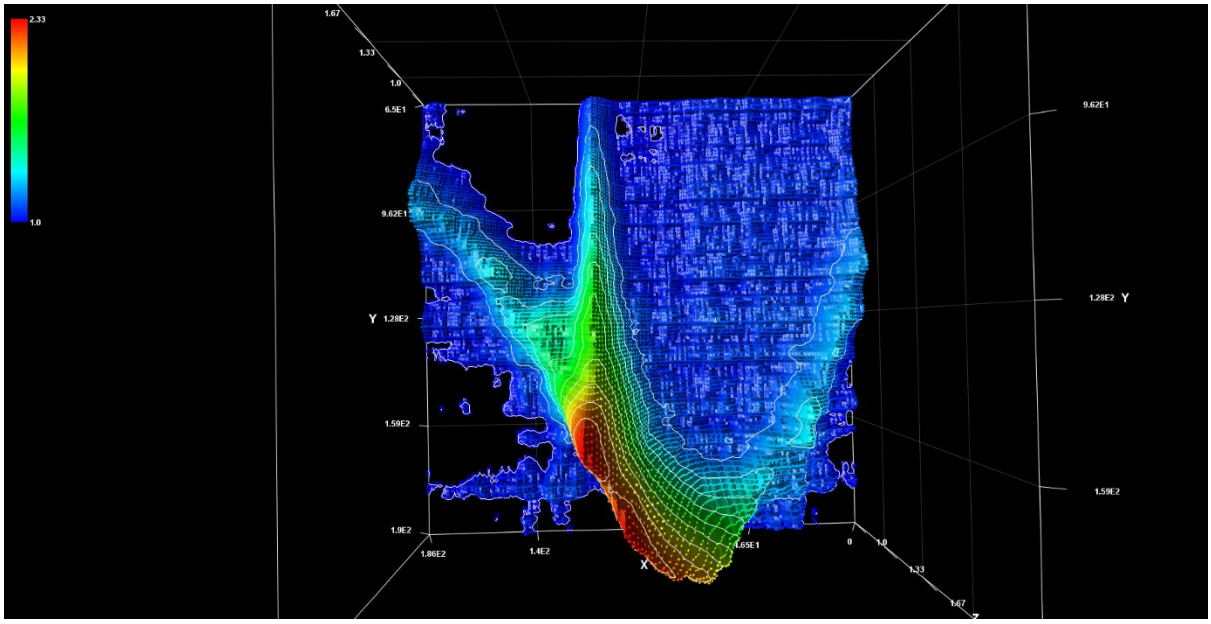
Plot of Milky Way over 3 days in 2 spatial dimensions with power on 3rd access – altering angle of view:



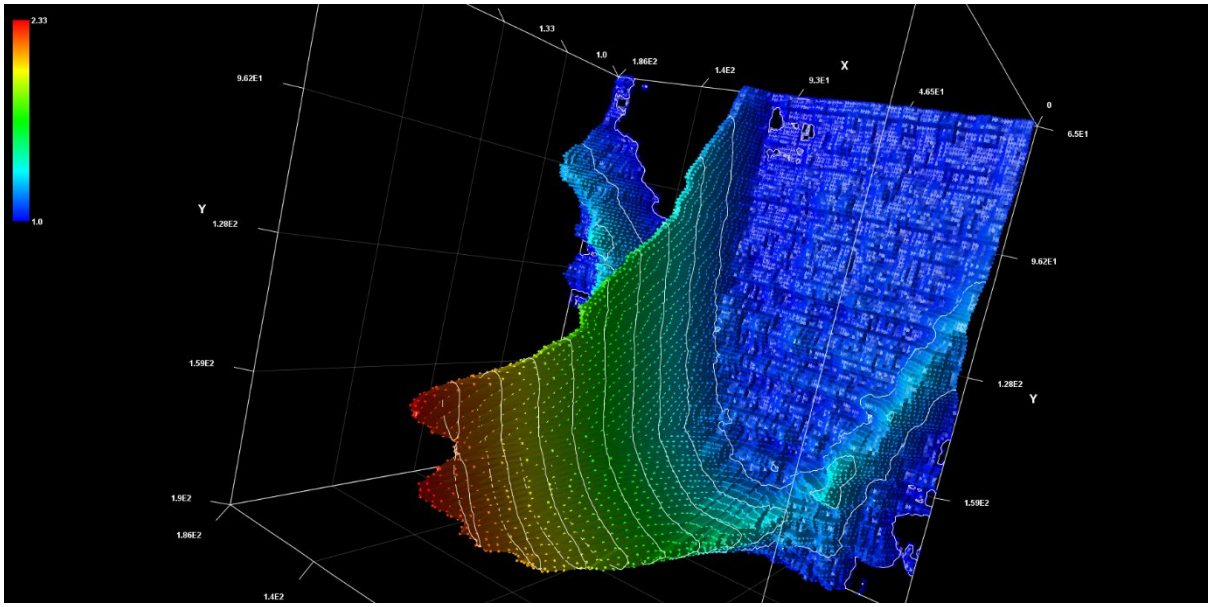
Plot of Milky Way over single days in 2 spatial dimensions with power on 3rd access – altering angle of view:



