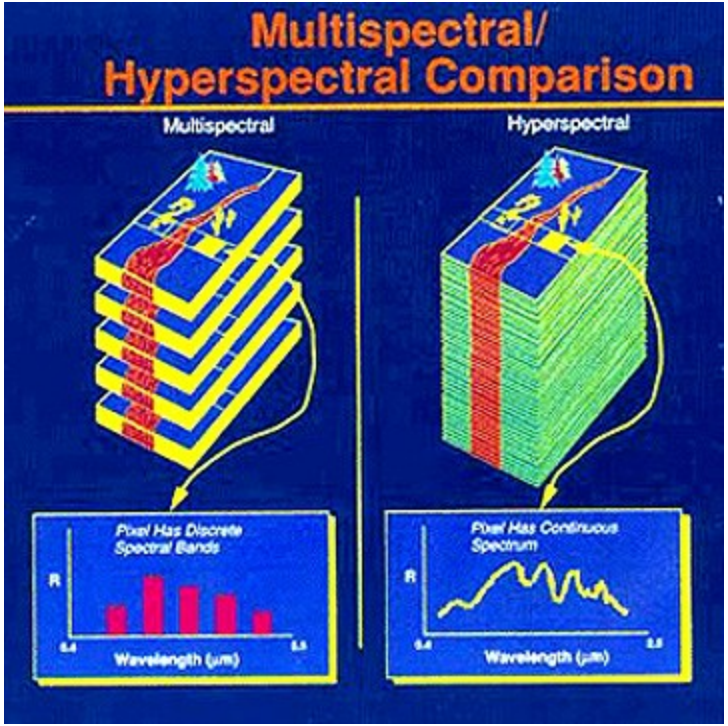
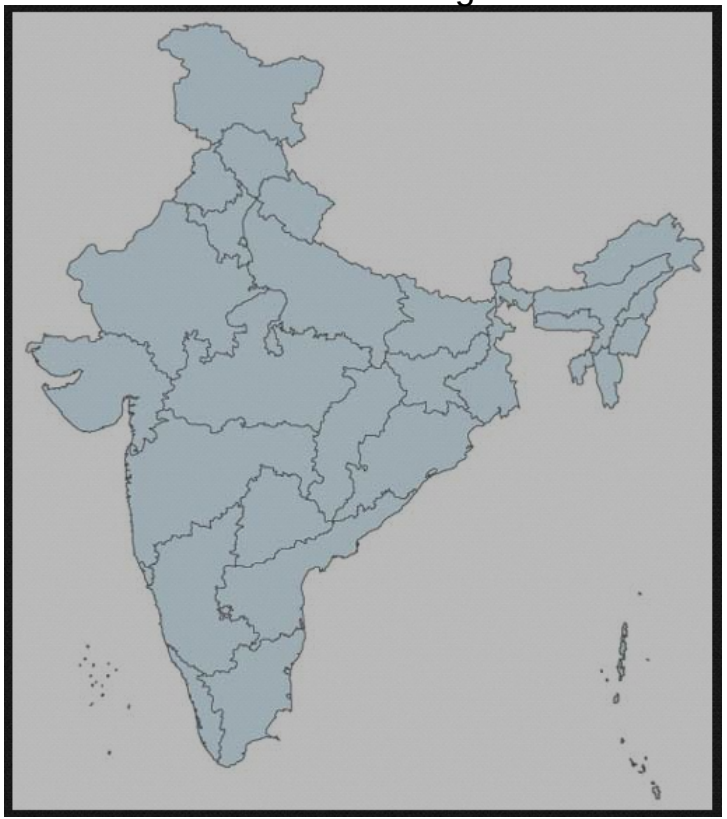
Geo-Referencing of Hyperspectral Images

