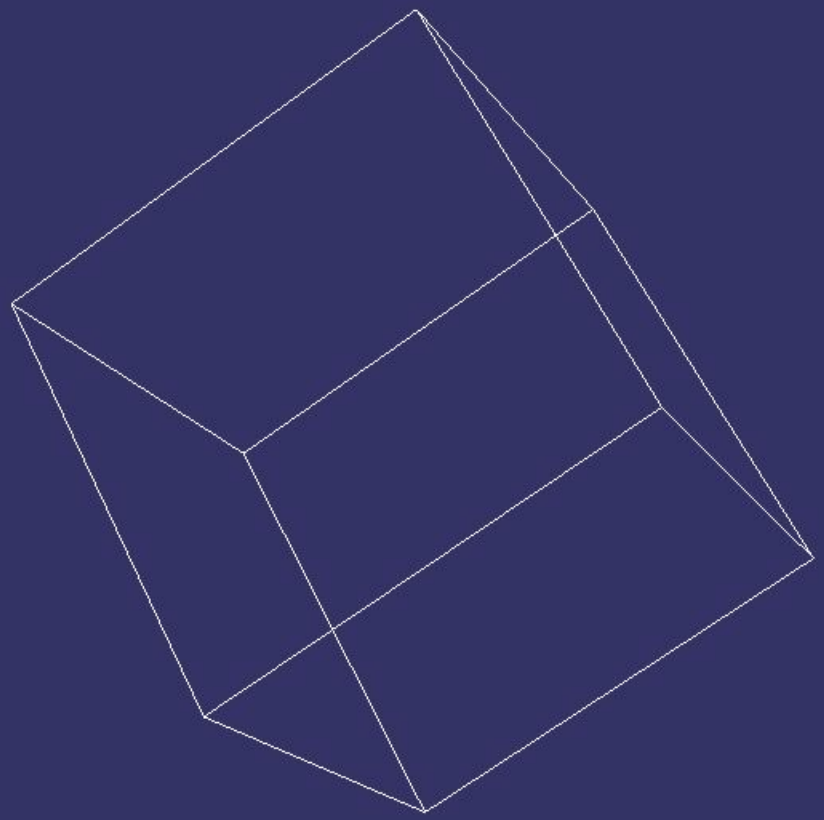
AAOGlimpse – Fun with OpenGL and FITS

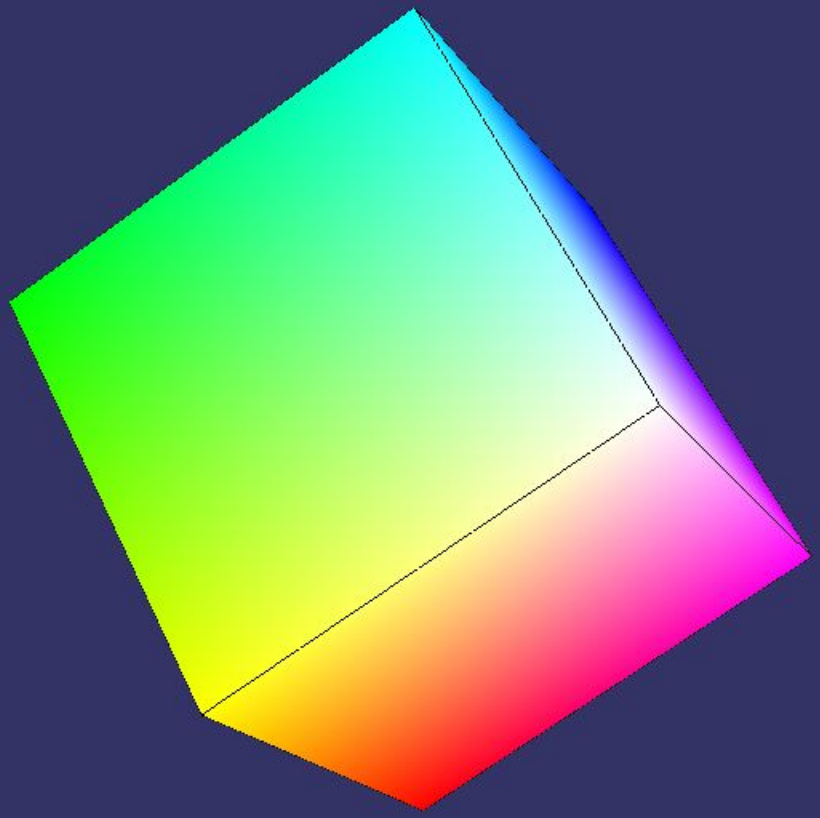
Keith Shortridge, Australian Astronomical Observatory

AAOGlimpse is a FITS image display program – with a small difference.

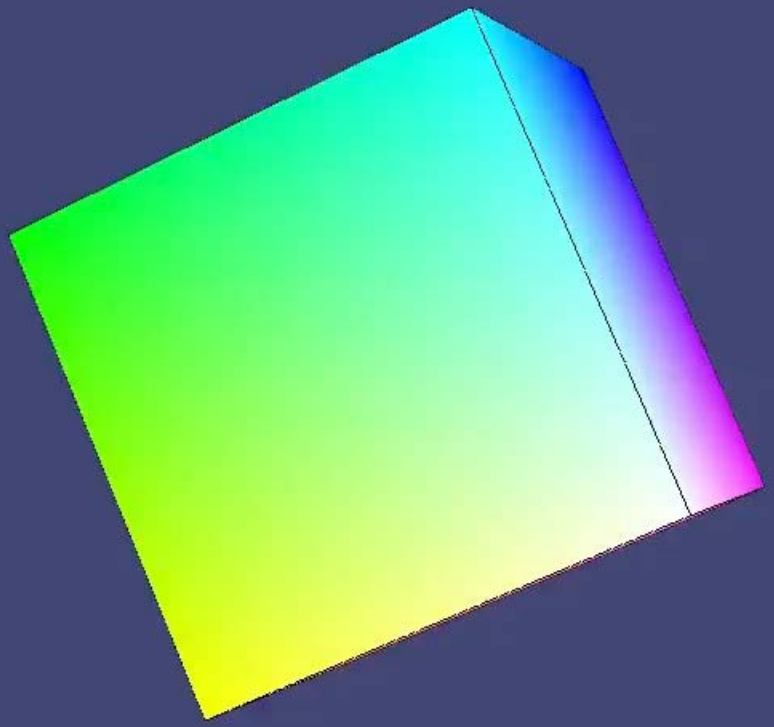
Here’s the basic idea....

