Images_Day2_Part1

March 21, 2016

```
In [30]: %%bash
         pip install aplpy
         pip install https://github.com/ericmandel/pyds9/archive/master.zip
```

```
Requirement already satisfied (use --upgrade to upgrade): aplpy in /Users/adam/anaconda/envs/esopython2
Requirement already satisfied (use --upgrade to upgrade): astropy in /Users/adam/anaconda/envs/esopytho
Requirement already satisfied (use --upgrade to upgrade): numpy>=1.6.0 in /Users/adam/anaconda/envs/eso
Collecting https://github.com/ericmandel/pyds9/archive/master.zip
  Downloading https://github.com/ericmandel/pyds9/archive/master.zip (1.0MB)
  Requirement already satisfied (use --upgrade to upgrade): pyds9==1.8.1 from https://github.com/ericma
Requirement already satisfied (use --upgrade to upgrade): six in /Users/adam/anaconda/envs/esopython201
```

```
In [31]: %%bash
         curl -O https://astropy.stsci.edu/data/galactic_center/gc_bolocam_gps.fits
         curl -O https://astropy.stsci.edu/data/galactic_center/gc_2mass_k.fits
```

```
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100 1605k  100 1605k    0     0   739k      0  0:00:02  0:00:02 --:--:--  740k
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100 1020k  100 1020k    0     0   435k      0  0:00:02  0:00:02 --:--:--  435k
```

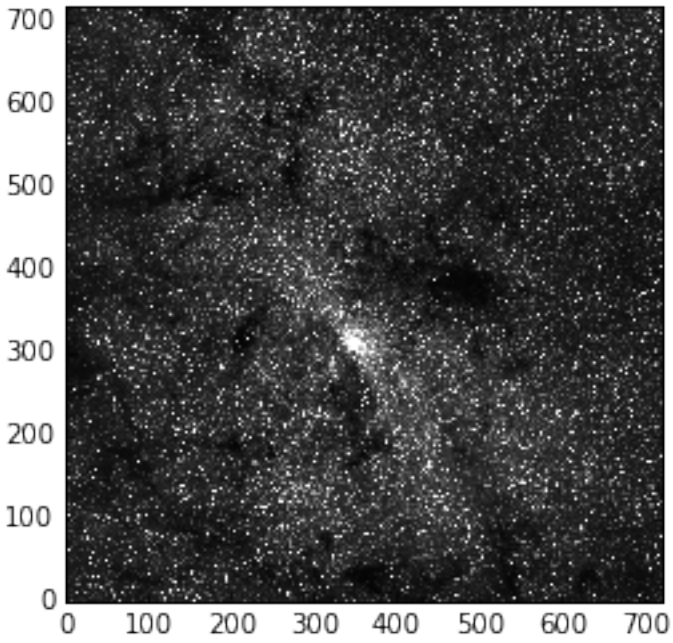
```
In [32]: %matplotlib inline
         import pylab as pl
```

```
In [33]: from astropy.io import fits
```

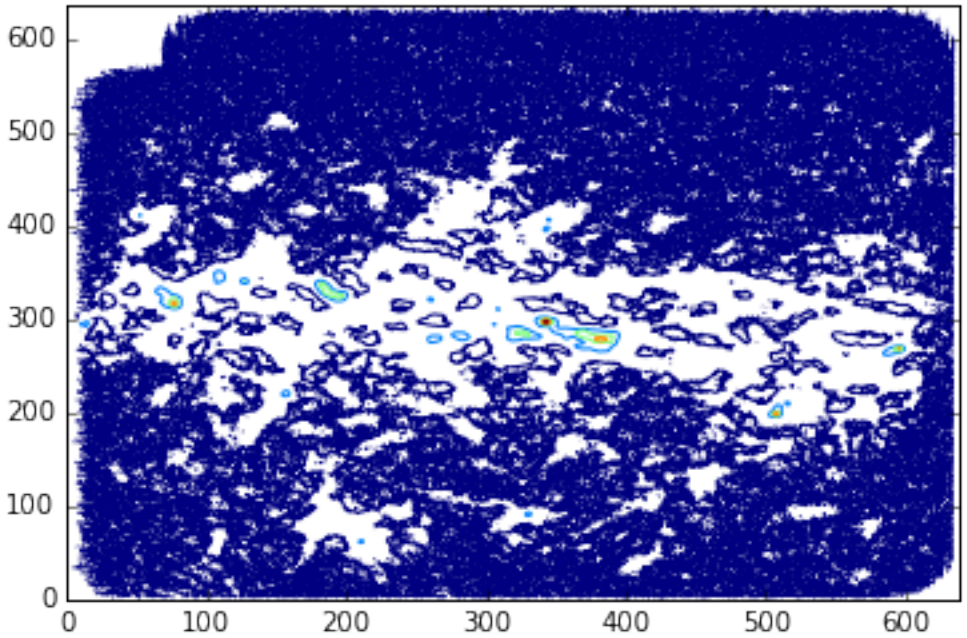
```
In [34]: stellardata = fits.getdata('gc_2mass_k.fits')
```

```
In [35]: pl.imshow(stellardata, cmap=pl.cm.gray, vmax=1000)
```

```
Out[35]: <matplotlib.image.AxesImage at 0x11f17b4e0>
```