Hyperspectral Imaging

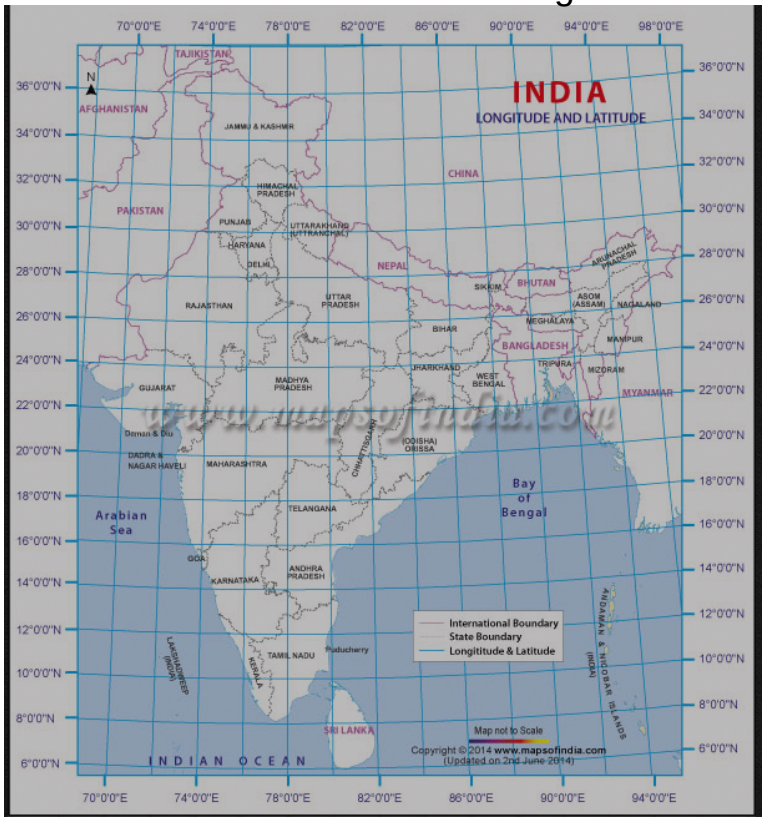


Geo-Referencing

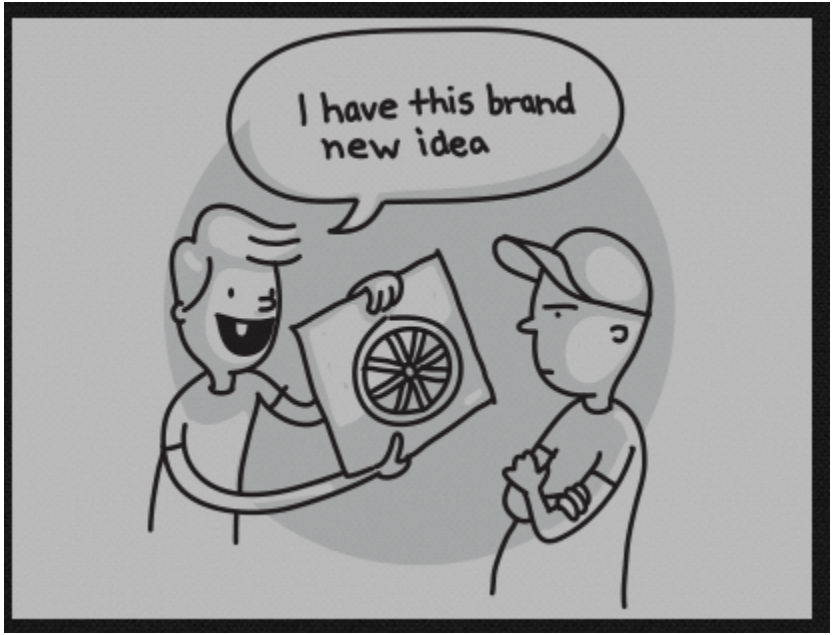
Raw Satellite Image

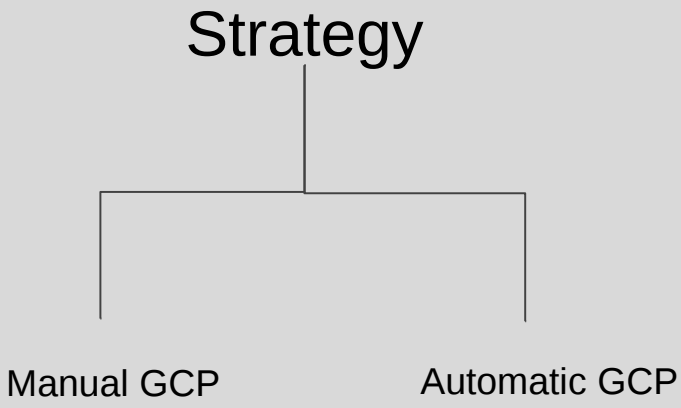


Geo-Referenced Image

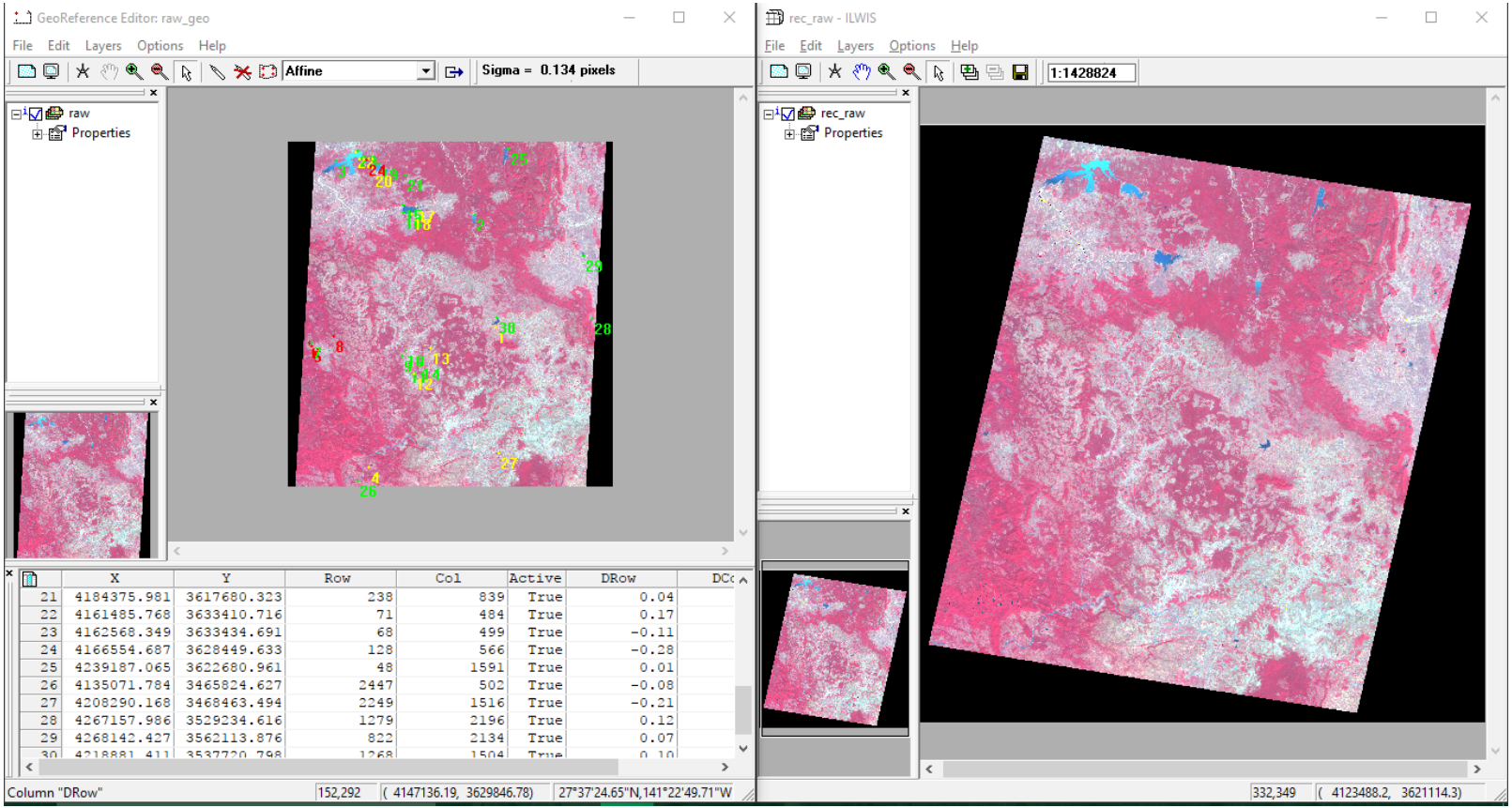


Re-Inventing the wheel ?