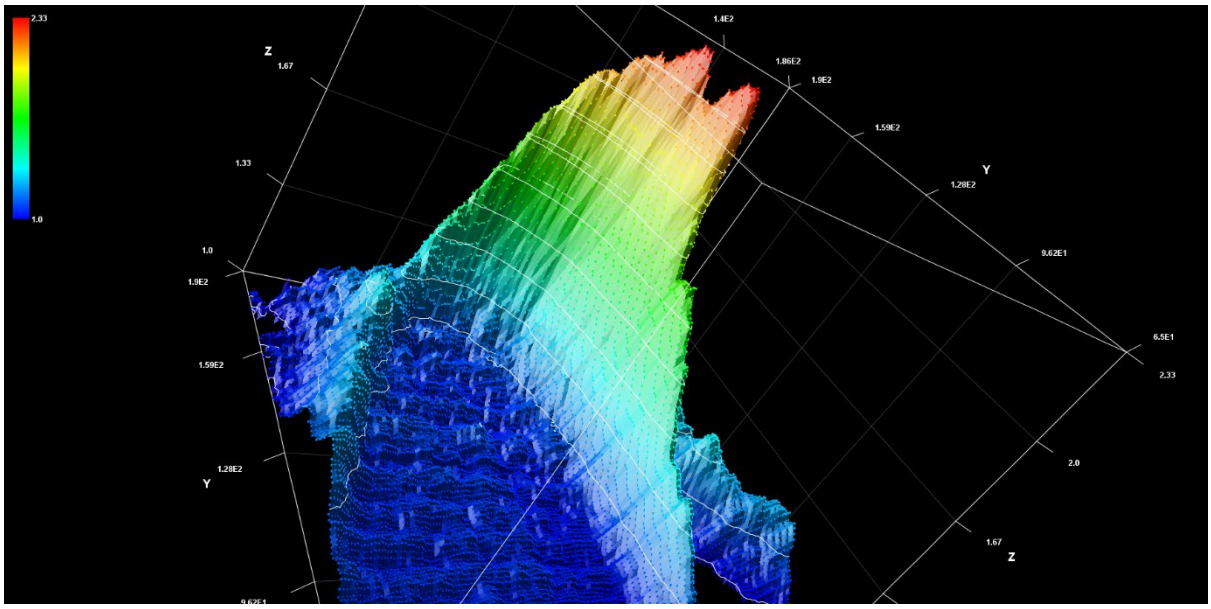
Plot of Milky Way over single days in 2 spatial dimensions with power on 3rd access – altering angle of view:



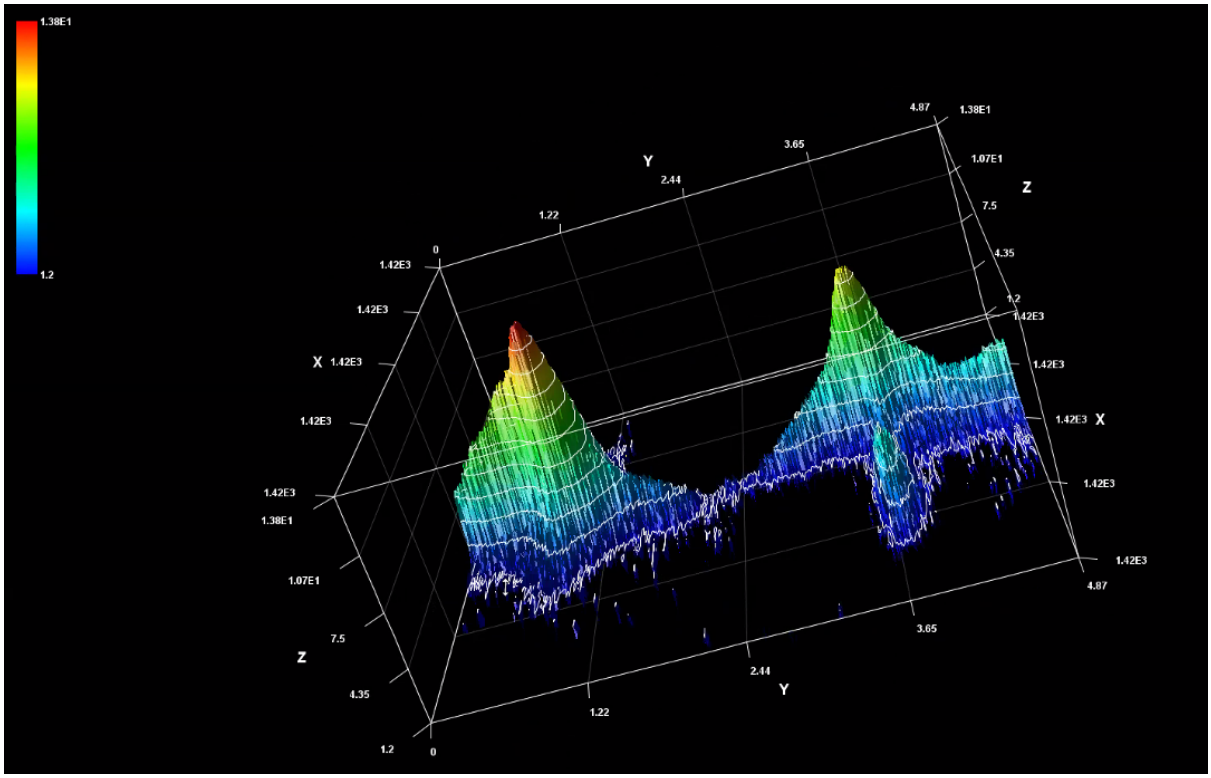
Plot of Milky Way over single days in 2 spatial dimensions with power on 3rd access – altering angle of view:



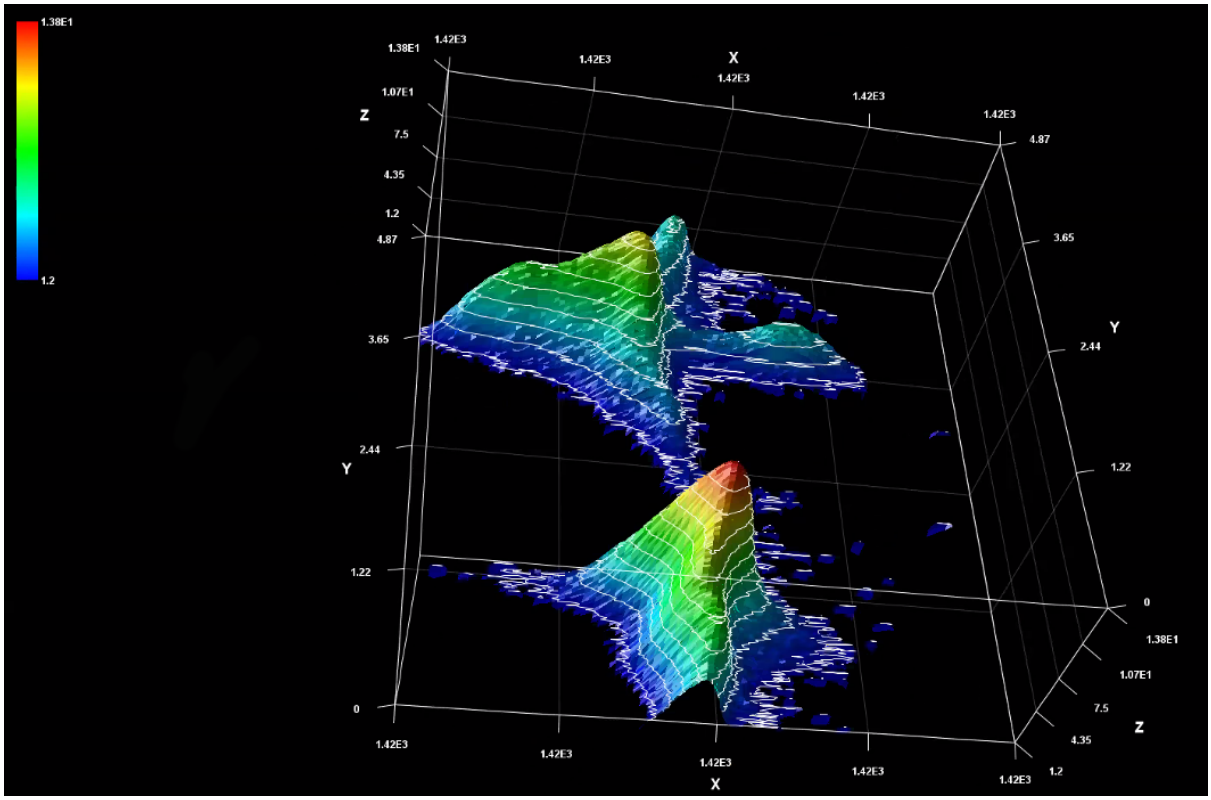