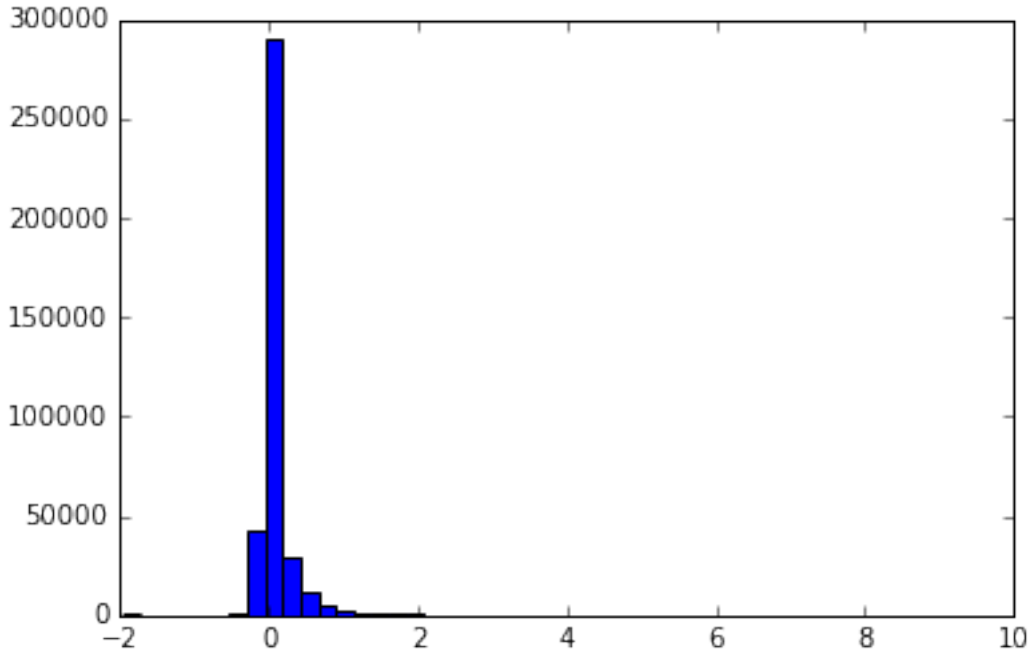



```
In [36]: dustdata = fits.getdata('gc_bolocam_gps.fits')

In [37]: pl.contour(dustdata)

Out[37]: <matplotlib.contour.QuadContourSet at 0x11f333a20>
```



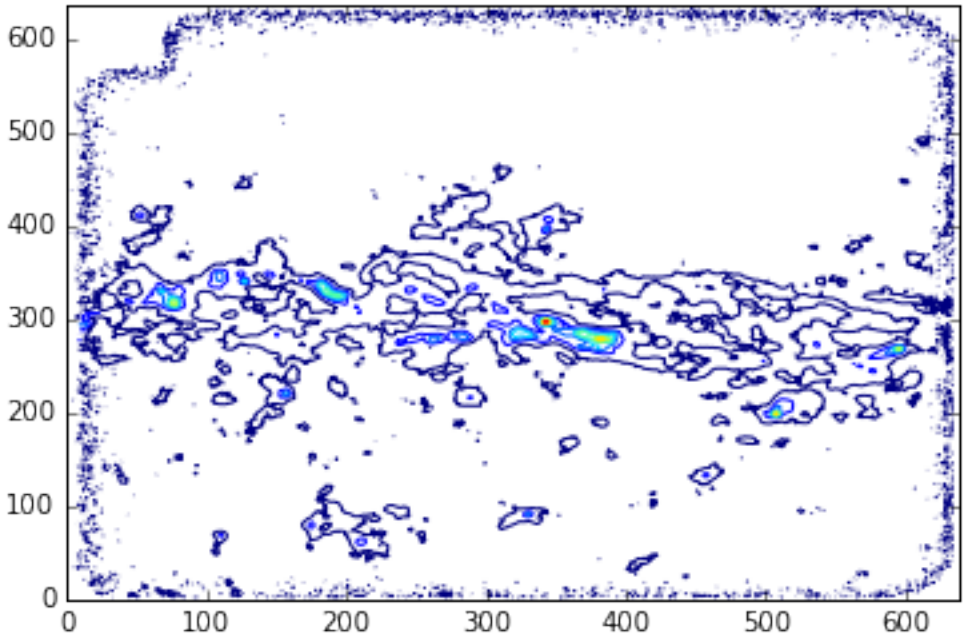
In [38]:
```
# pl.hist(dustdata.flatten(), bins=50)
pl.hist(dustdata[np.isfinite(dustdata)], bins=50)
```