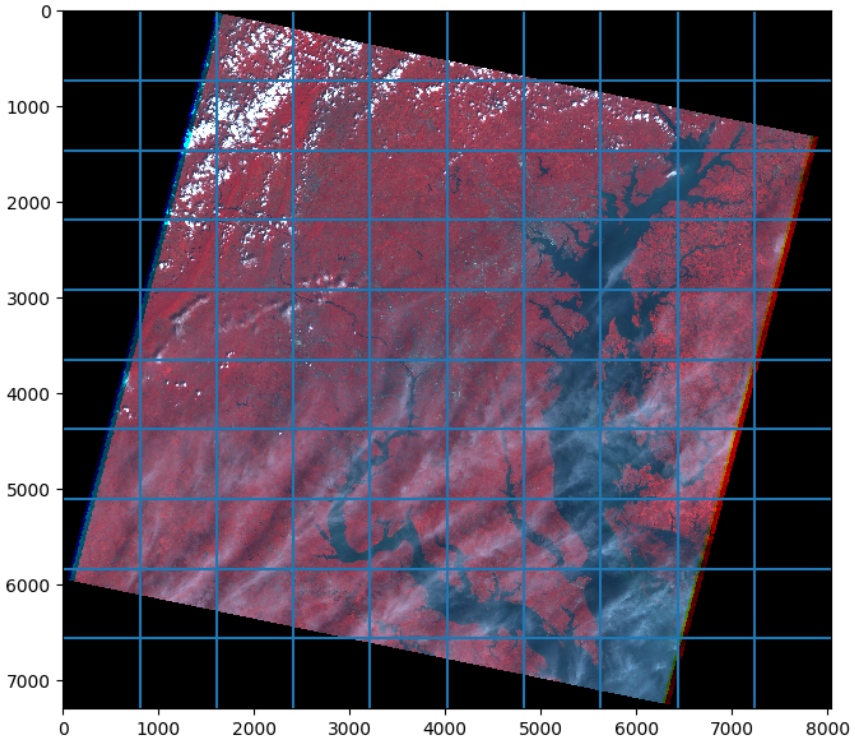

Strategy
Manual GCP
Automatic GCP

Manual GCP


GeoReference Editor: raw_geo
File Edit Layers Options Help
Affine
Sigma = 0.134 pixels
raw
Properties
rec_raw - ILWIS
File Edit Layers Options Help
1:1428824
rec_raw
Properties
X Y Row Col Active DRow
21 4184375.981 3617680.323 238 839 True 0.04
22 4161485.768 3633410.716 71 484 True 0.17
23 4162568.349 3633434.691 68 499 True -0.11
24 4166554.687 3628449.633 128 566 True -0.28
25 4239187.065 3622680.961 48 1591 True 0.01
26 4135071.784 3465824.627 2447 502 True -0.08
27 4208290.168 3468463.494 2249 1516 True -0.21
28 4267157.986 3529234.616 1279 2196 True 0.12
29 4268142.427 3562113.876 822 2134 True 0.07
Column "DRow"
152,292
(4147136.19, 3629846.78)
27°37'24.65"N,141°22'49.71"W
332,349
(4123488.2, 3621114.3)

Current Implementation

Rectified Image



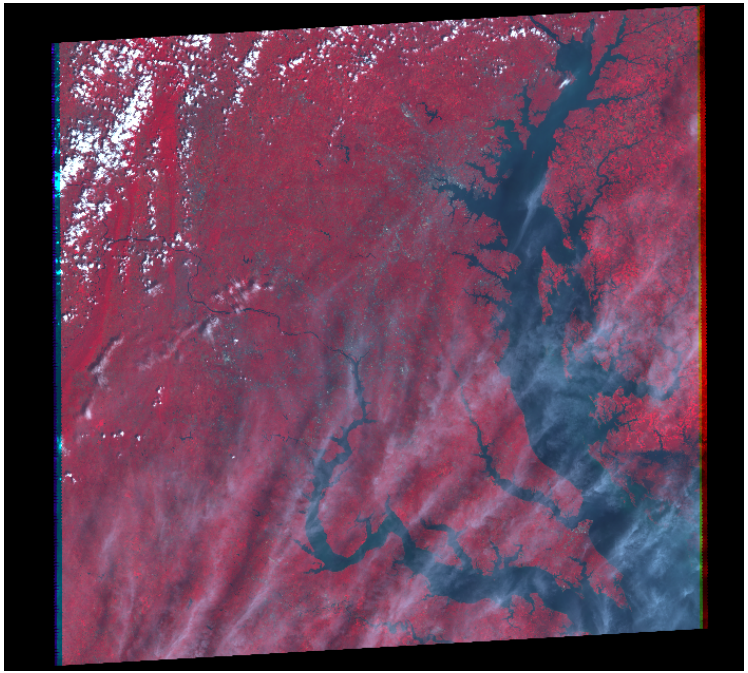
Identifying GCP’s

rec_im(x,y); raw_im(x,y)