Plot of Milky Way over single days in 2 spatial dimensions with power on 3rd access – altering angle of view:



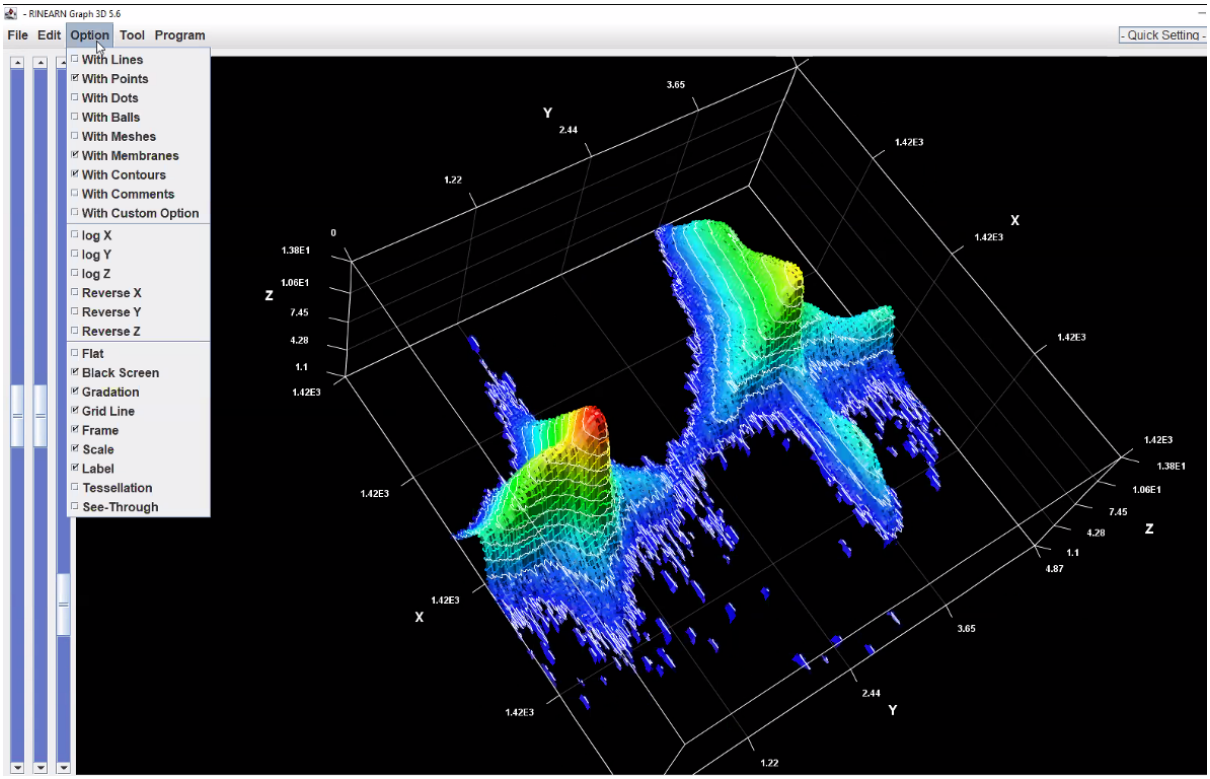
Plot of Milky Way over single days in 2 spatial dimensions with power on 3rd access – altering angle of view:



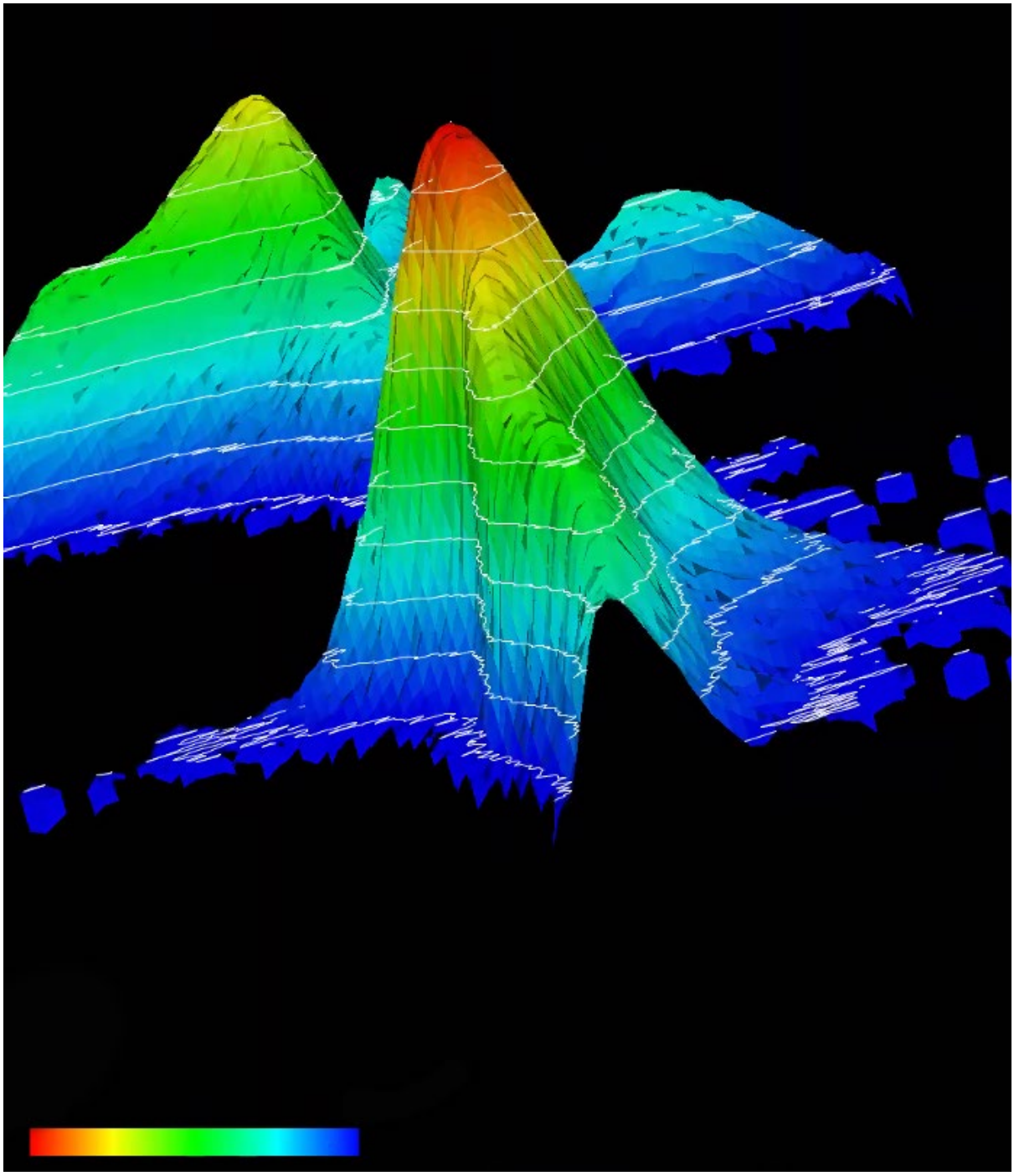