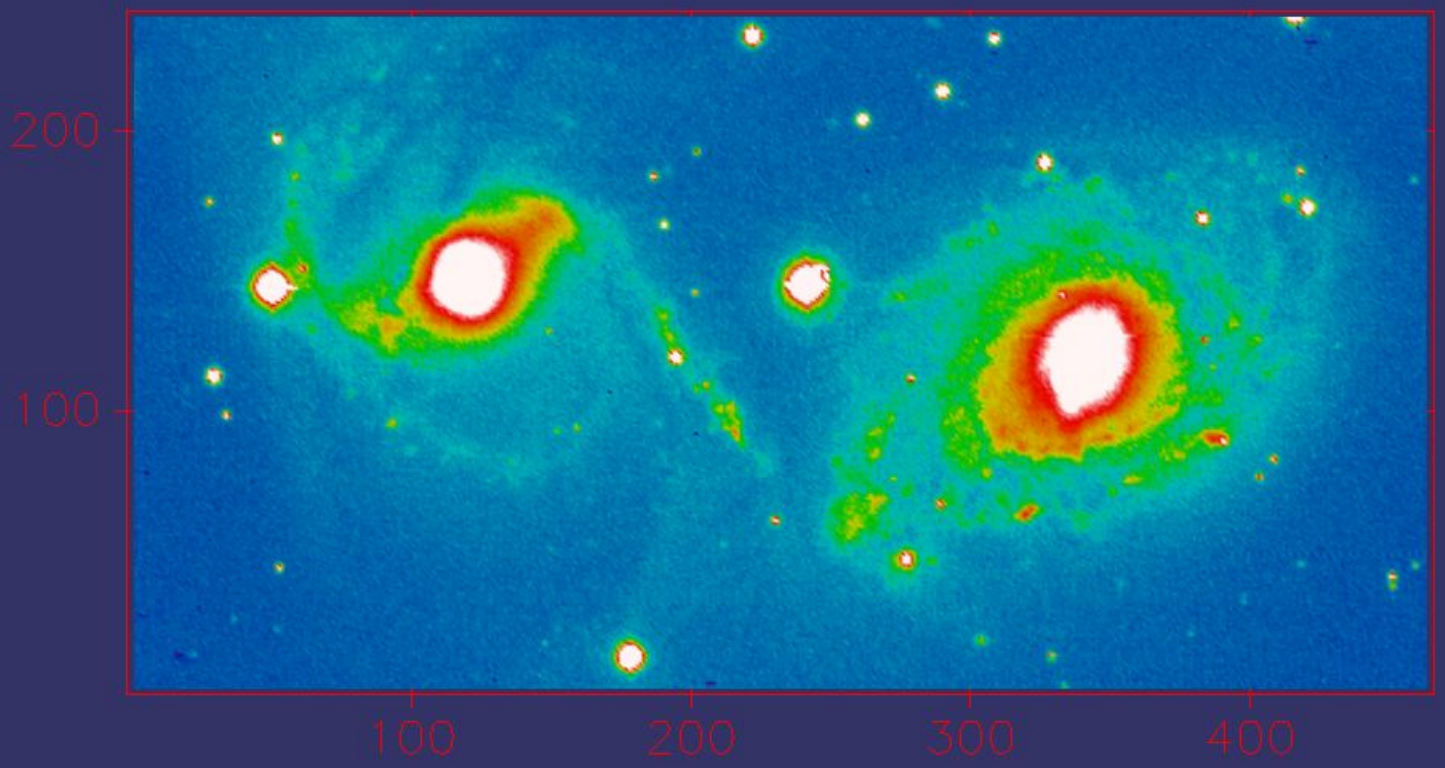


glVertex3f (x,y,z);



```
glVertex3f (x,y,z);
glColor3f (r,g,b);
```

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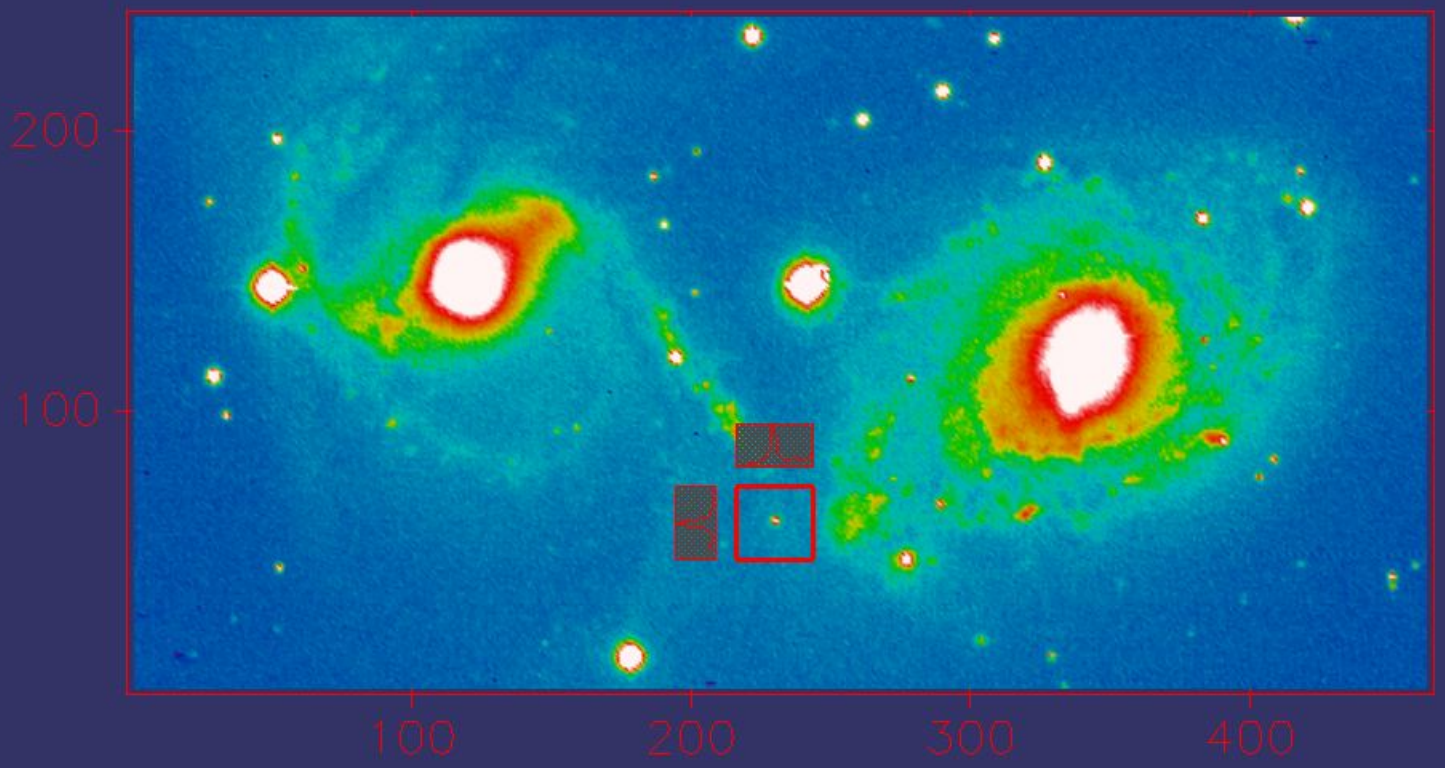
100
100
200
300
400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100
100
200
300
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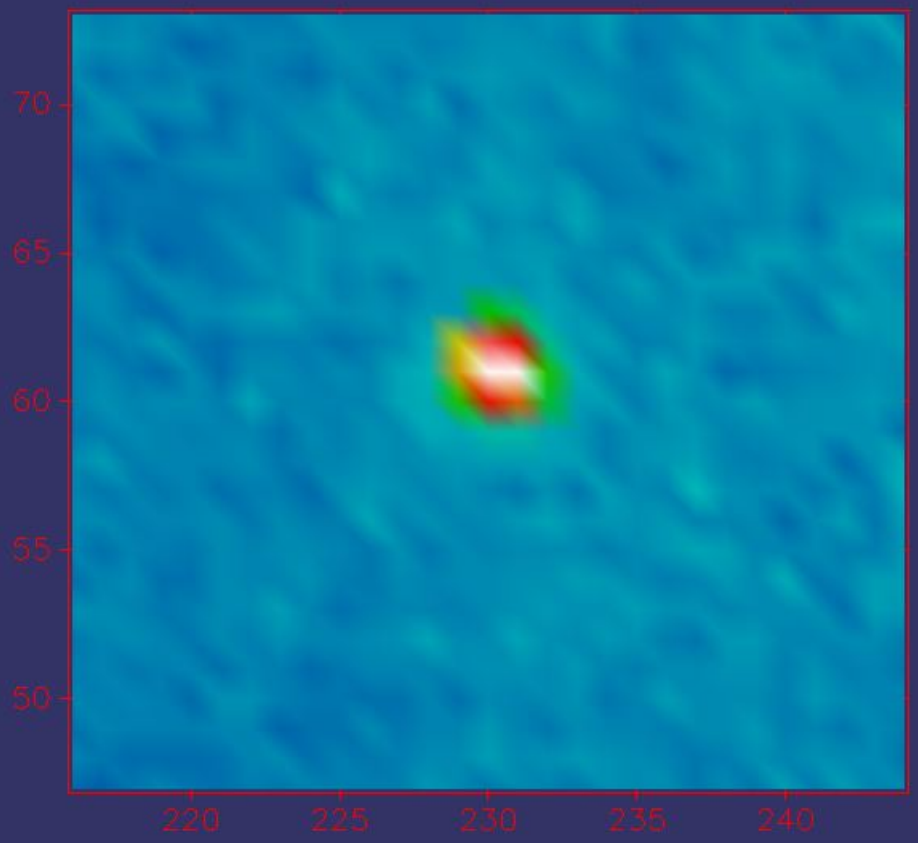
70