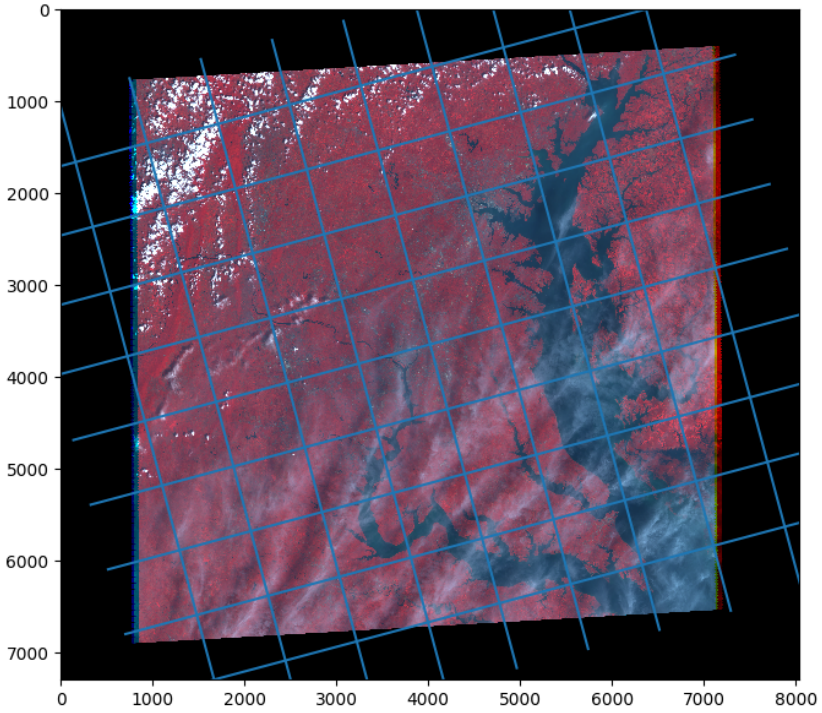
coords.txt

```
1 0,0;118,161
2 320,0;281,179
3 320,220;266,294
4 0,220;92,270
5
```

Raw image



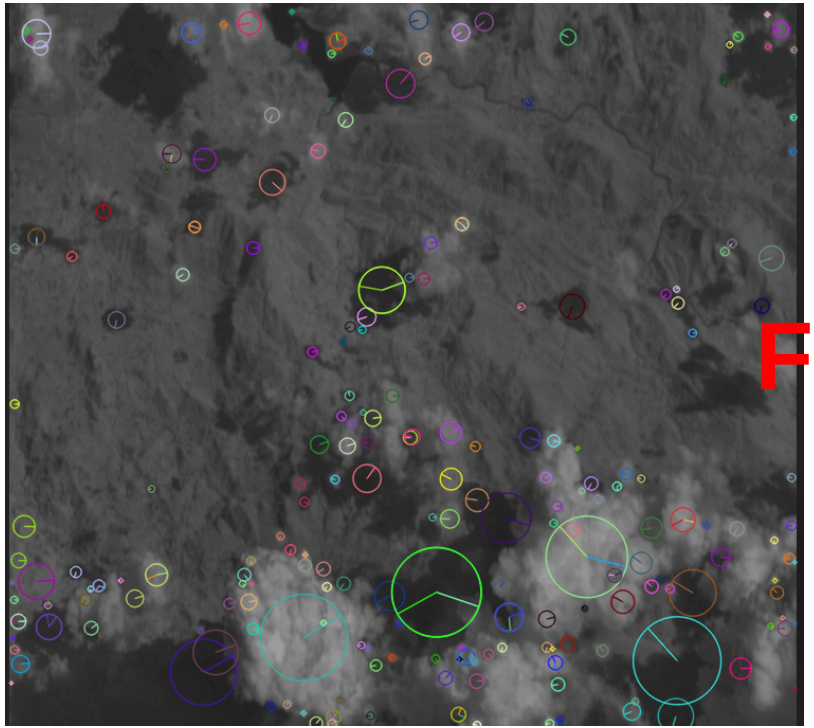
Rectified raw image



Automatic GCP

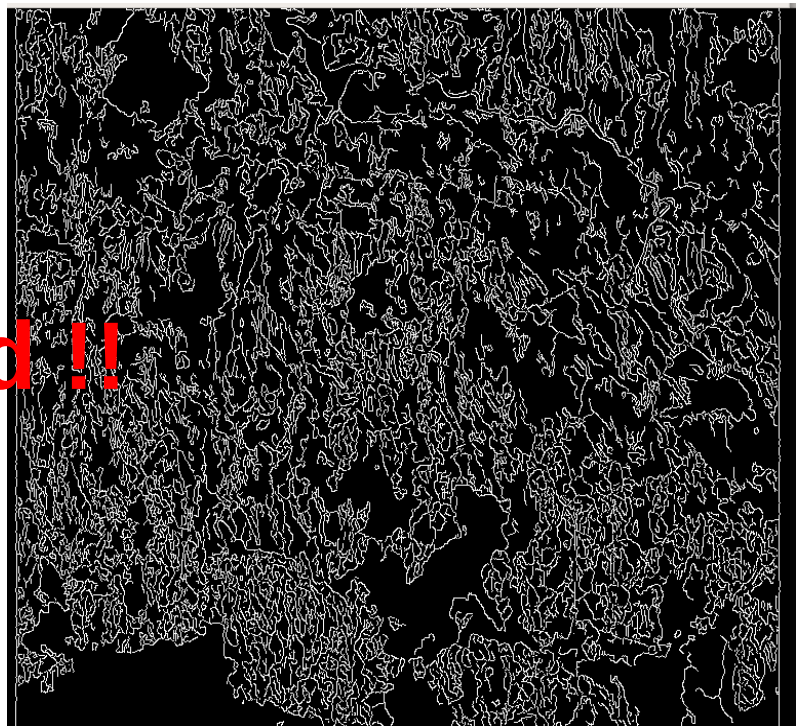
Approaches tried :