Plot of Milky Way over single days in 2 spatial dimensions with power on 3rd access – altering angle of view:

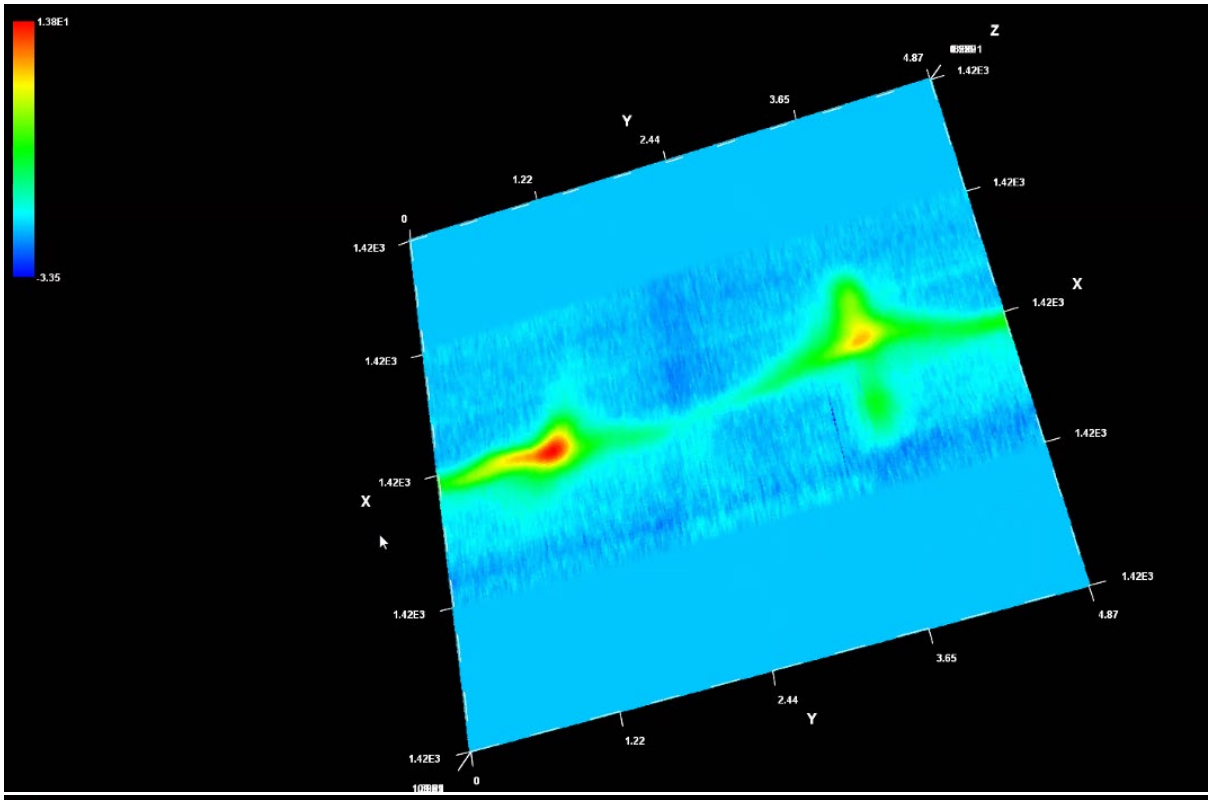


Plot of Milky Way over single days in 2 spatial dimensions with power on 3rd access – settings in Rinearn3D:



Following are further plots from different perspectives:

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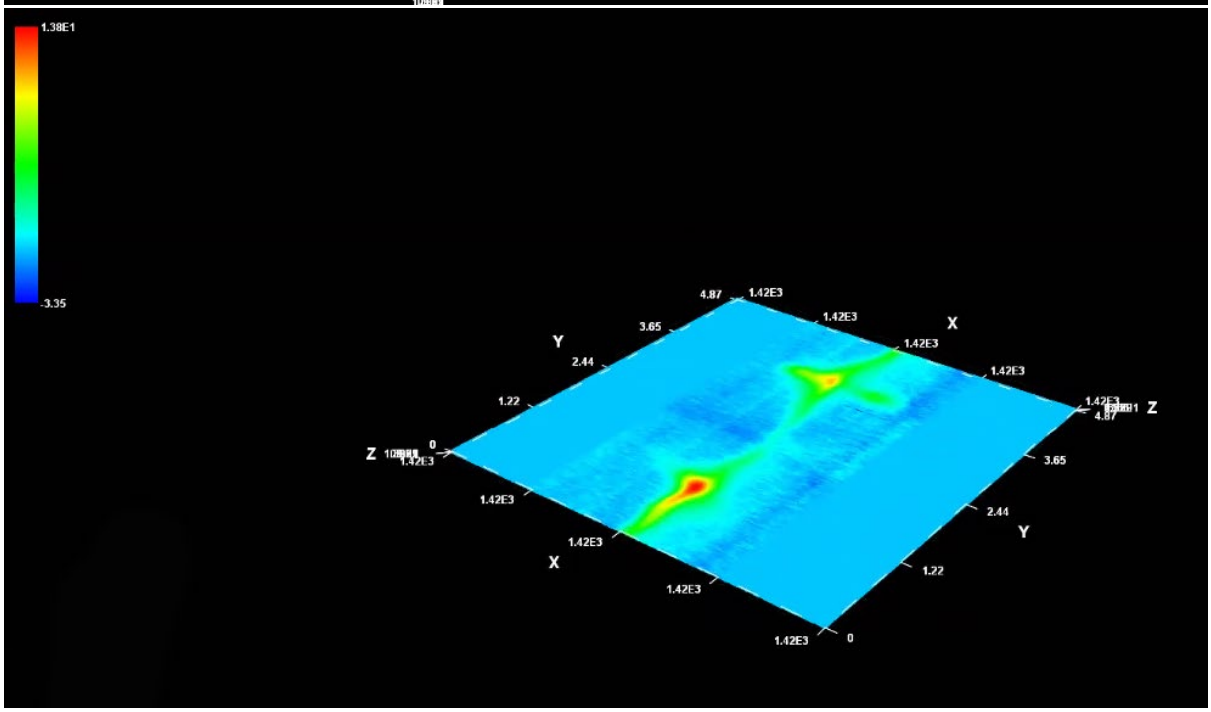
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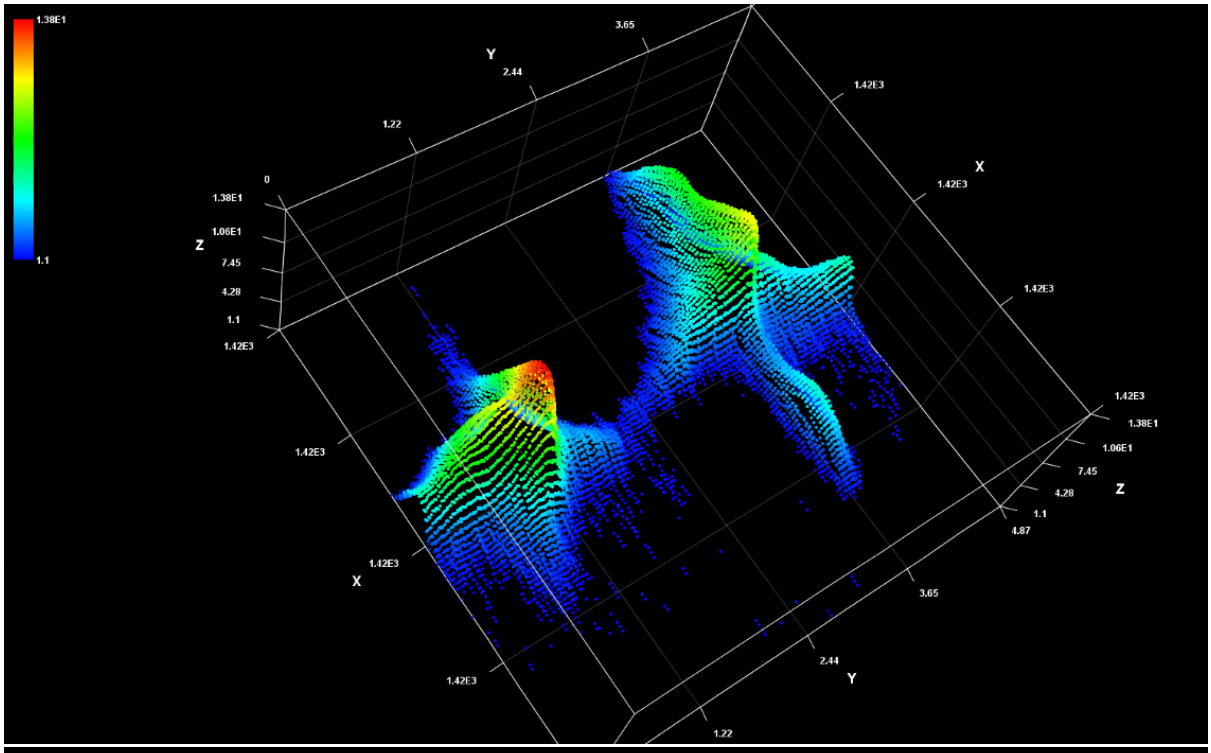
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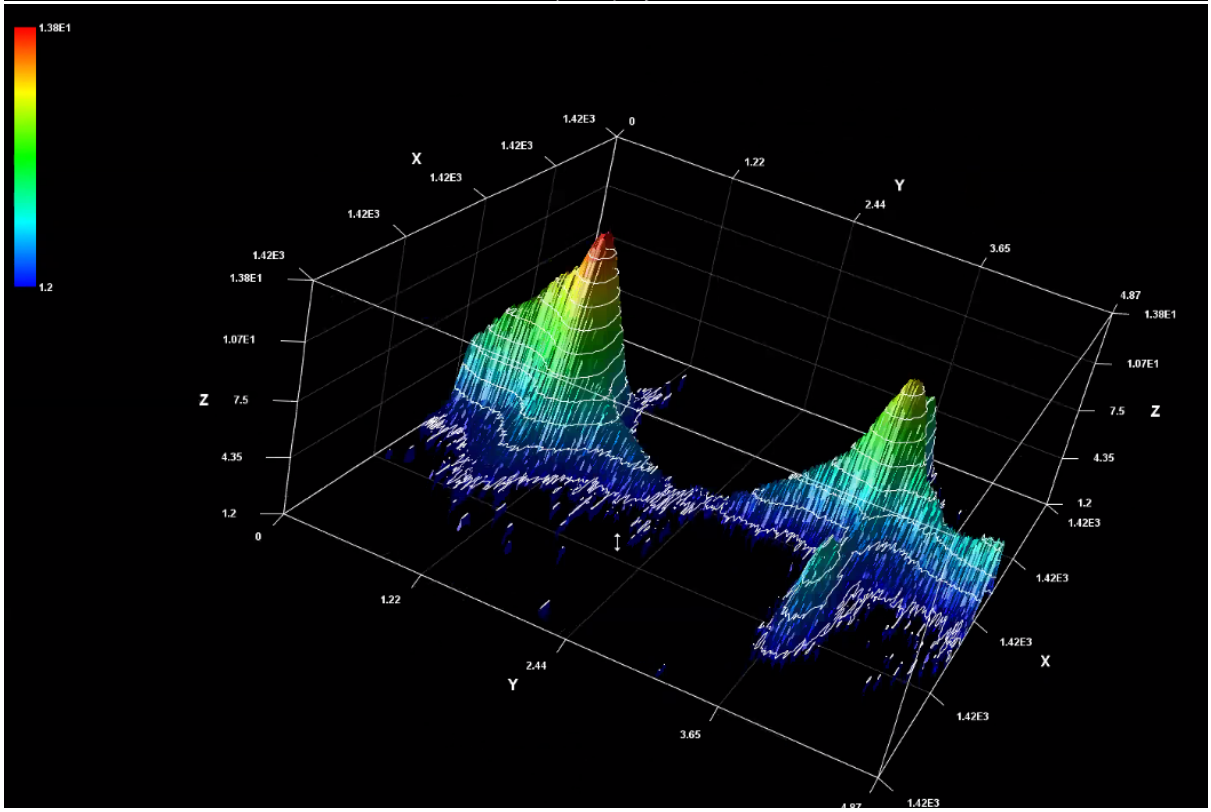