65
60
55
50
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225
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235
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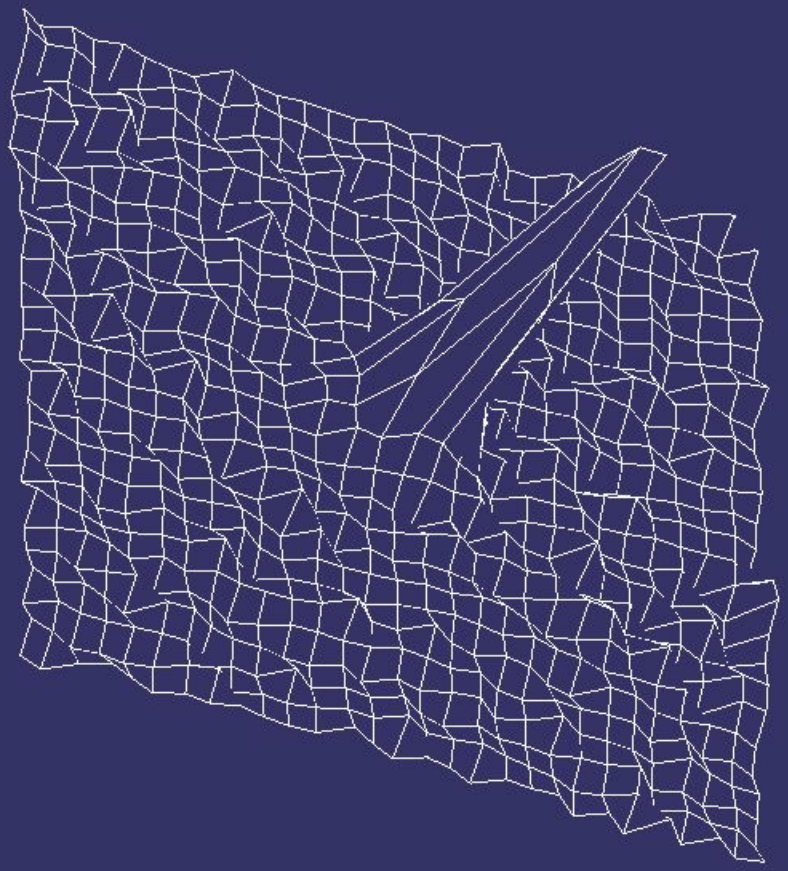
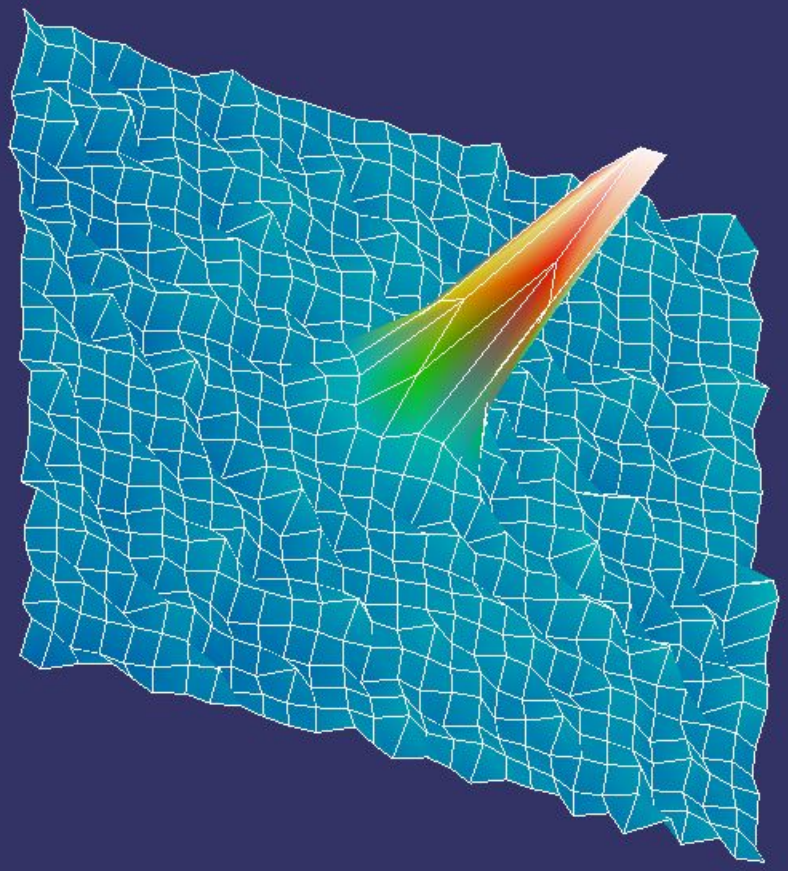
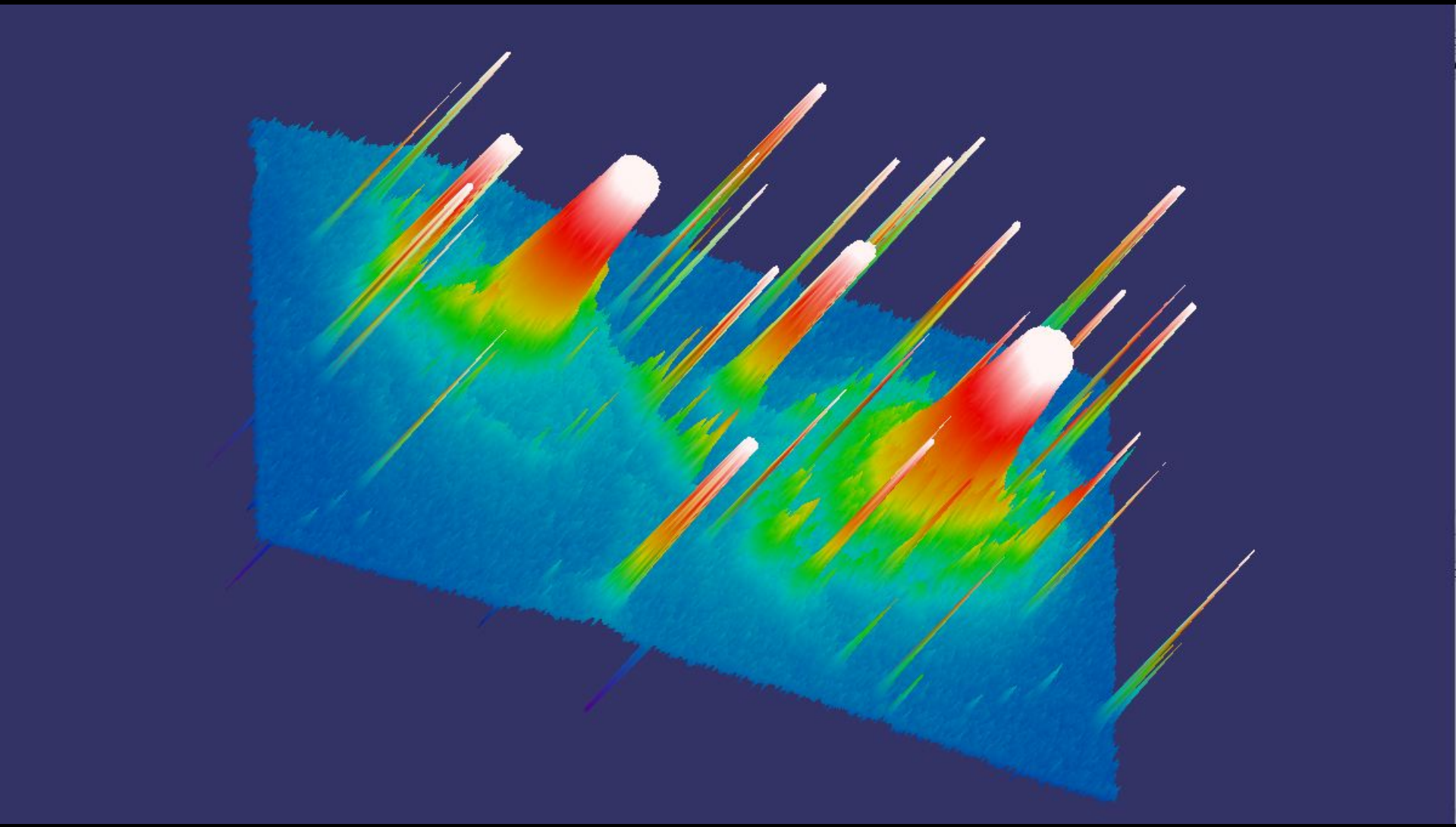
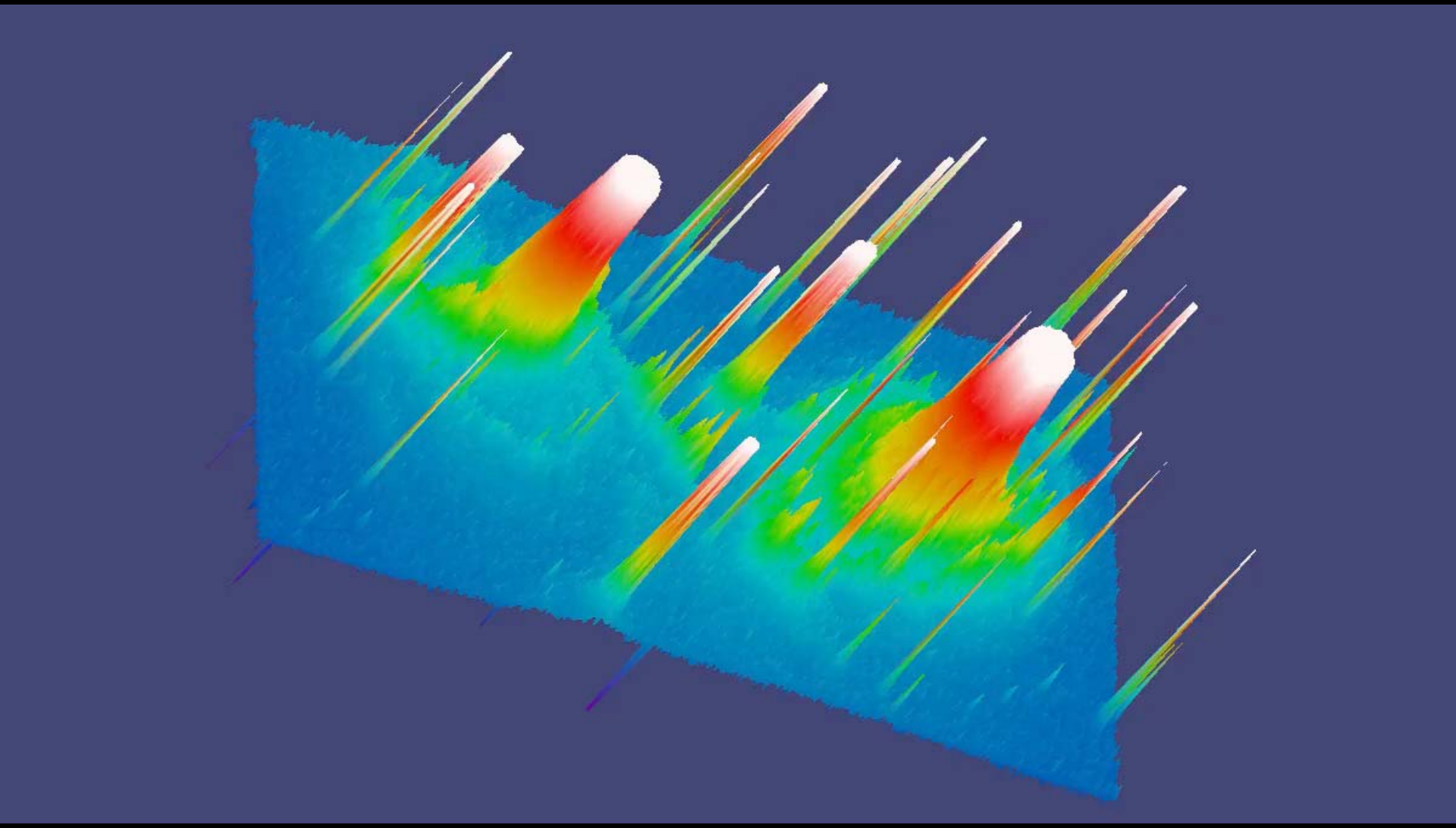
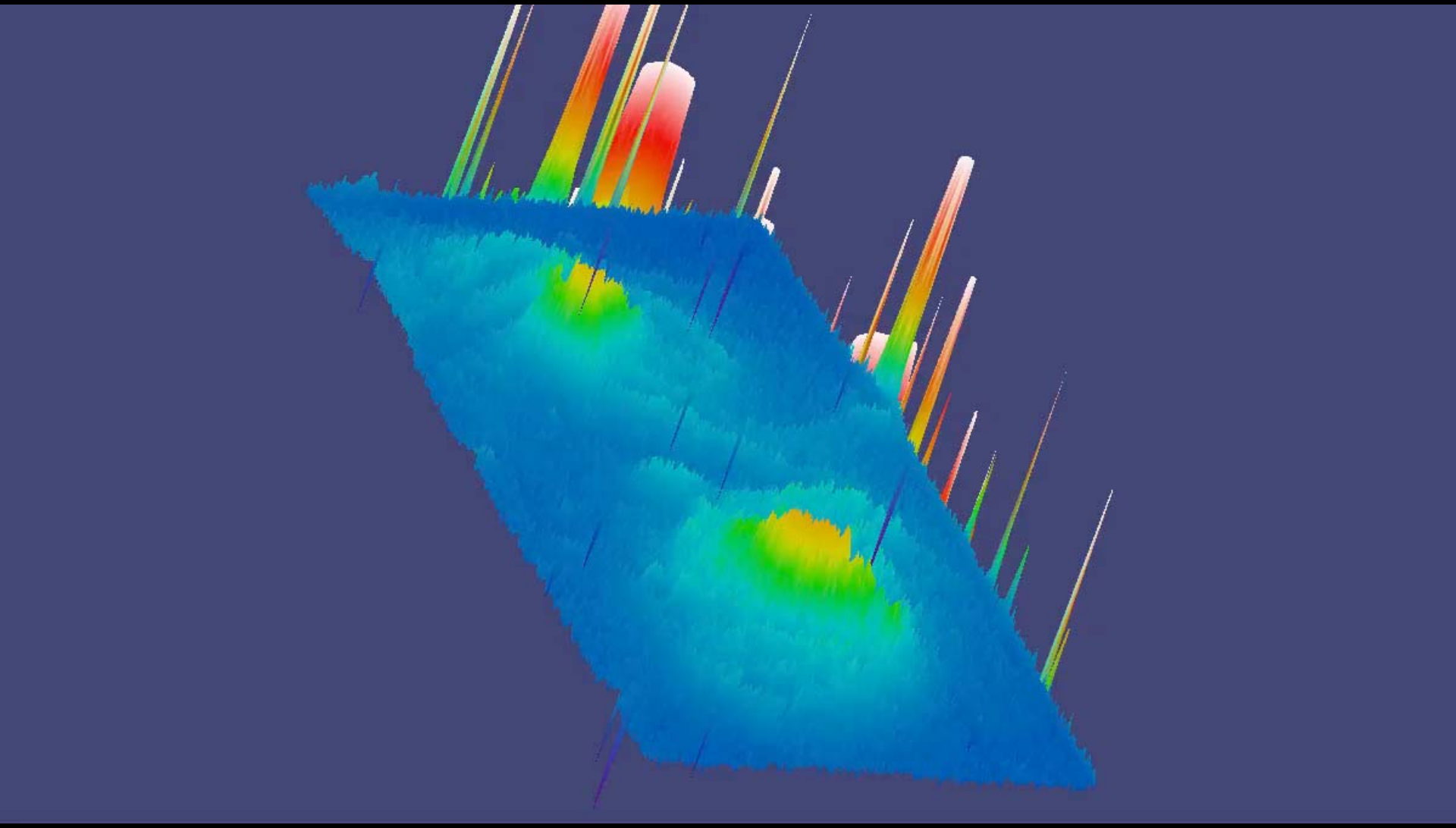