SIFT features



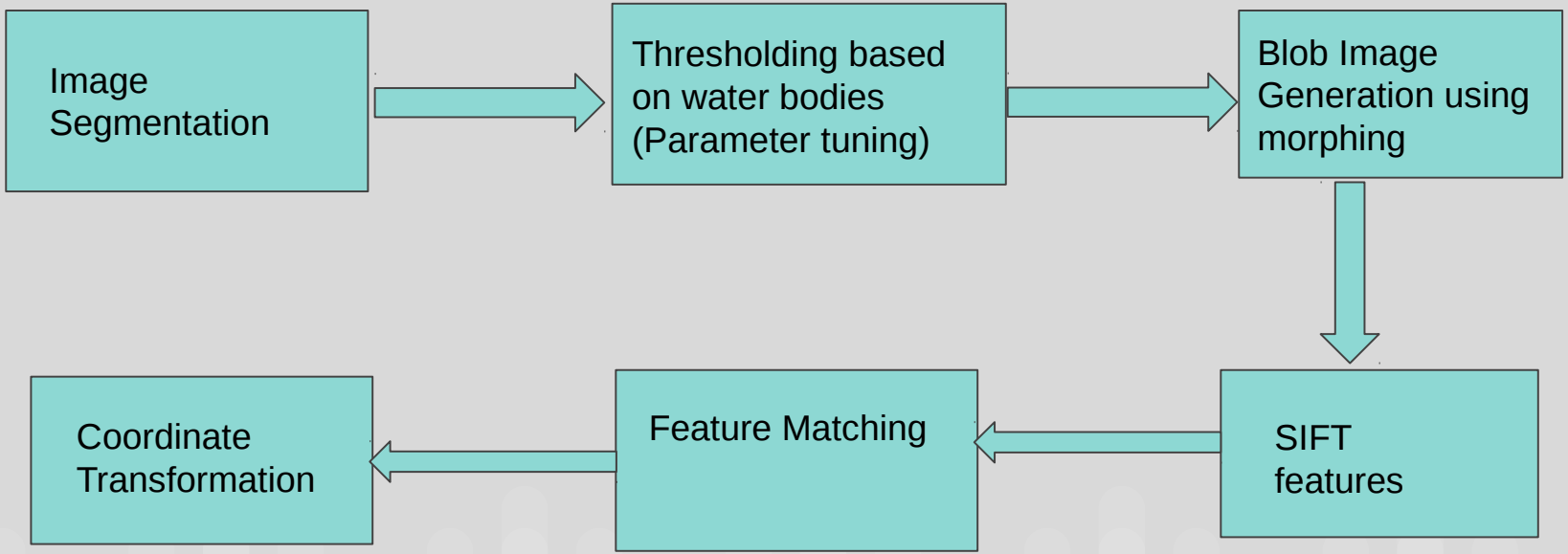
Failed !!