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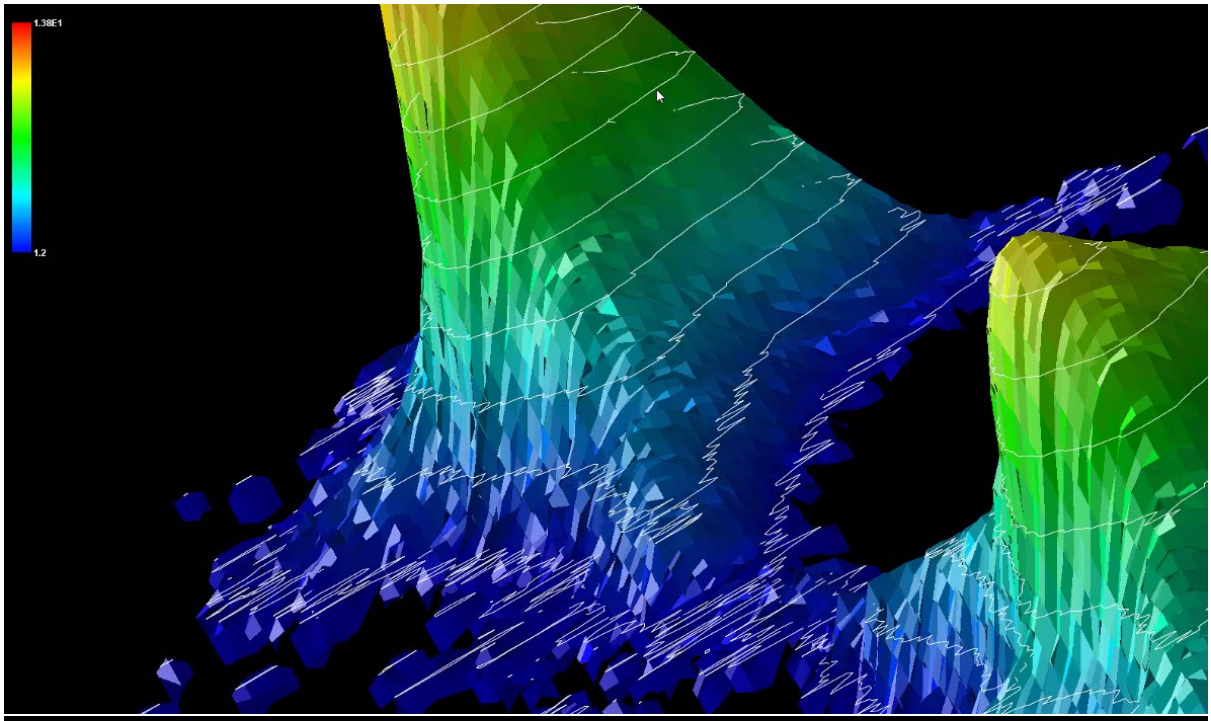
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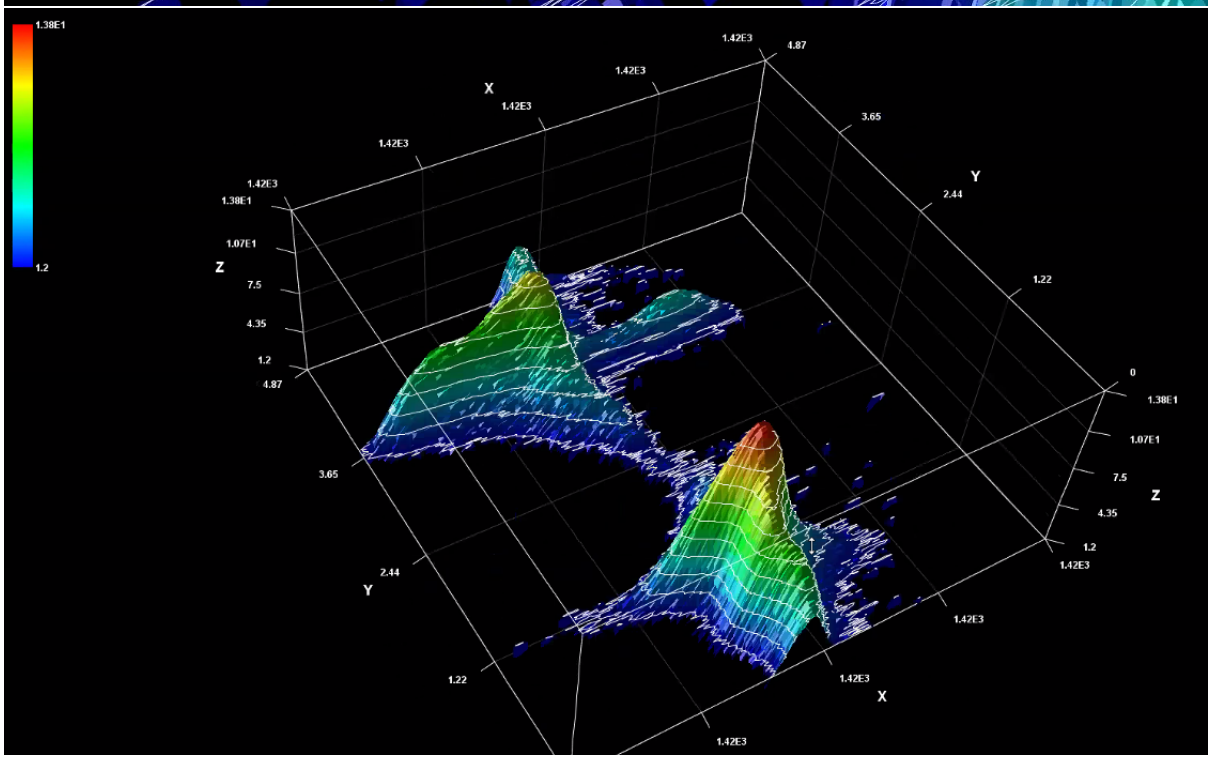
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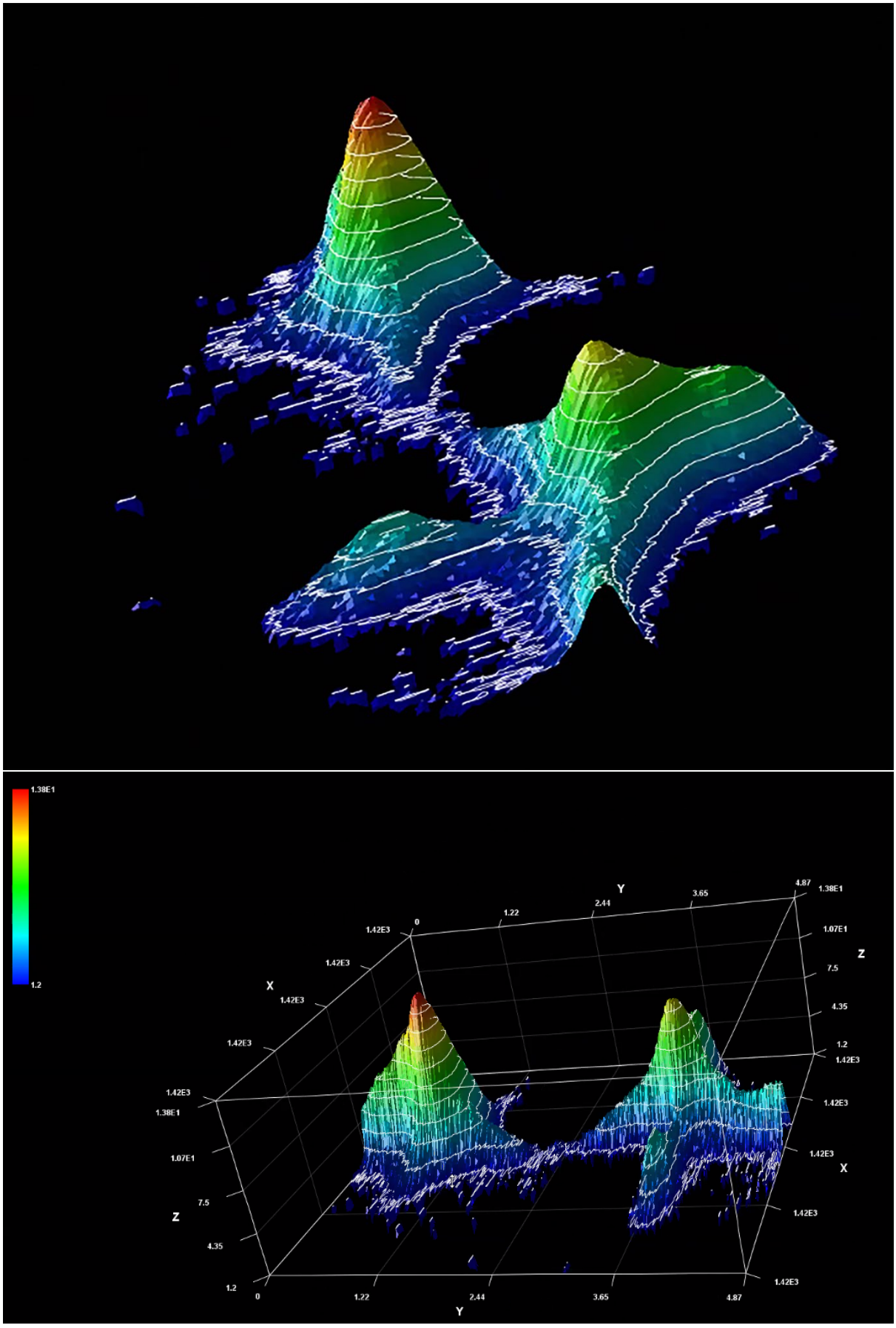
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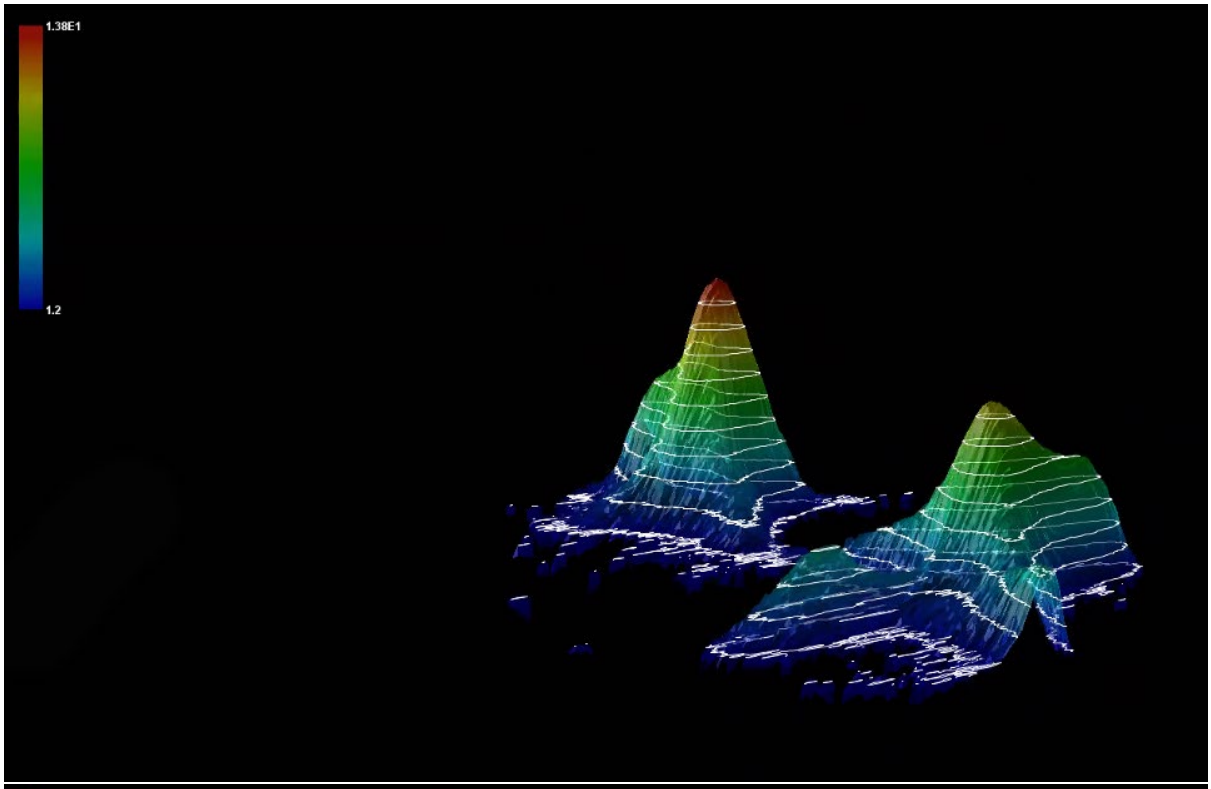