Formal Definition of Functional Requirements

World Coordinate System (WCS) support

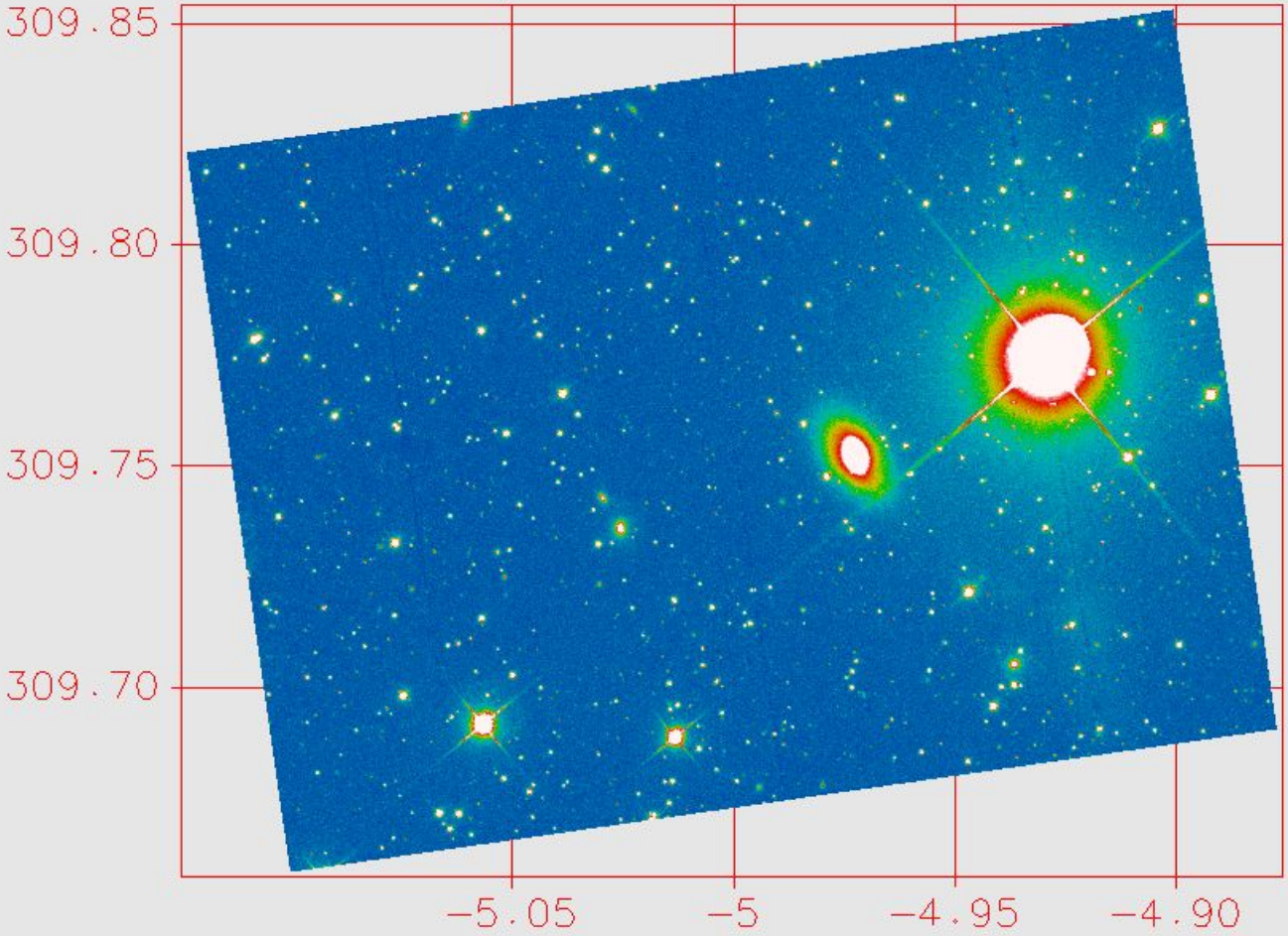
Support for 3D data

WCS

Uses Mark Calabretta's wcslib

Each data pixel has X,Y,Z WCS coordinates, and these are used to draw its surface in coordinate space. (Can use a lot of memory.)

In OpenGL you draw the surfaces in the coordinate space you choose. (You don't have to think about the screen at all.) Then how you view it is something completely separate.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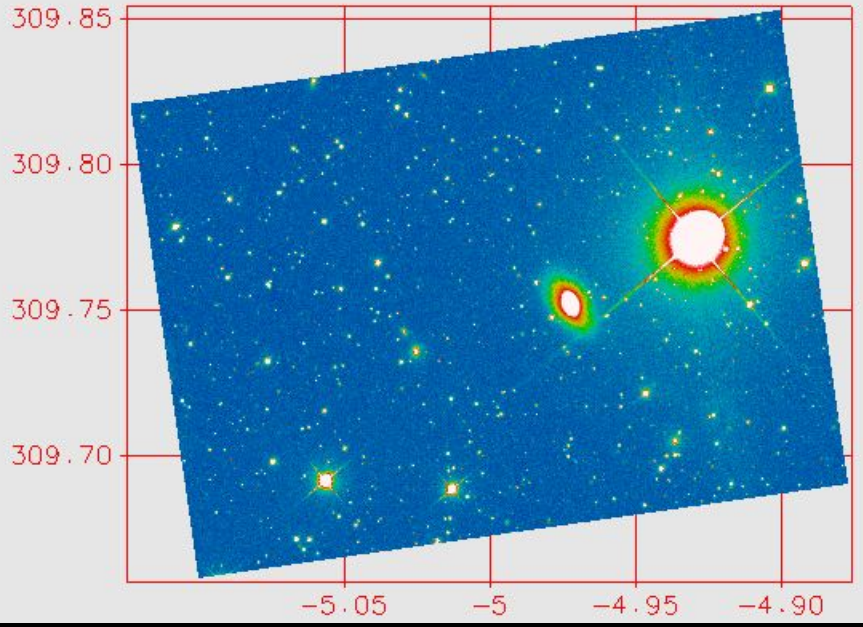
309.80
309.75
309.70
−5.05
−5
−4.95
−4.90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309.80
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−5.05
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−4.95
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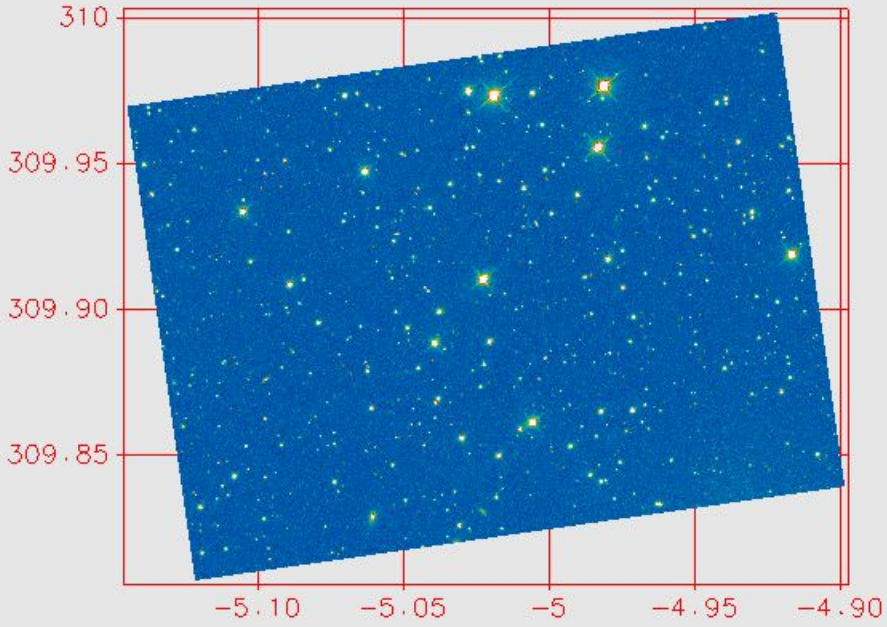
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309.95
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309.85
−5.10
−5.05
−5
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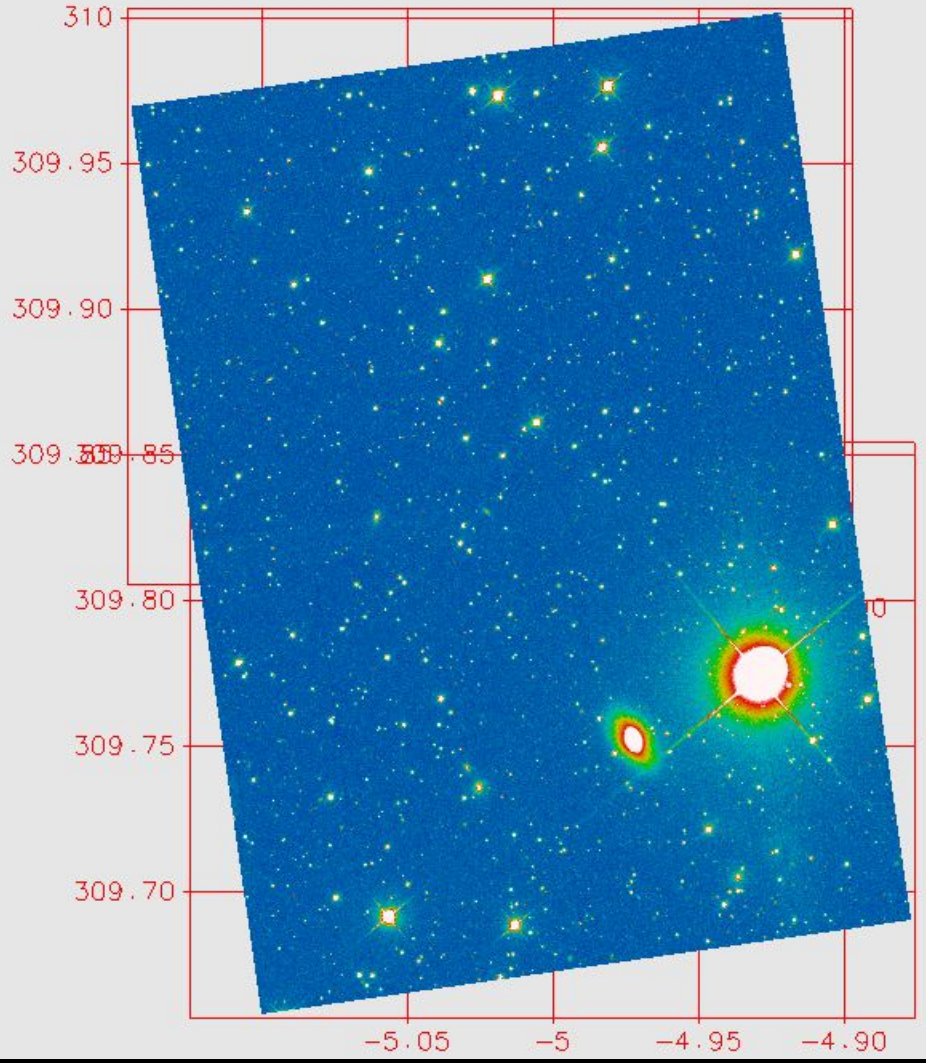
−4.90