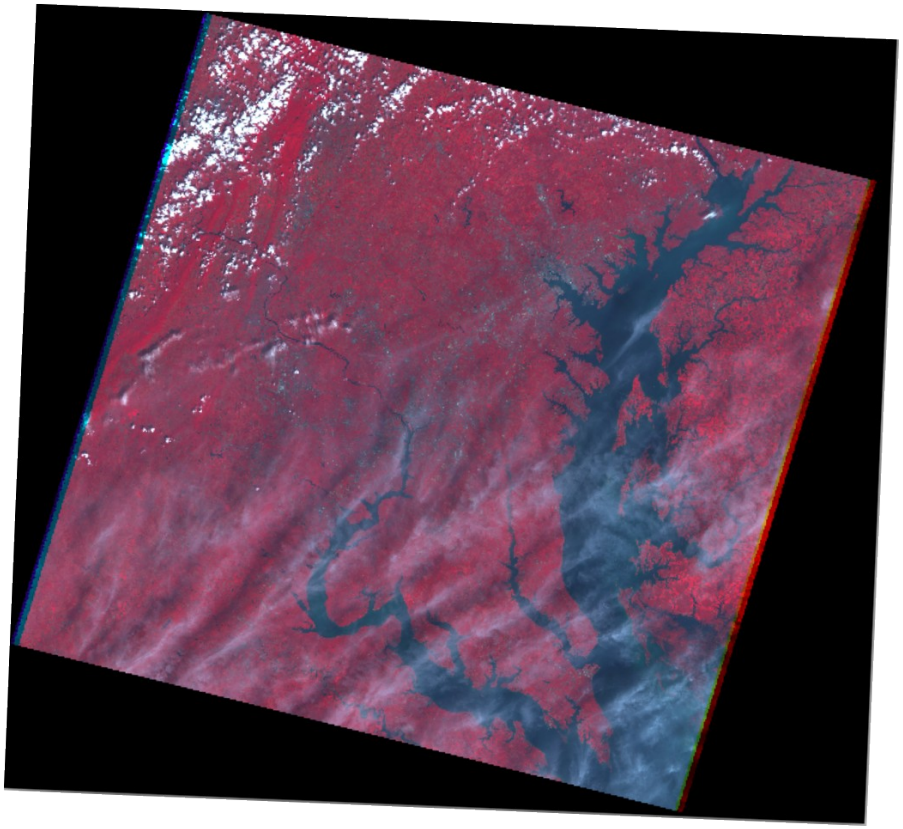
Canny edge detector



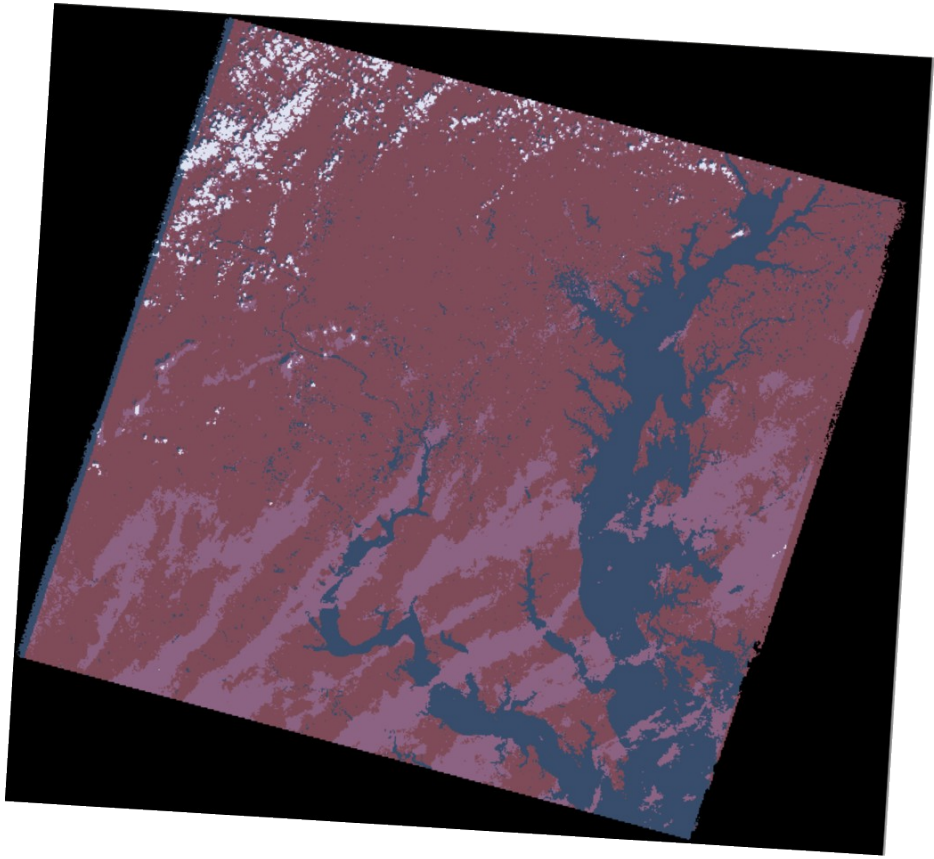
Semi-Automatic GCP

Process Pipeline