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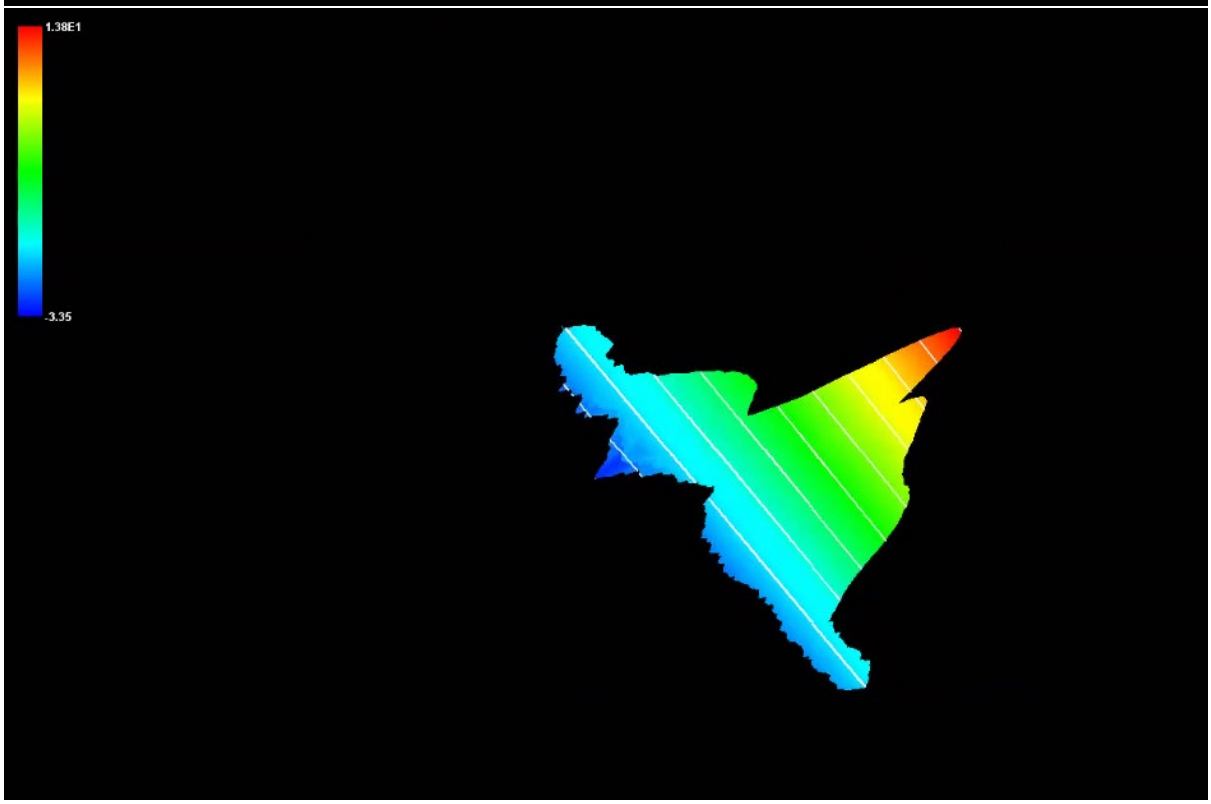
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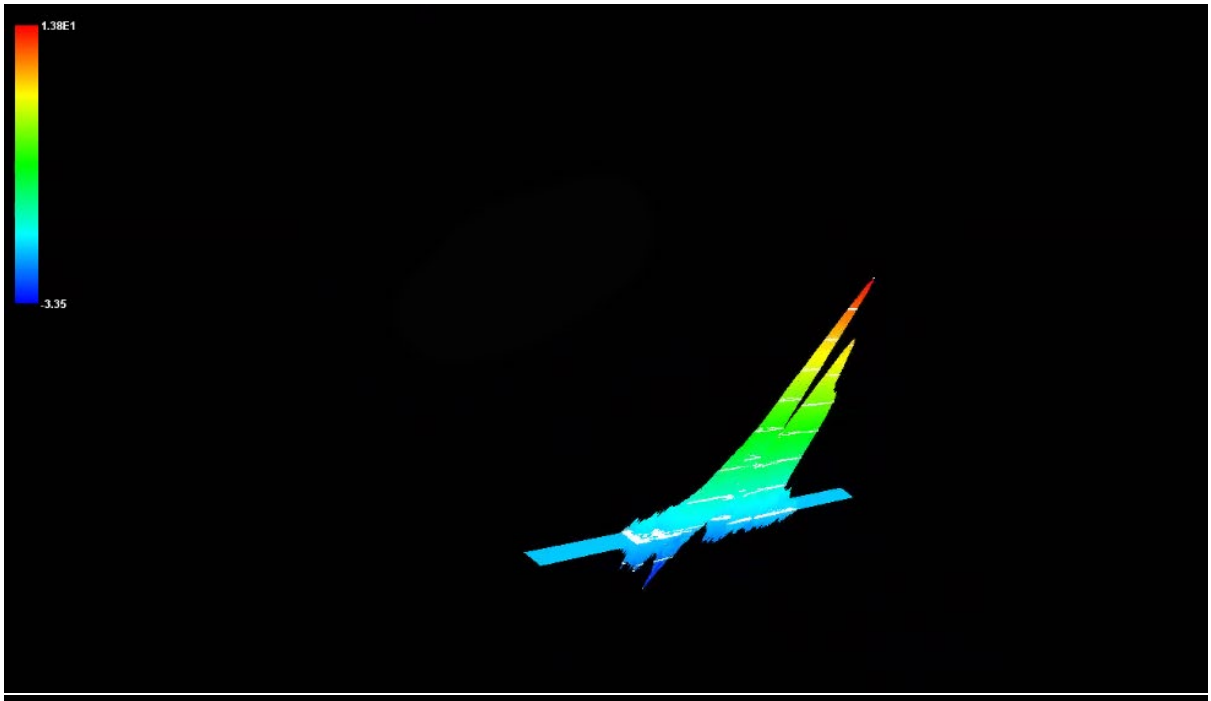
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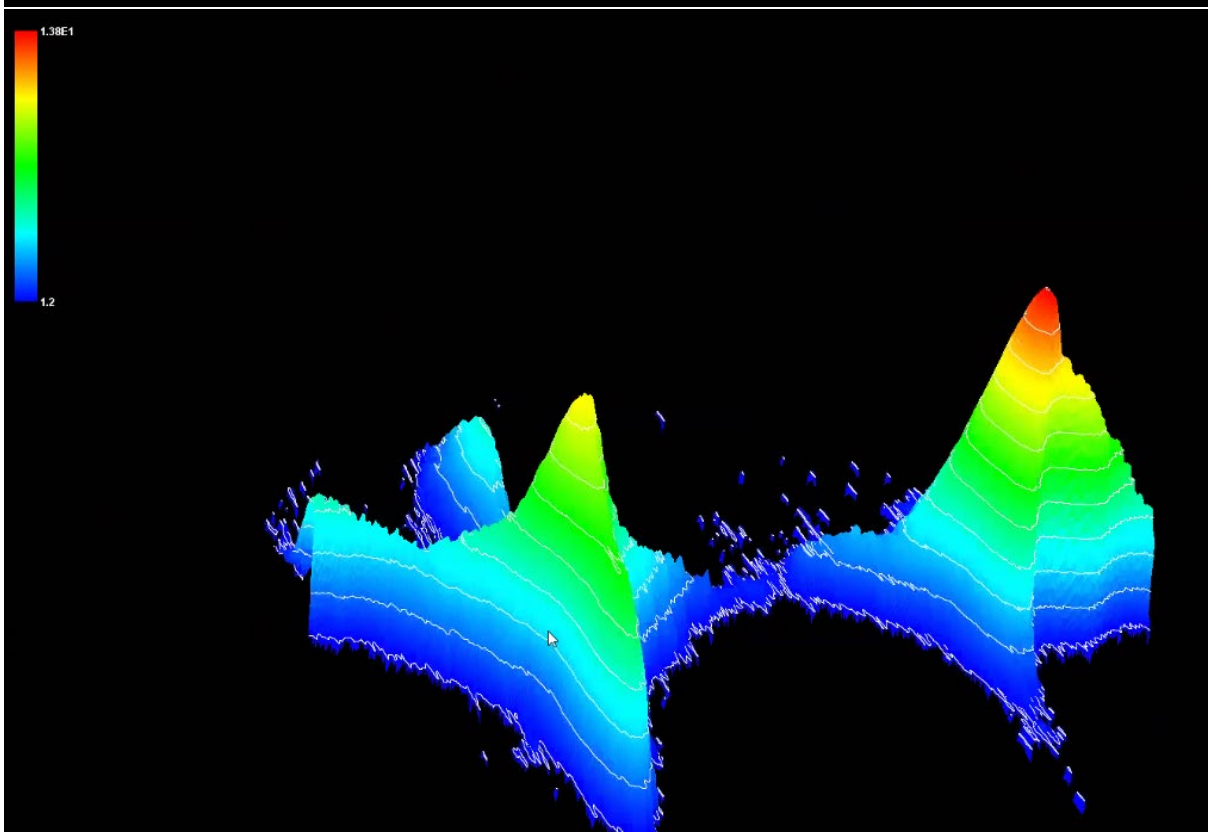