310
309.95
309.90
309.80
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−5.05
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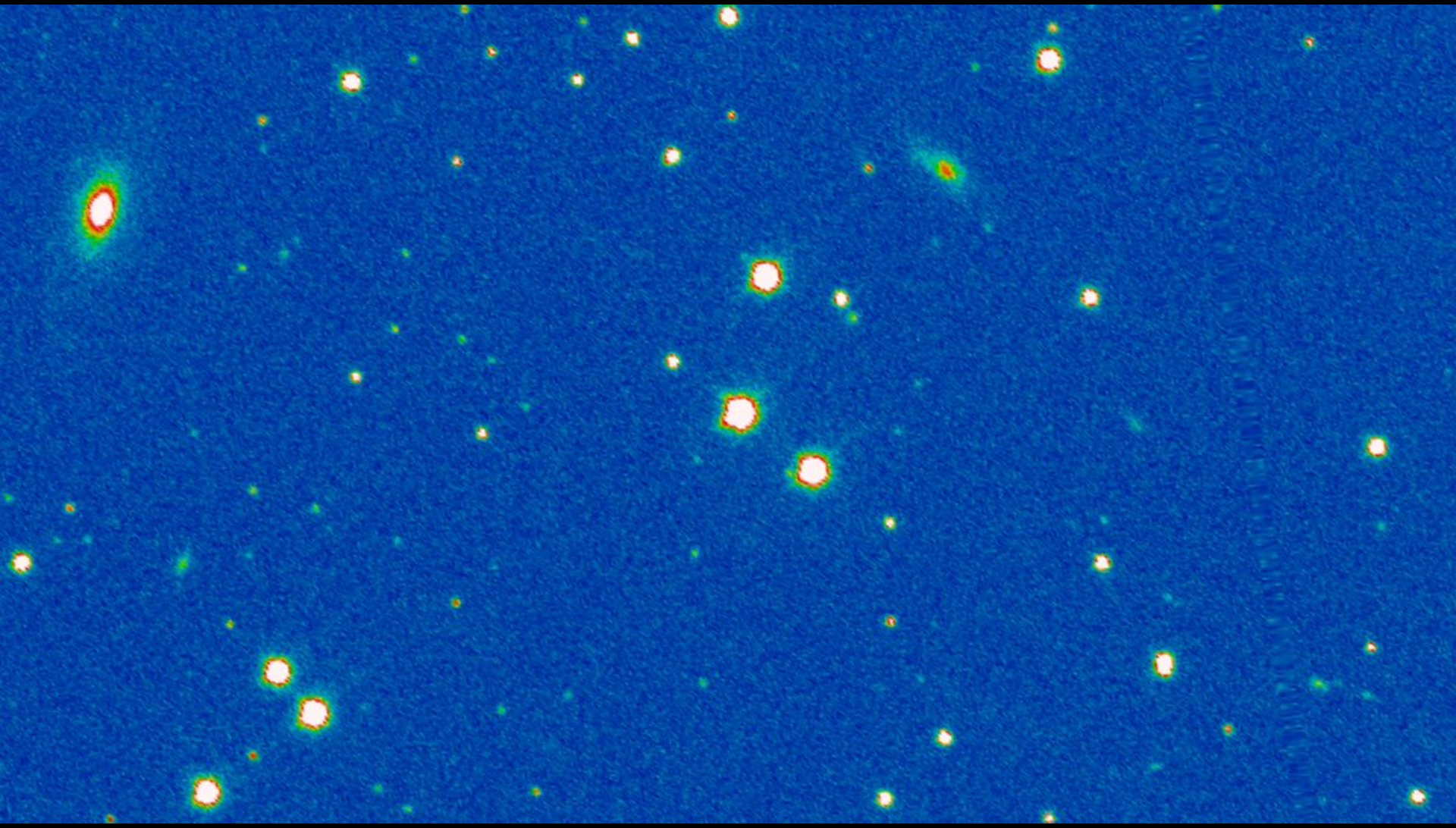
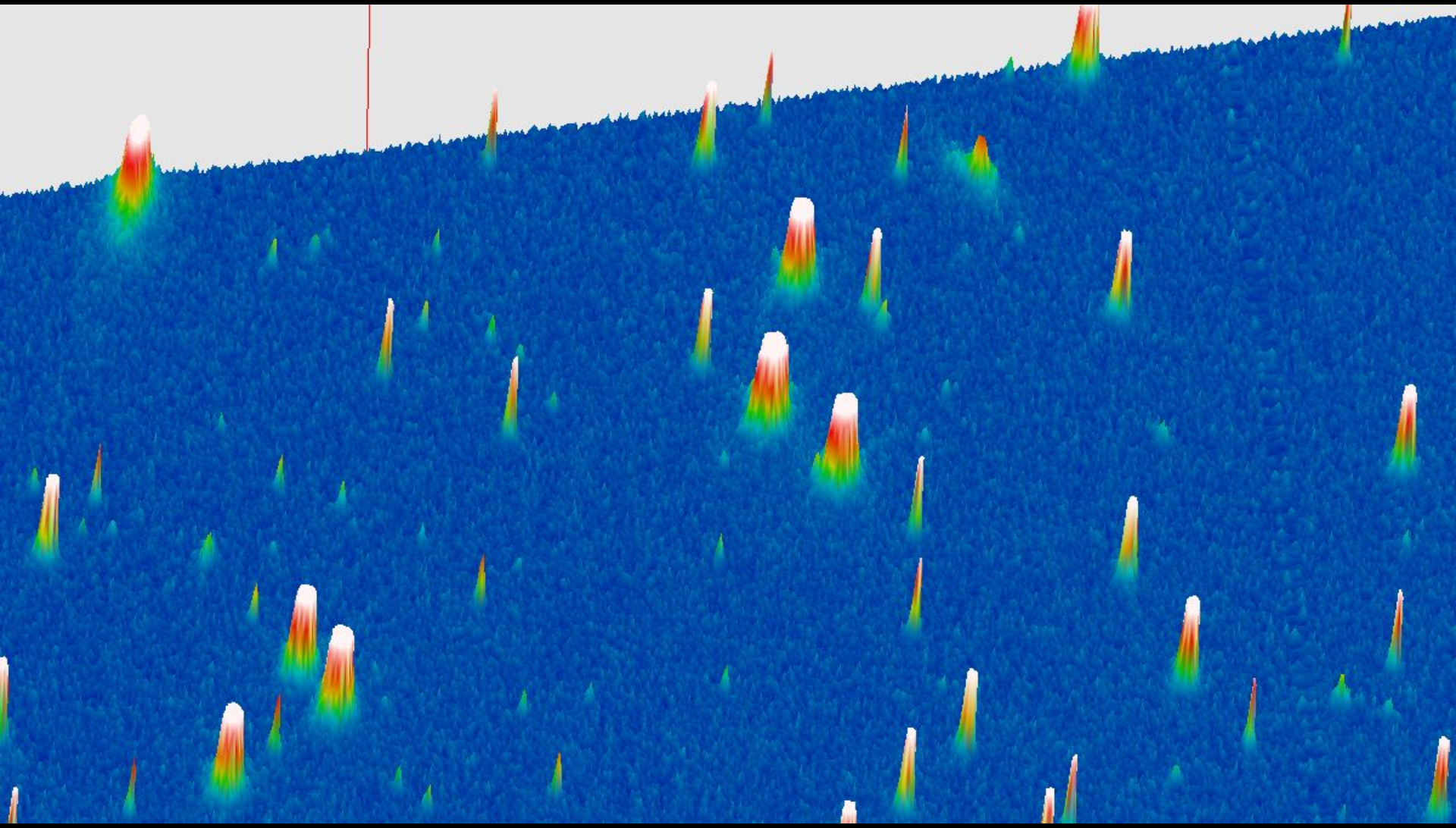
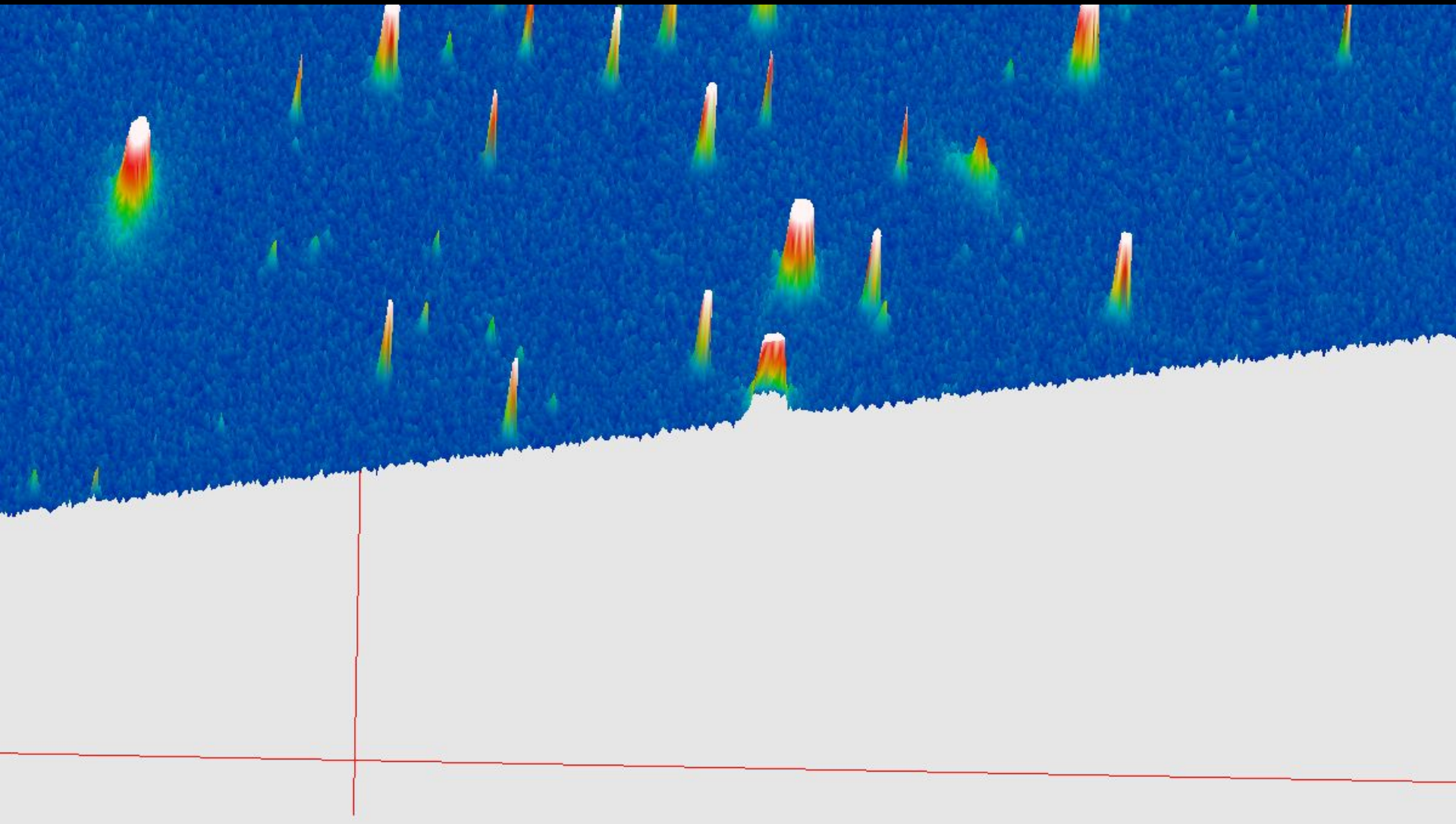
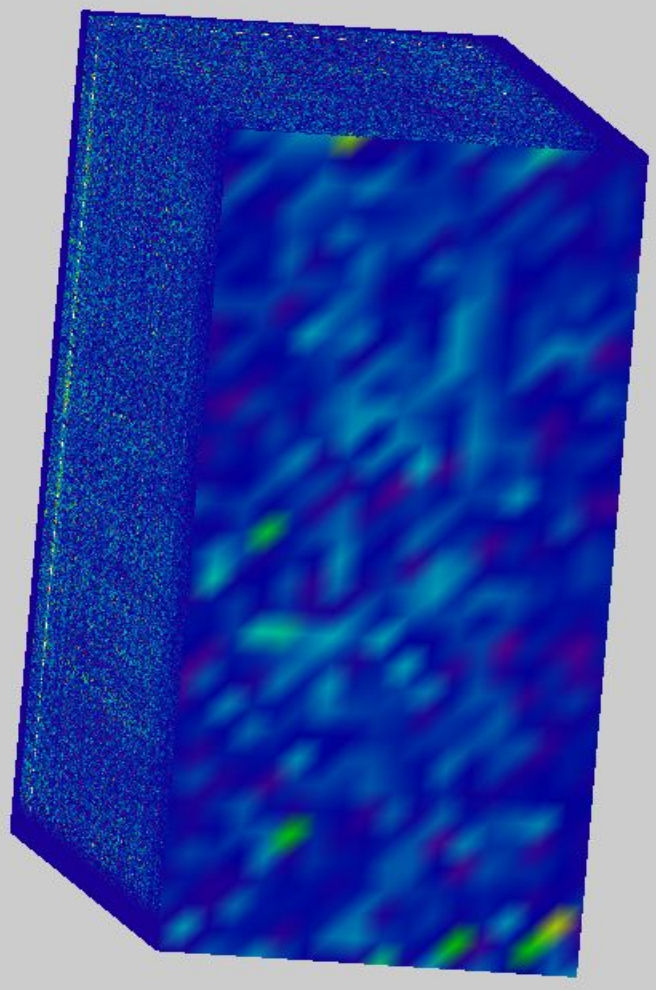