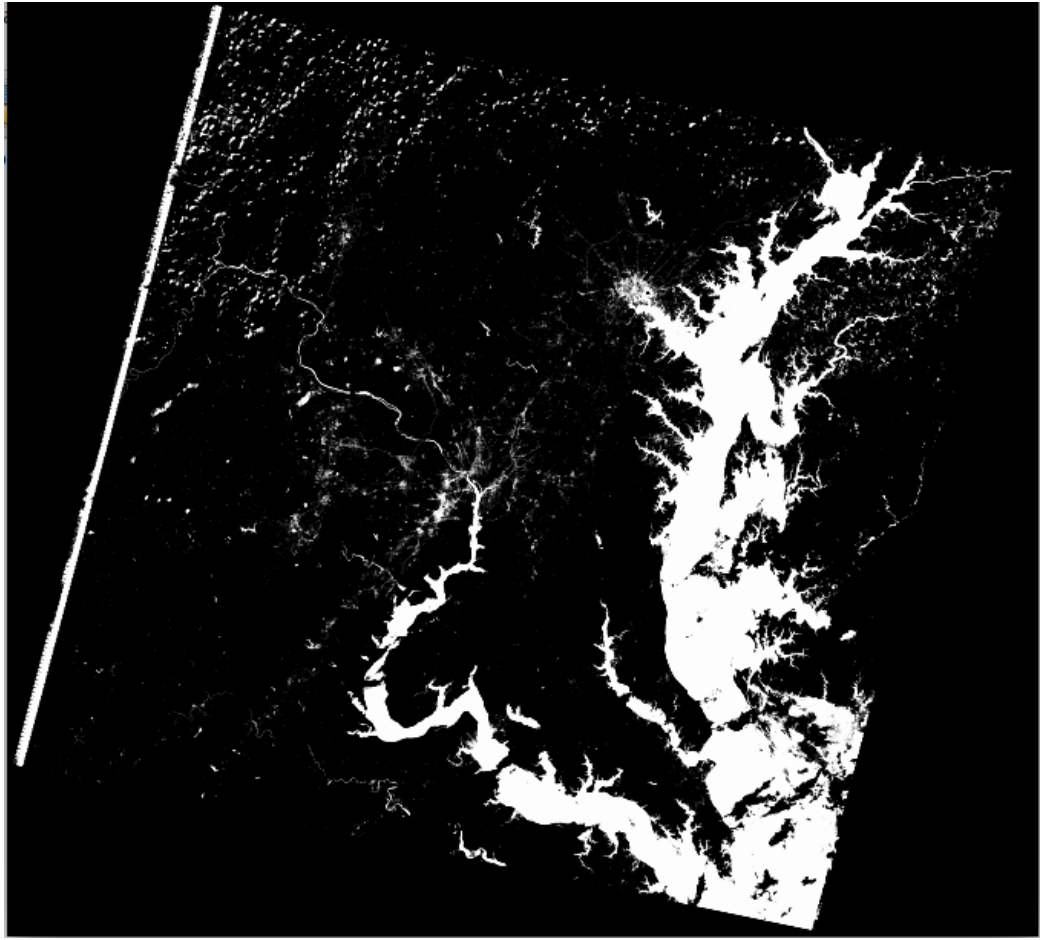




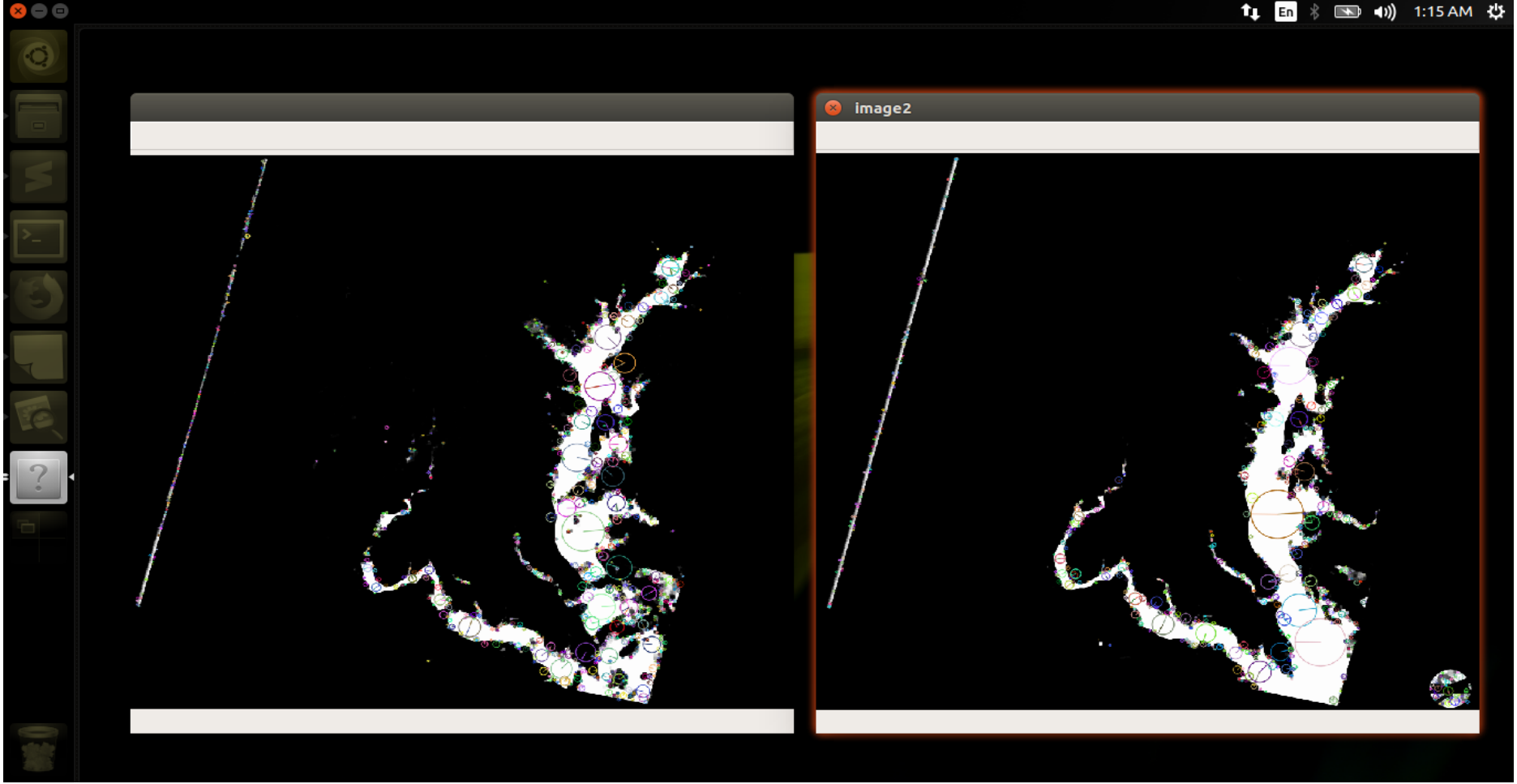
Original Image



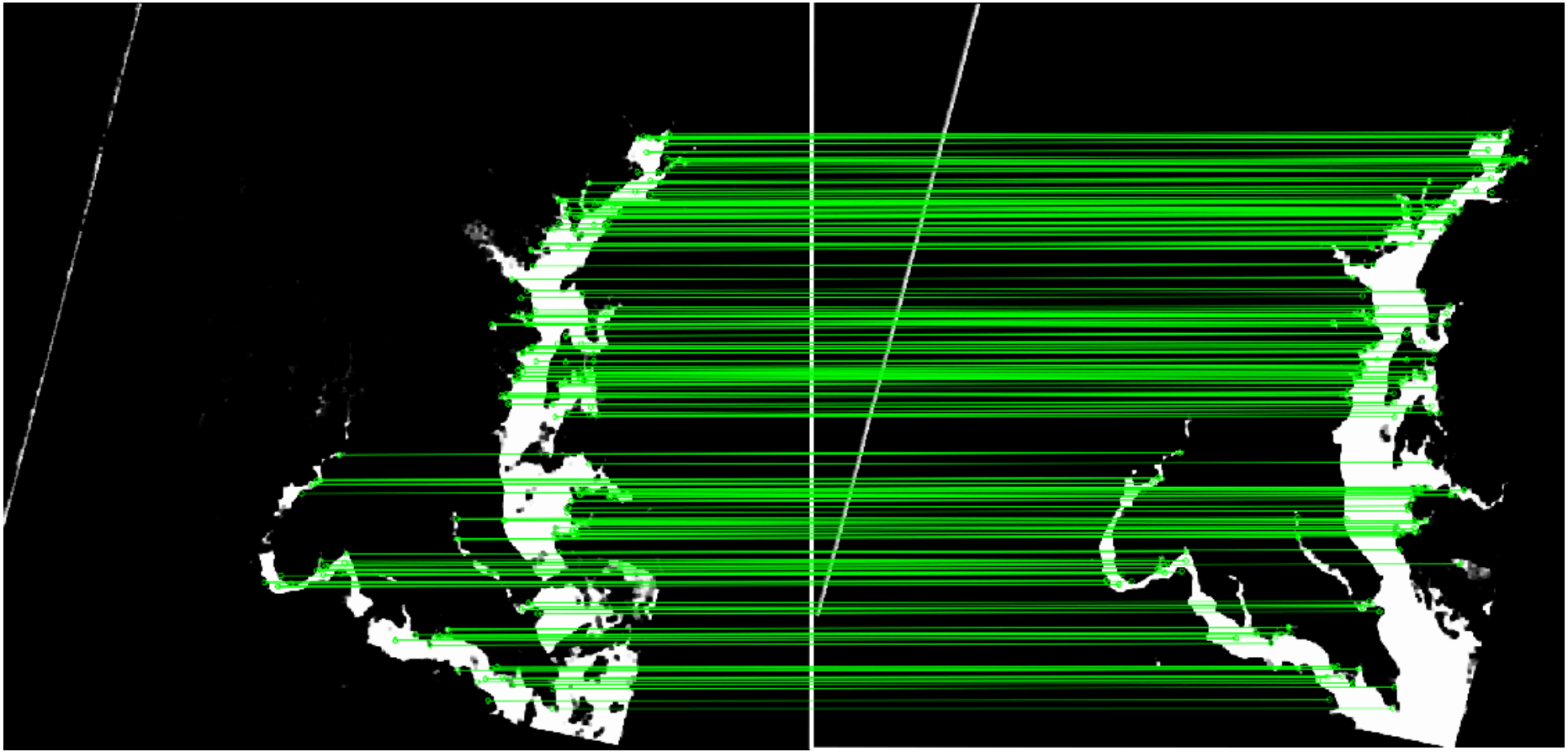
Segmented Image (K = 5)



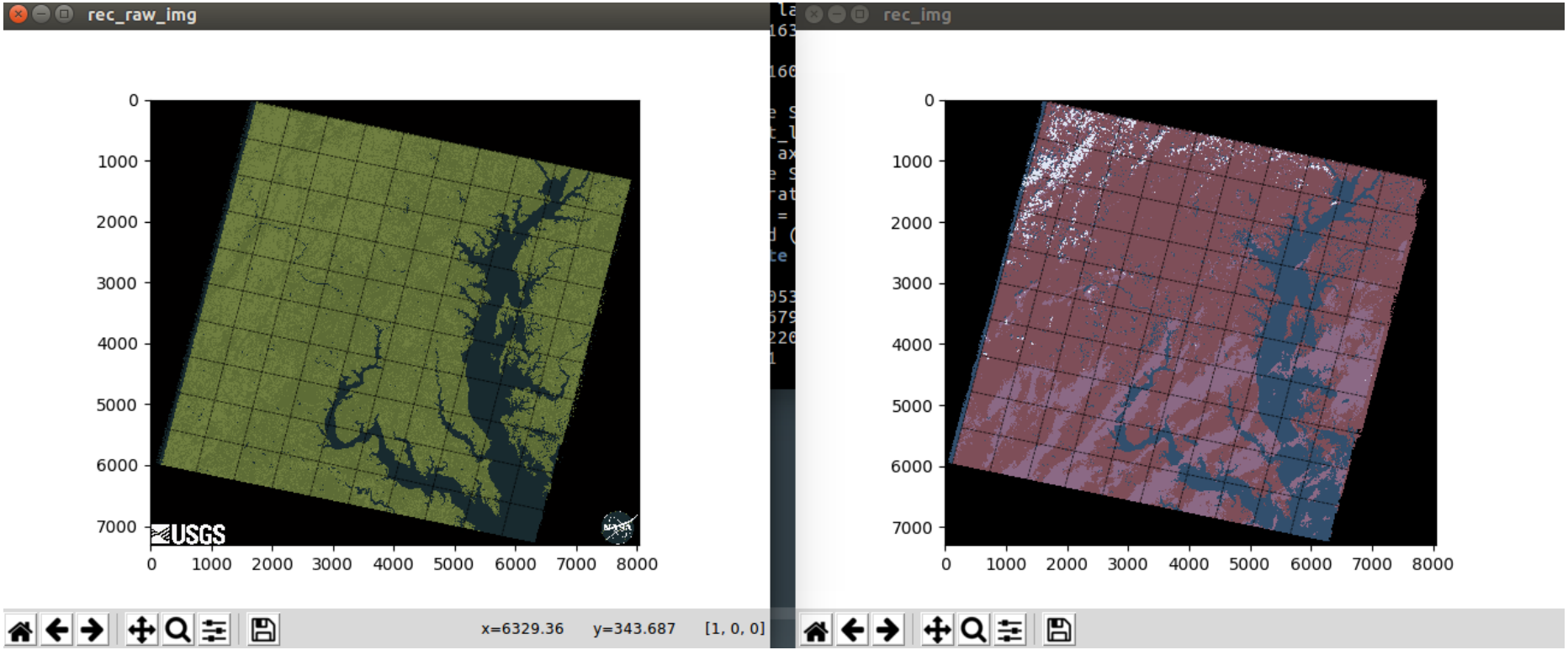
Thresholding of Image (based on water bodies)



Morphing and SIFT detection



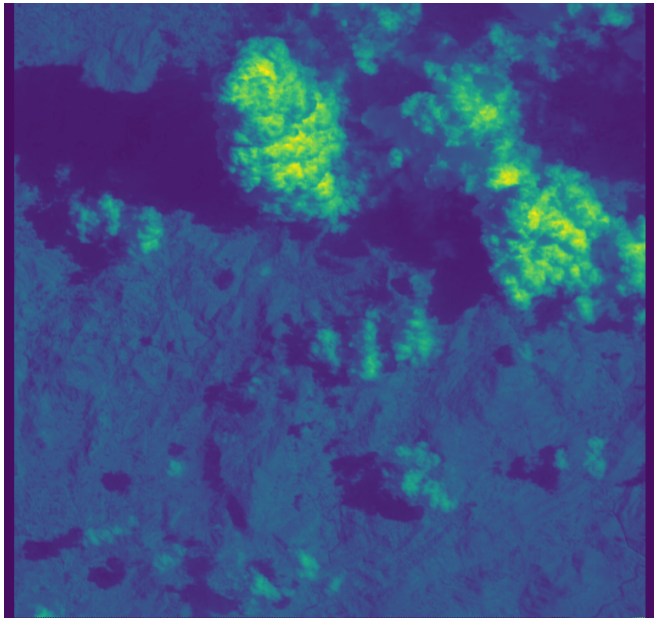
SIFT feature matching



Coordinate transformation

Challenges faced

1) Noise in Hyperspectral data:



2) Lack of sufficient data:

- CHRIS Proba-1 has no public repositories to access remote sensing data, unlike usgs.

Note:
The above technique can be extended to hyperspectral images as well, except at the last step we perform coordinate transformation on multiple layers.

DEMO !!!