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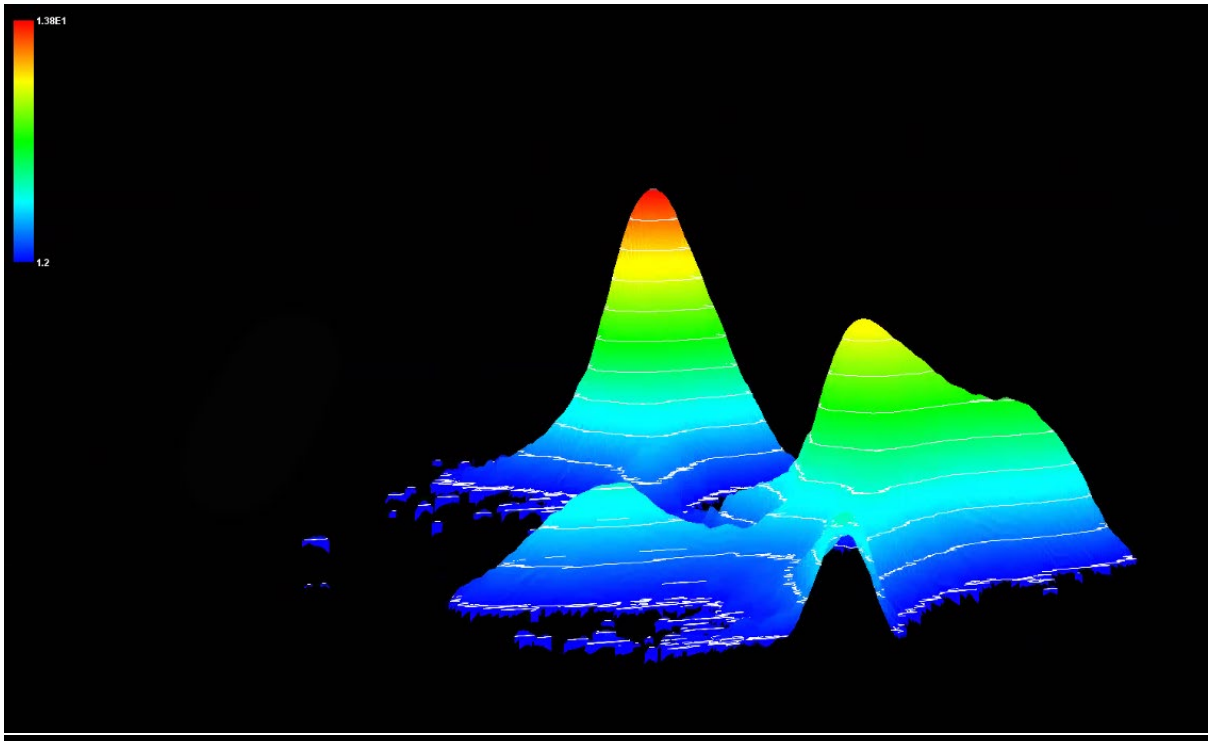
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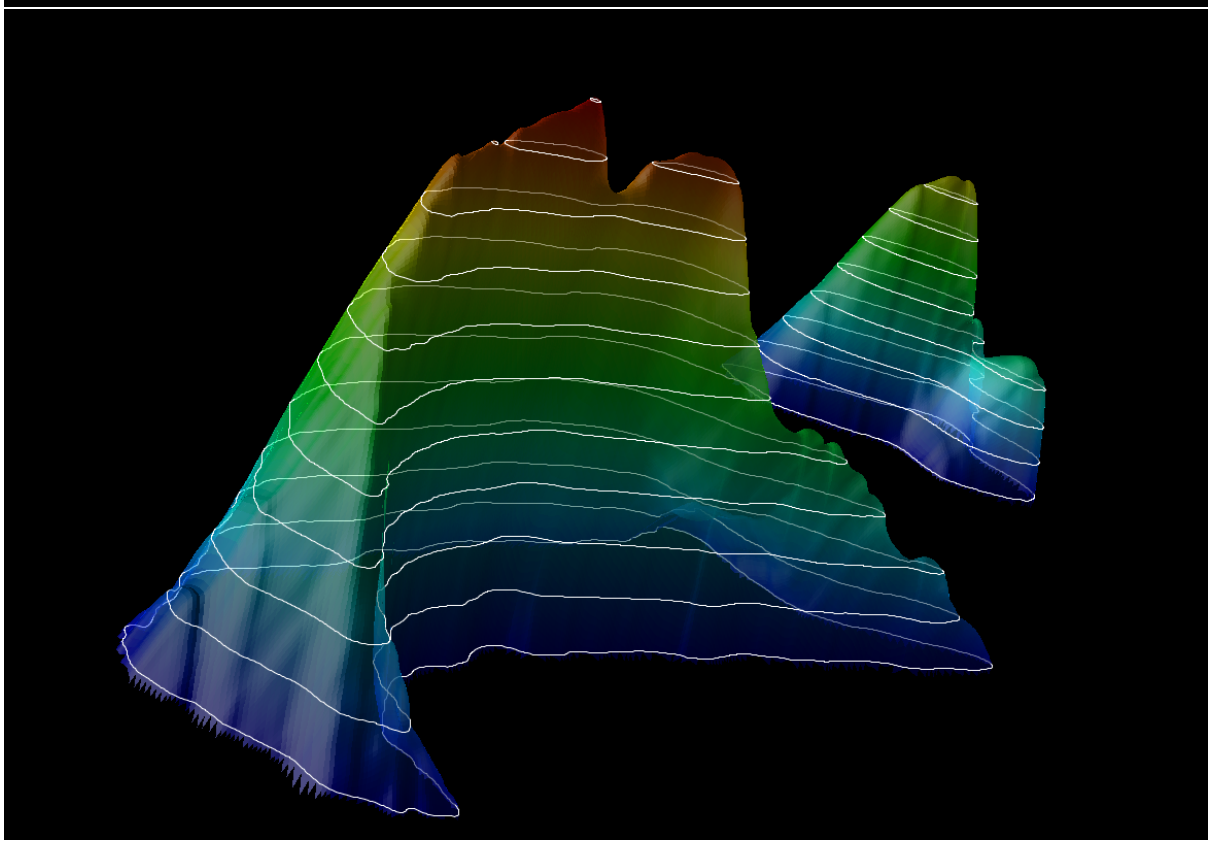

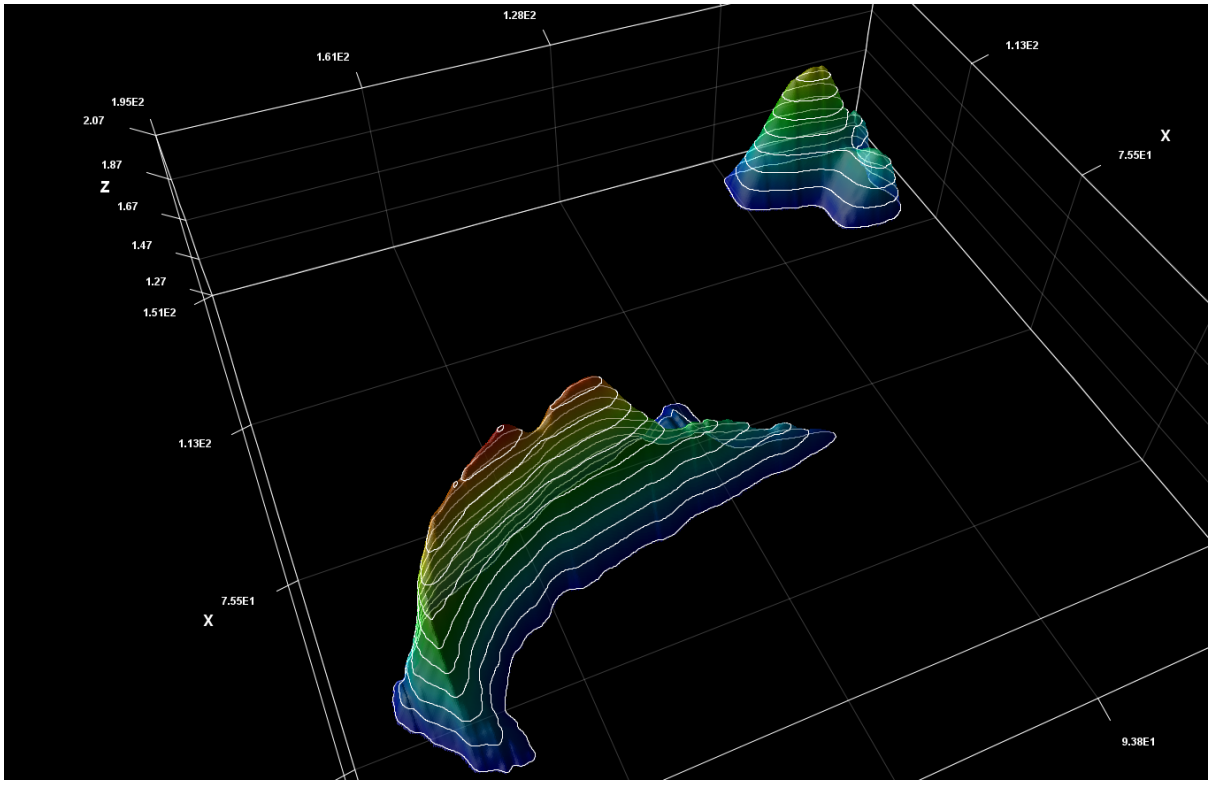

Further information.

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.