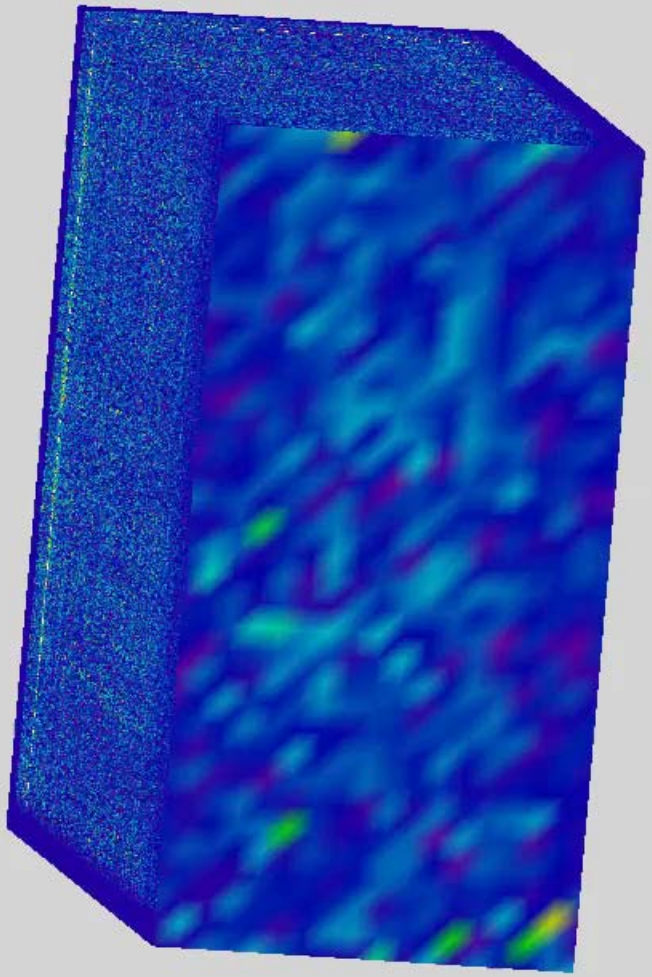


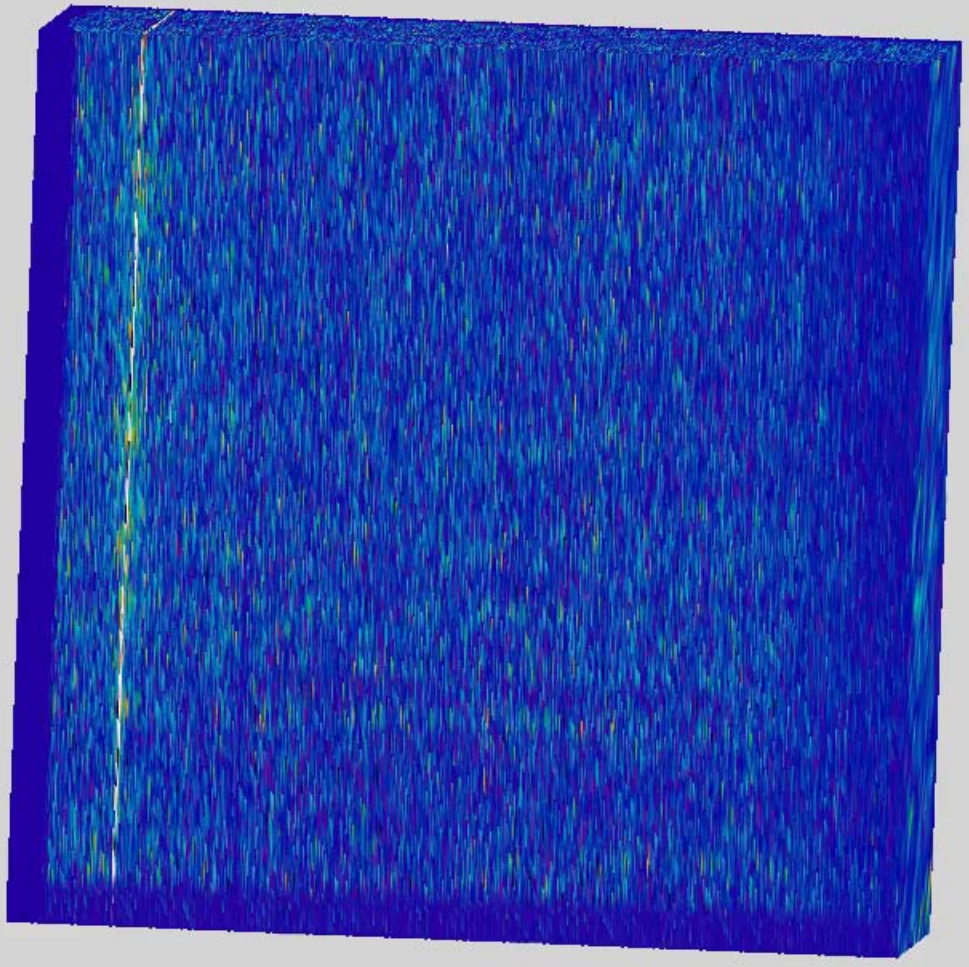


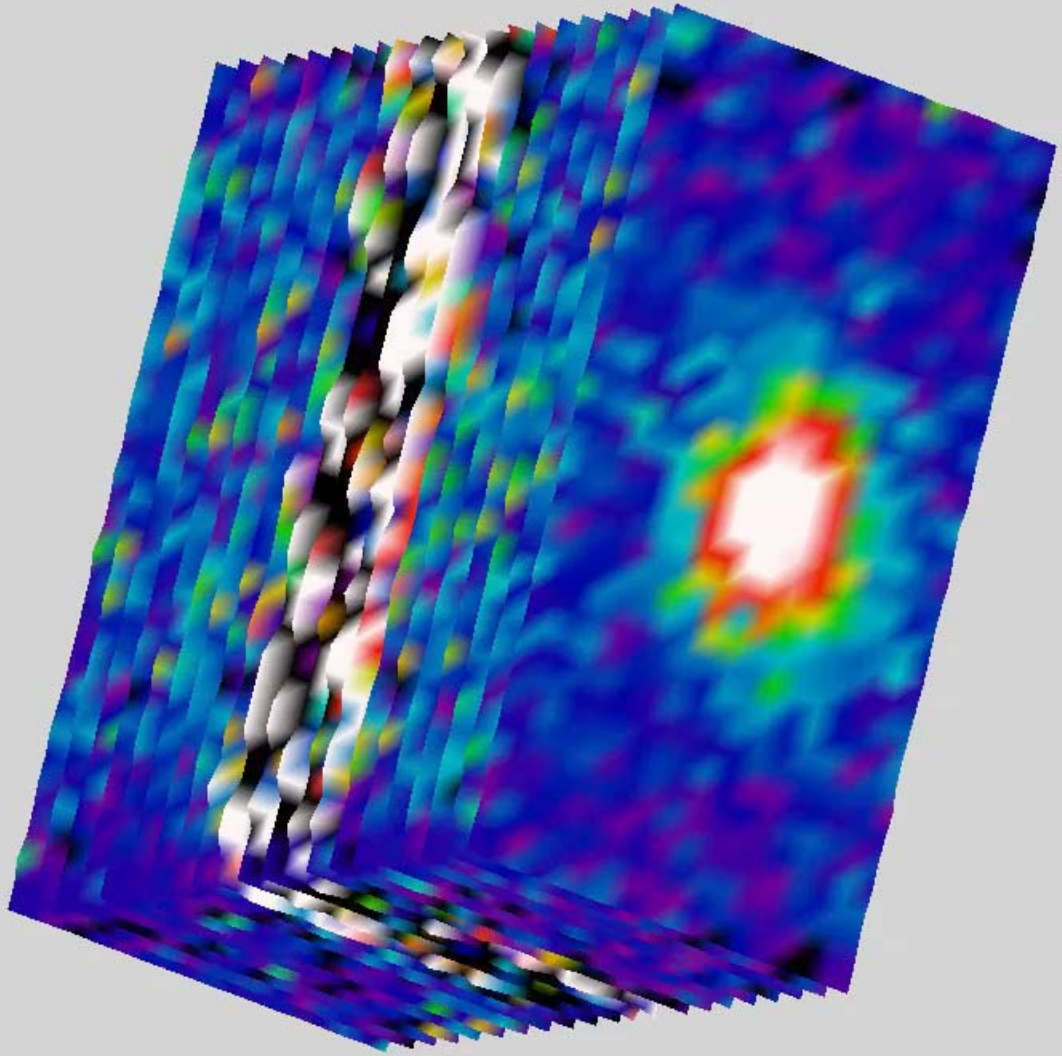
3D Data

Each plane of the data is its own 3D surface, and you have a lot of these 3D surfaces.