Out[38]:
```
(array([  1.00000000e+00,   3.00000000e+00,   4.00000000e+00,
          4.00000000e+00,   3.10000000e+01,   1.46000000e+02,
          1.27700000e+03,   4.25890000e+04,   2.89834000e+05,
          2.97930000e+04,   1.11970000e+04,   5.02900000e+03,
          2.38000000e+03,   1.46500000e+03,   9.86000000e+02,
          7.11000000e+02,   4.68000000e+02,   3.19000000e+02,
          2.79000000e+02,   2.58000000e+02,   1.84000000e+02,
          1.81000000e+02,   1.33000000e+02,   1.02000000e+02,
          8.90000000e+01,   8.20000000e+01,   6.90000000e+01,
          6.10000000e+01,   5.10000000e+01,   5.00000000e+01,
          3.50000000e+01,   1.90000000e+01,   1.80000000e+01,
          1.80000000e+01,   7.00000000e+00,   9.00000000e+00,
          7.00000000e+00,   1.10000000e+01,   2.00000000e+00,
          4.00000000e+00,   5.00000000e+00,   2.00000000e+00,
          1.00000000e+00,   0.00000000e+00,   2.00000000e+00,
          2.00000000e+00,   0.00000000e+00,   2.00000000e+00,
          0.00000000e+00,   1.00000000e+00]),
 array([-1.94999576, -1.71324491, -1.47649406, -1.23974322, -1.00299237,
        -0.76624153, -0.52949068, -0.29273983, -0.05598899,  0.18076186,
         0.4175127 ,  0.65426355,  0.89101439,  1.12776524,  1.36451609,
         1.60126693,  1.83801778,  2.07476862,  2.31151947,  2.54827032,
         2.78502116,  3.02177201,  3.25852285,  3.4952737 ,  3.73202455,
         3.96877539,  4.20552624,  4.44227708,  4.67902793,  4.91577878,
         5.15252962,  5.38928047,  5.62603131,  5.86278216,  6.099533  ,
         6.33628385,  6.5730347 ,  6.80978554,  7.04653639,  7.28328723,
         7.52003808,  7.75678893,  7.99353977,  8.23029062,  8.46704146,
         8.70379231,  8.94054316,  9.177294  ,  9.41404485,  9.65079569,
         9.88754654]),
 <a list of 50 Patch objects>)
```



```
In [39]: pl.contour(dustdata, levels=np.linspace(0.2,10,10))
```