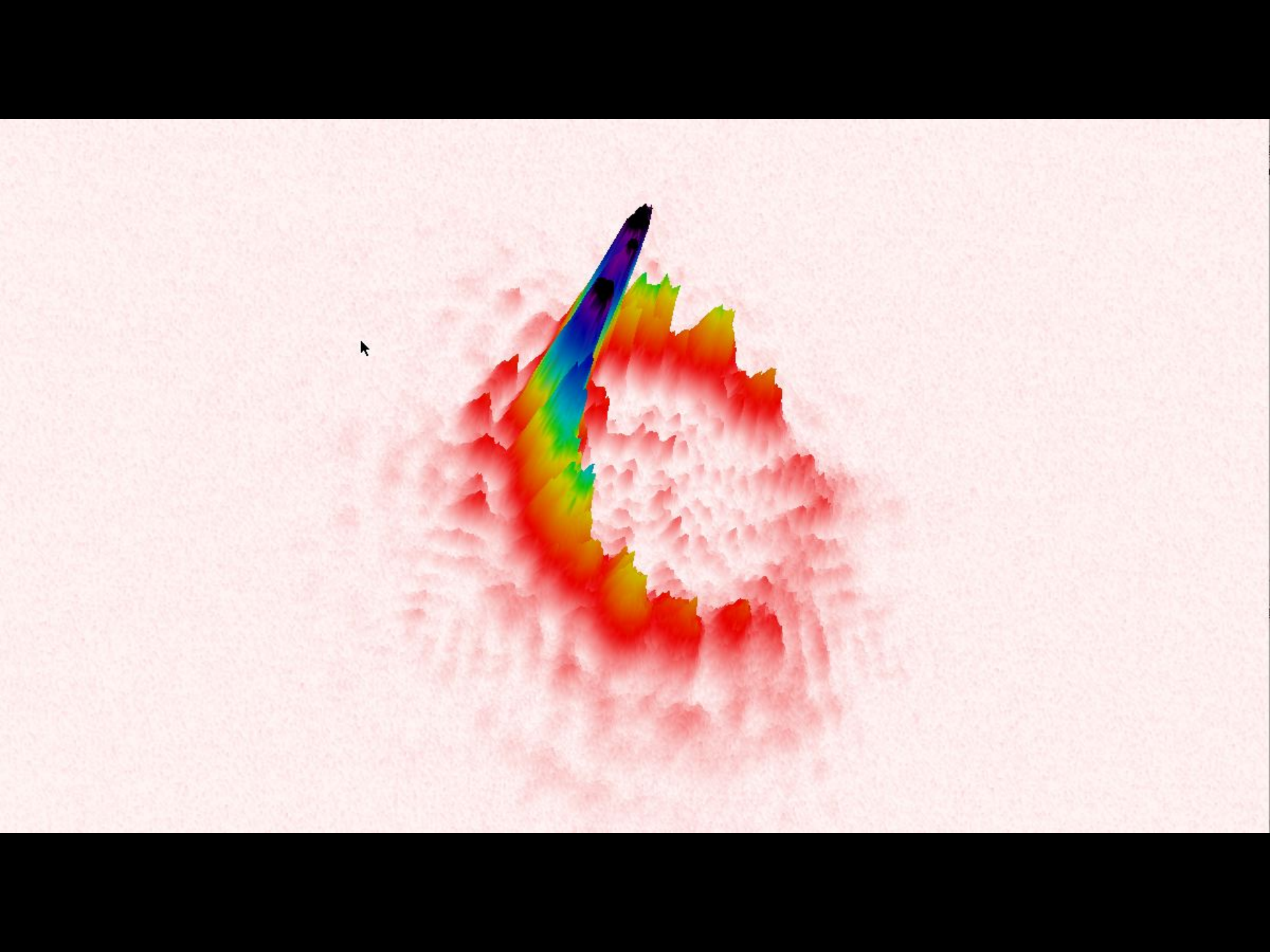






More Functional Requirements

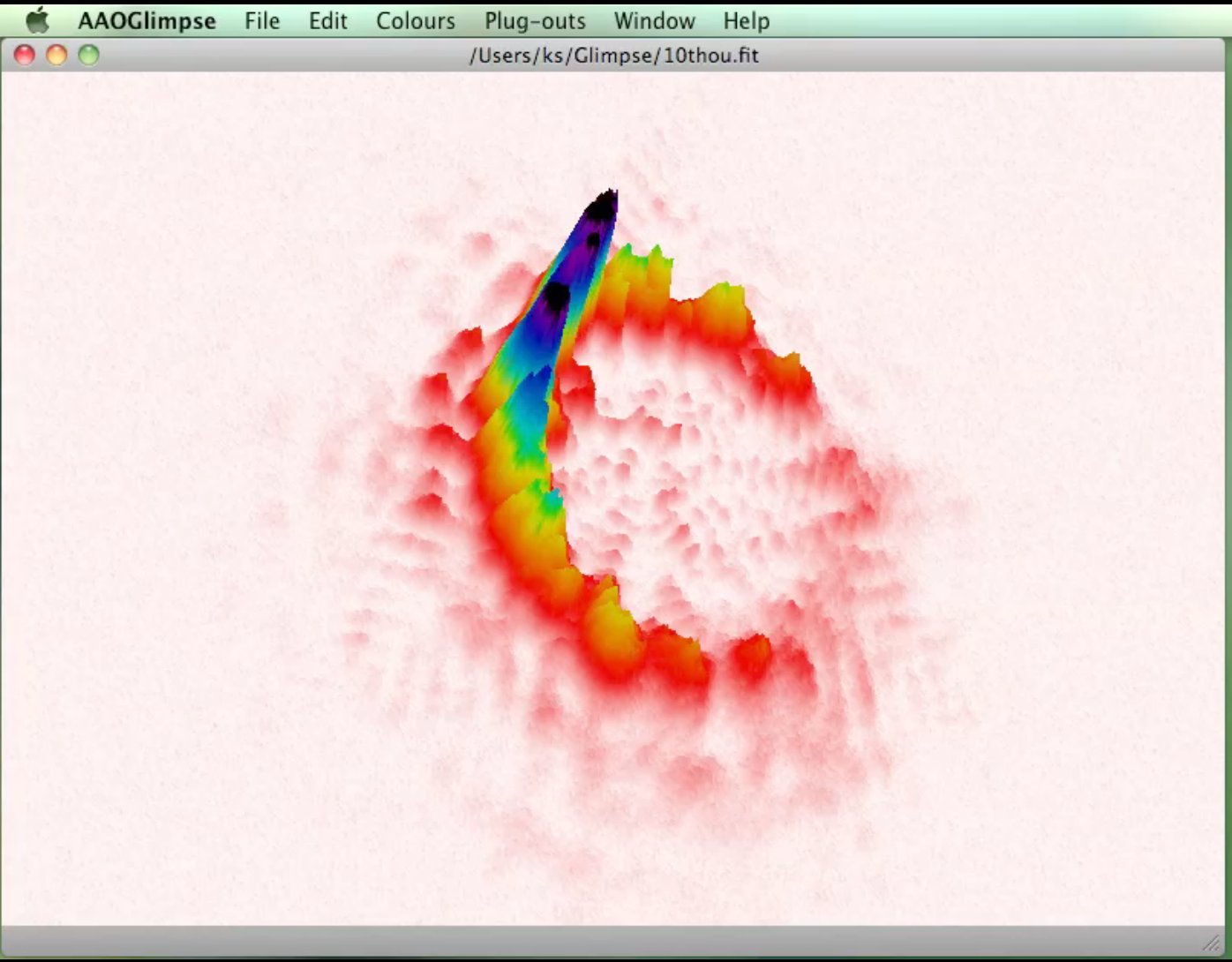
Analysis of optical test data – our optical engineers wanted to fit ellipses to out-of-focus test images.



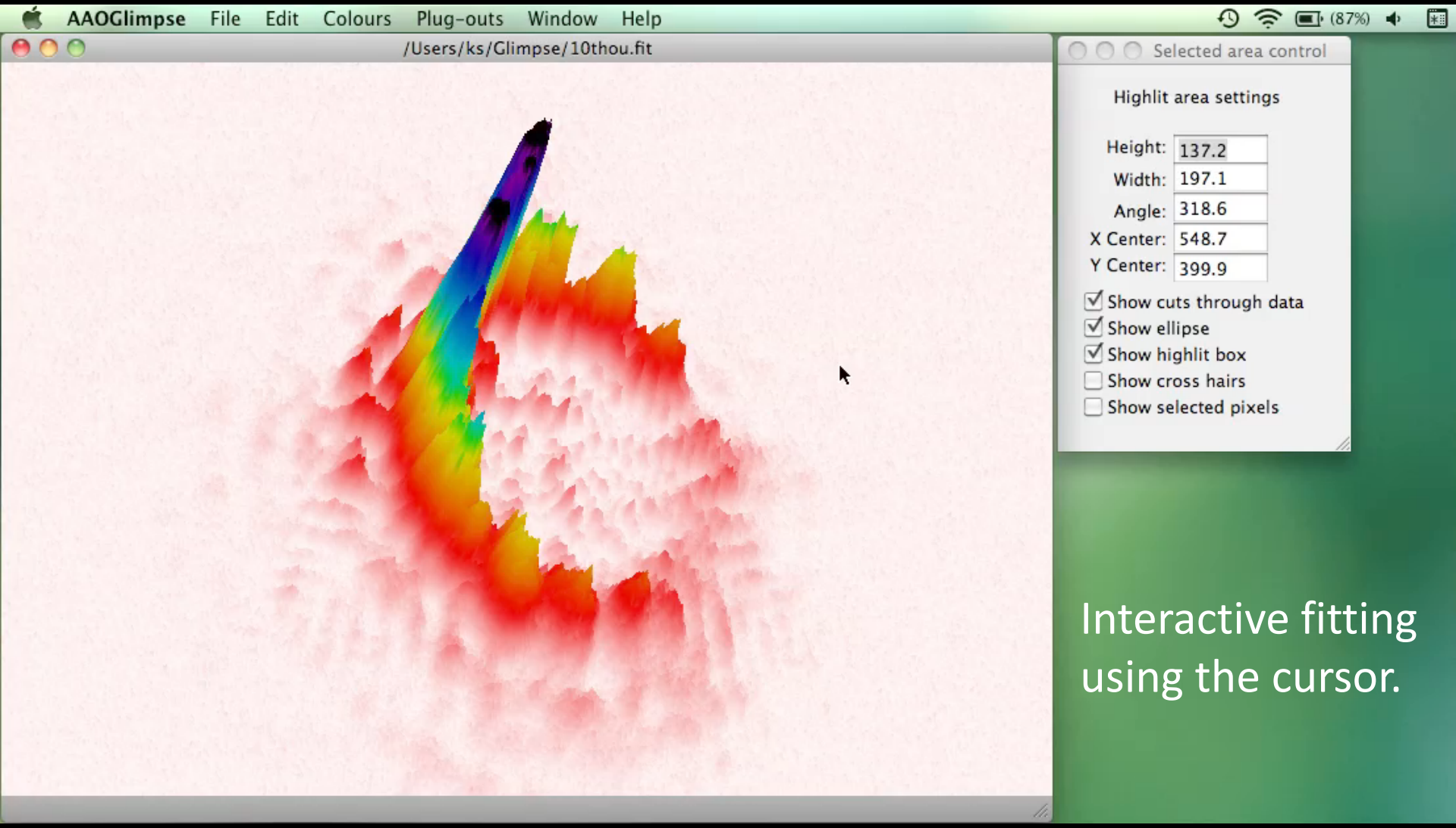
Optical Test Data Functional Requirements

Ellipse fitting - Interactive and Automatic

JPEG input



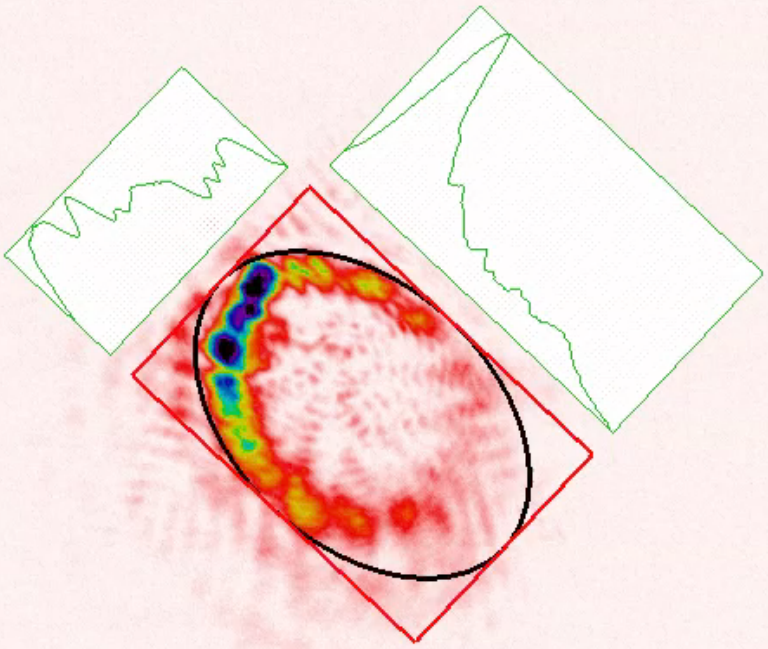
Automatic fitting using ‘plug-out’ utility programs.


AAOGlimpse File Edit Colours Plug-outs Window Help
(87%)
/Users/ks/Glimpse/10thou.fit
Selected area control
Highlit area settings
Height: 137.2
Width: 197.1
Angle: 318.6
X Center: 548.7
Y Center: 399.9
Show cuts through data
Show ellipse
Show highlit box
Show cross hairs
Show selected pixels
Interactive fitting using the cursor.

AAOGlimpse File Edit Colours Plug-outs Window Help (85%)

/Users/ks/Glimpse/10thou.fit

X: 295 Y: 274 Z: 1 Data: 0



Selected area control

Highlit area settings

Height:	133.0
Width:	200.0
Angle:	316.7
X Center:	549.8
Y Center:	397.3

- [x] Show cuts through data
- [x] Show ellipse
- [x] Show highlit box
- [ ] Show cross hairs
- [ ] Show selected pixels

A bit of fun with JPEGs

Read in using libjpeg.

Surface height depends on sum of all R,G,B colour values.

Surface colour is the R,G,B colour for each pixel.


1er Arrt
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DE
L'ÉCHELLE


MEDOVA


1er Arrt
RUE
DE
L'ÉCHELLE

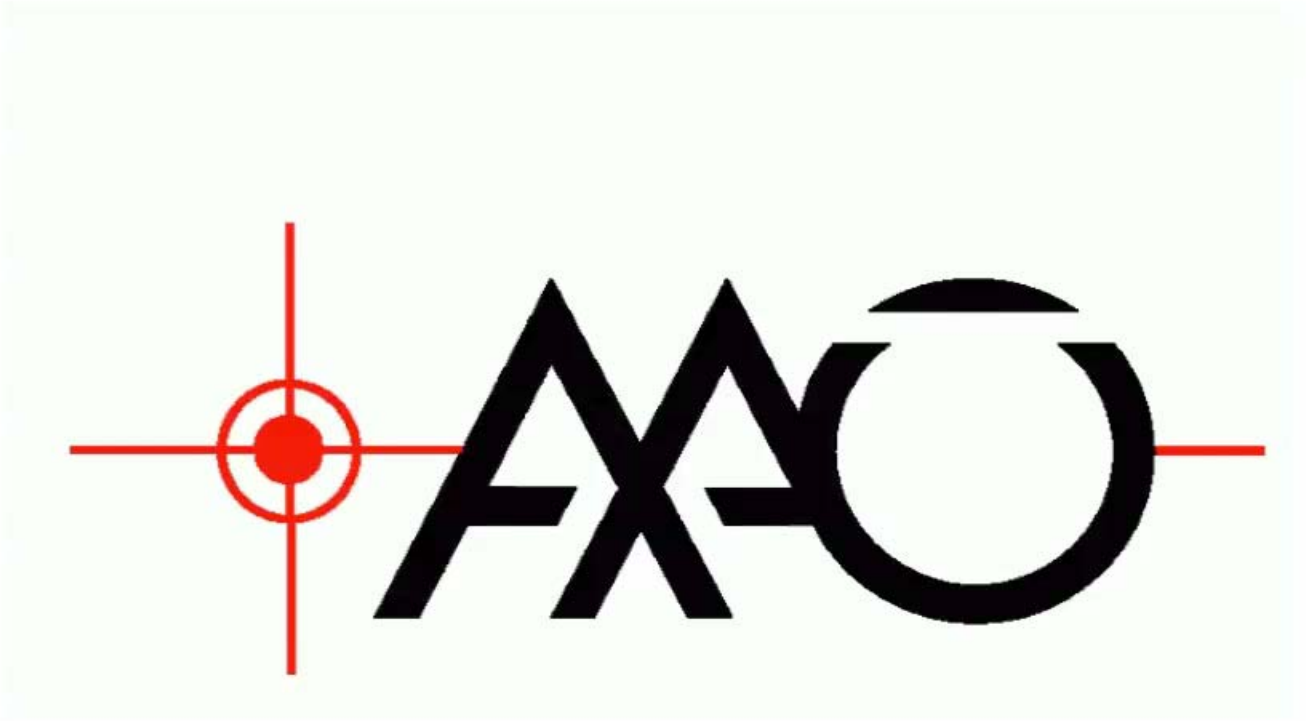
Current Status

Available for download as an OS X executable.

http://www.aao.gov.au/local/www/ks/AAODisp.html (or Google AAOGlimpse)

~8200 system-independent lines of C++
~850 OS X dependent lines of Objective-C++ (OS X user interface)

Source will be made available (following a little housekeeping).
Port to Linux or Windows should be straightforward – needs some effort.



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