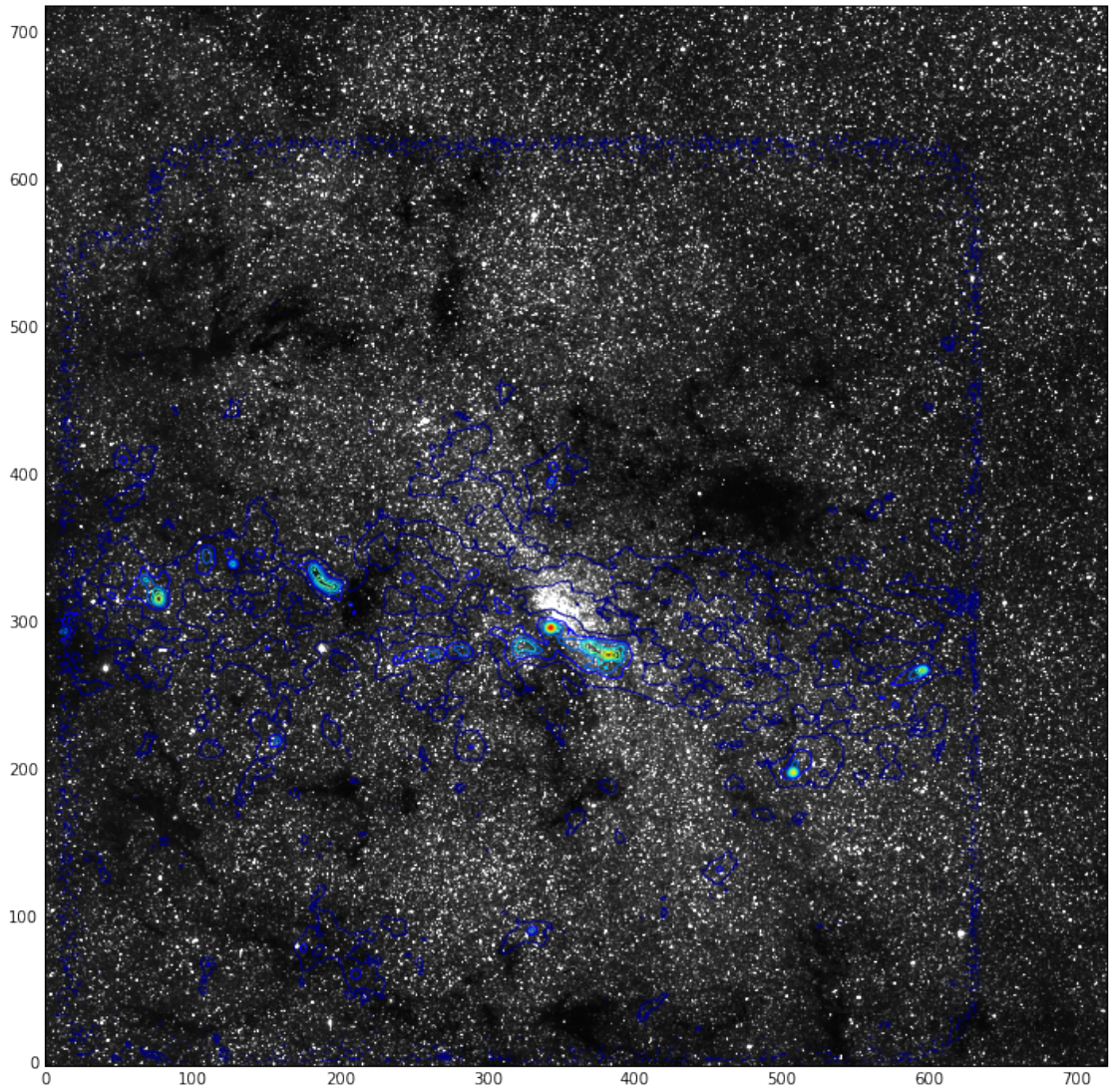
```
Out[39]: <matplotlib.contour.QuadContourSet at 0x119e72e48>
```



An example of why overplotting directly doesn't work:

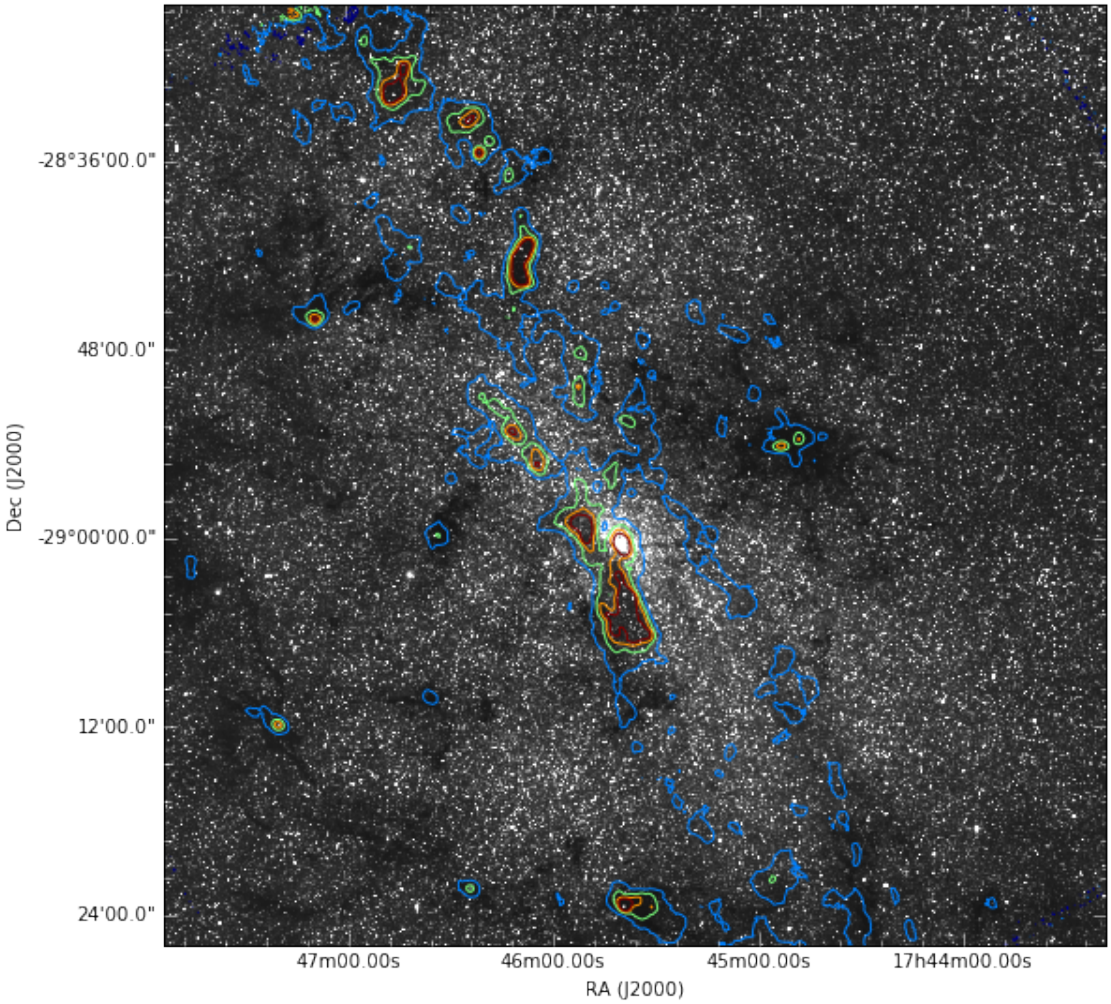
```
In [40]: pl.figure(figsize=(12,12))
         pl.imshow(stellardata, cmap=pl.cm.gray, vmax=1000)
         pl.contour(dustdata, levels=np.linspace(0.2,10,10))
```

```
Out[40]: <matplotlib.contour.QuadContourSet at 0x11a6747f0>
```




```
In [41]: import aplpy

In [42]: F = aplpy.FITSFigure('gc_2mass_k.fits')
         F.show_grayscale(vmax=1000)
         F.show_contour('gc_bolocam_gps.fits', convention='calabretta')
```

```
/Users/adam/anaconda/envs/esopython2016/lib/python3.5/site-packages/matplotlib/artist.py:221: MatplotlibDeprecationWarning: get_axes has been deprecated in mpl 1.5, please use the
axes property.  A removal date has not been set.
  warnings.warn(_get_axes_msg, mplDeprecation, stacklevel=1)

INFO: Auto-setting vmin to  4.221e+02 [aplpy.core]

WARNING: FITSFixedWarning: LONPOLE2= 180.000000000 /lonpole
invalid alternate code, keyword resembles LONPOLEa but isn't. [astropy.wcs.wcs]
WARNING: FITSFixedWarning: LATPOLE2= 0.00000000000 /latpole
invalid alternate code, keyword resembles LATPOLEa but isn't. [astropy.wcs.wcs]
```




```
In [43]: import pyds9

In [47]: DD = pyds9.DS9('mine')

In [48]: DD.set('frame 1')
         DD.set_pyfits(fits.open('gc_2mass_k.fits'))

Out[48]: 1

In [49]: DD.set('frame lock wcs')
         DD.set('frame 2')
         DD.set_pyfits(fits.open('gc_bolocam_gps.fits'))

Out[49]: 1

In [50]: DD.set('blink')

Out[50]: 1
```

0.1 Exercises

1. Using the `gc_2mass_k.fits` image & aplpy, make a finder chart of the galactic center

- add a scalebar
- make nicer contours
- adjust the scaling
- add a colorbar
- Recenter & zoom on a particular object

In [ ]: