DAOPHOT INSTRUCTIONS

05/31/2016

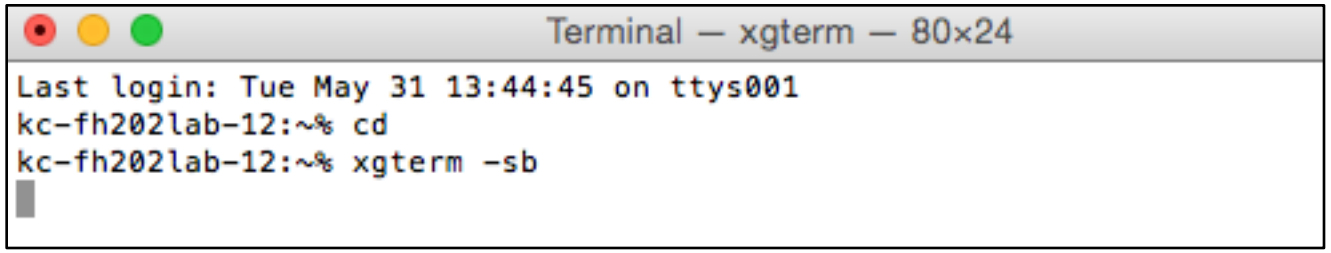
Danny Shanaberger

Gillen Brown

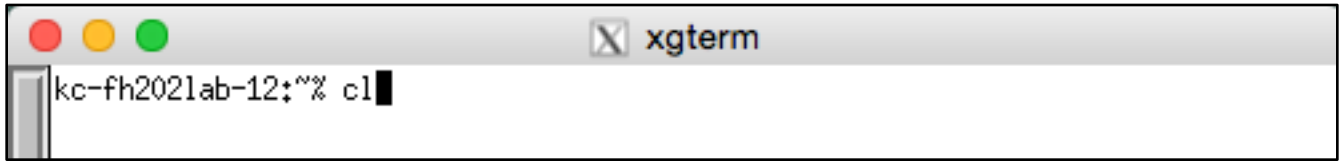
Dr. Krystal Tyler

UMKC Galaxy Evolution Group

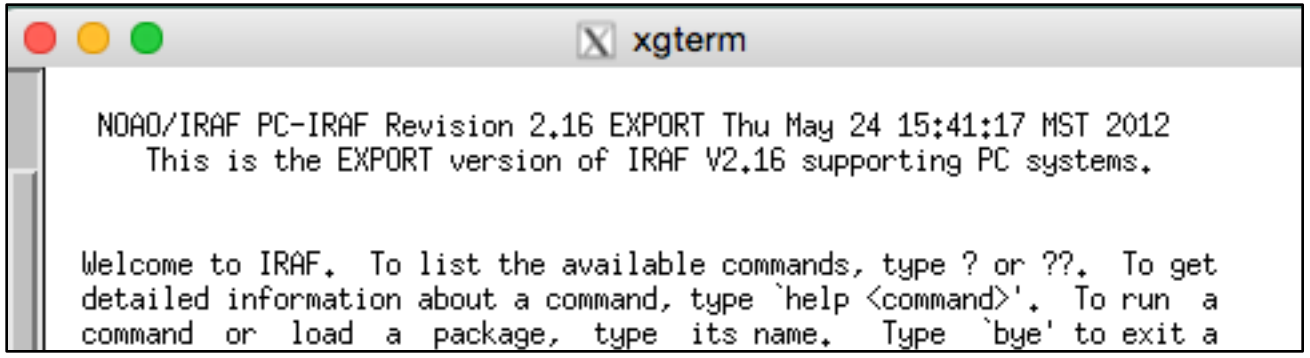
change directories to the location of login.cl and open a xgterm



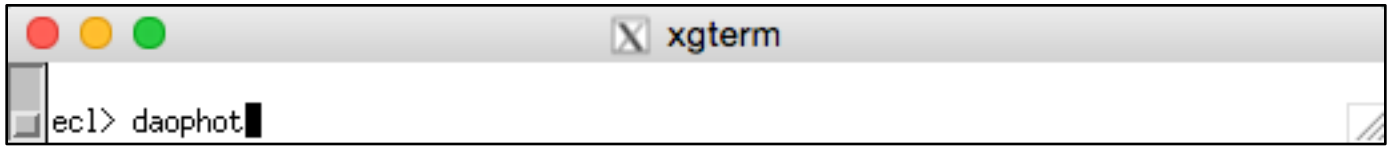
use command line in xgterm to enter iraf



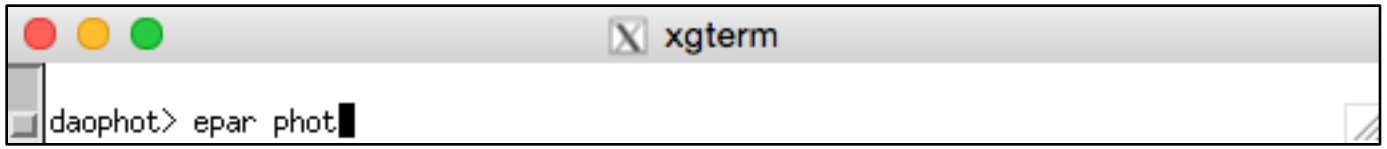
iraf welcome text



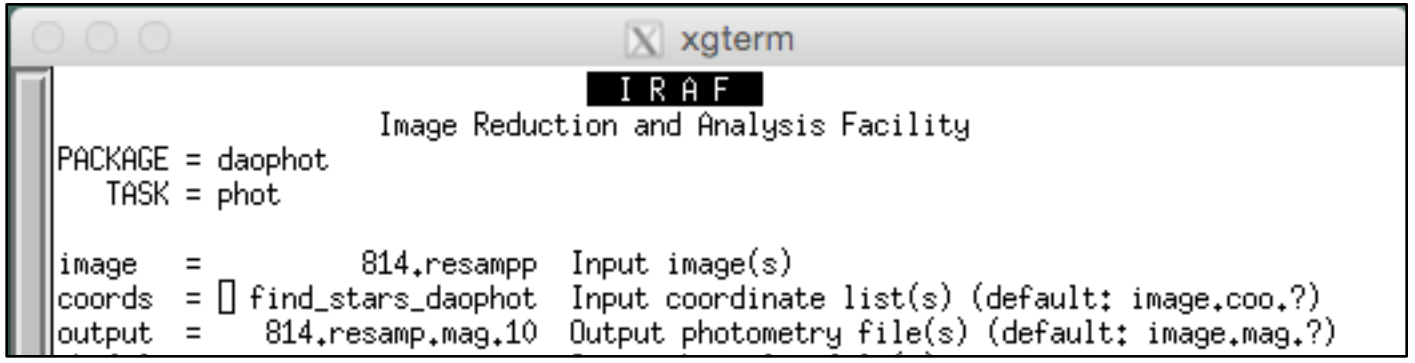
enter daophot package



open the phot task parameter file



edit the phot task



epar task # opens the task parameter file
ctrl d # close and save task parameter file
http://iraf.noao.edu/tips/cl.html # more iraf tips

xgterm

```
                                  I R A F
                       Image Reduction and Analysis Facility
PACKAGE = daophot
   TASK = phot

image   =          814.resampp  Input image(s)
coords  = find_stars_daophot  Input coordinate list(s) (default: image.coo.?)
output  =    814.resamp.mag.10  Output photometry file(s) (default: image.mag.?)
skyfile =                      Input sky value file(s)
(plotfil=                    ) Output plot metacode file
(datapar=                    ) Data dependent parameters
(centerp=                    ) Centering parameters
(fitskyp=                    ) Sky fitting parameters
(photpar=                    ) Photometry parameters
(interac=                   no) Interactive mode?
(radplot=                   no) Plot the radial profiles?
(icomman=                    ) Image cursor: [x y wcs] key [cmd]
(gcomman=                    ) Graphics cursor: [x y wcs] key [cmd]
(wcsin  =              logical) The input coordinate system (logical,tv,physical
(wcsout =              logical) The output coordinate system (logical,tv,physica
(cache  =            )_.cache) Cache the input image pixels in memory?
(verify =           )_.verify) Verify critical phot parameters?
(update =           )_.update) Update critical phot parameters?
(verbose=          )_.verbose) Print phot messages?
(graphic=         )_.graphics) Graphics device
(display=          )_.display) Display device
(mode   =                  ql)
```

daophot assumes the input image is a .fits

a two column text file of star centroids

find_stars_daophot

```
1490.4595 37.6459
2013.1876 74.4881
1113.5857 409.7739
1090.6927 432.9072
194.4265 461.5694
550.6296 813.8557
1100.4646 858.9034
```

use epar to edit these daophot tasks before running phot

iraf tasks are sensitive to coordinate type:
world = sky coordinates/radec
logical = pixel/image coordinates

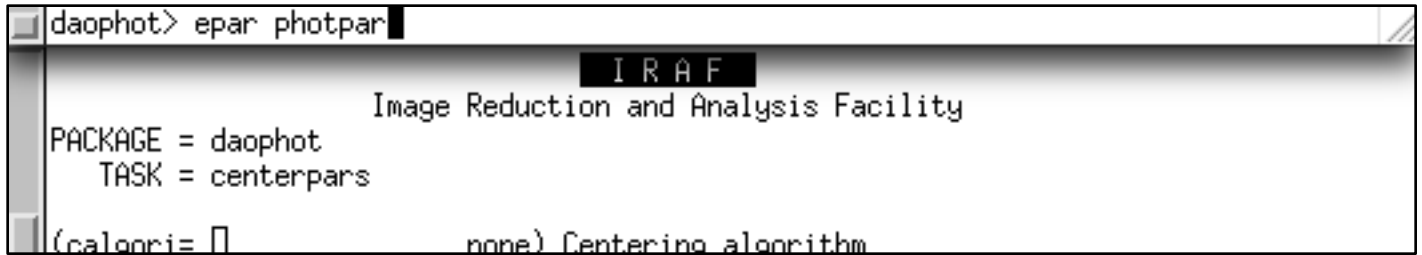
http://stsdas.stsci.edu/cgi-bin/gethelp.cgi?phot

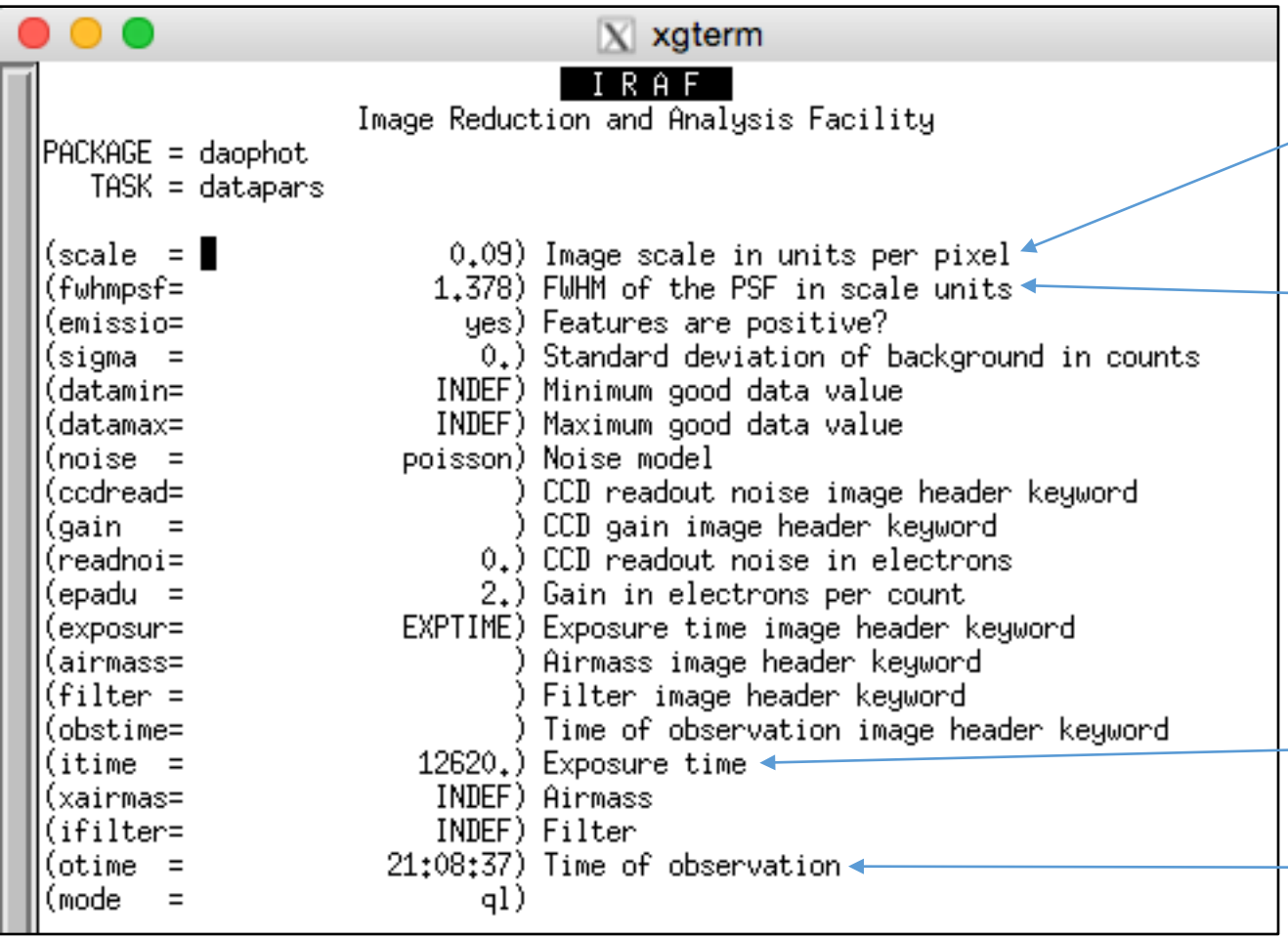
edit the datapar task with epar

edit the centerp task with epar

edit the fitskyp task with epar

edit the photpar task with epar





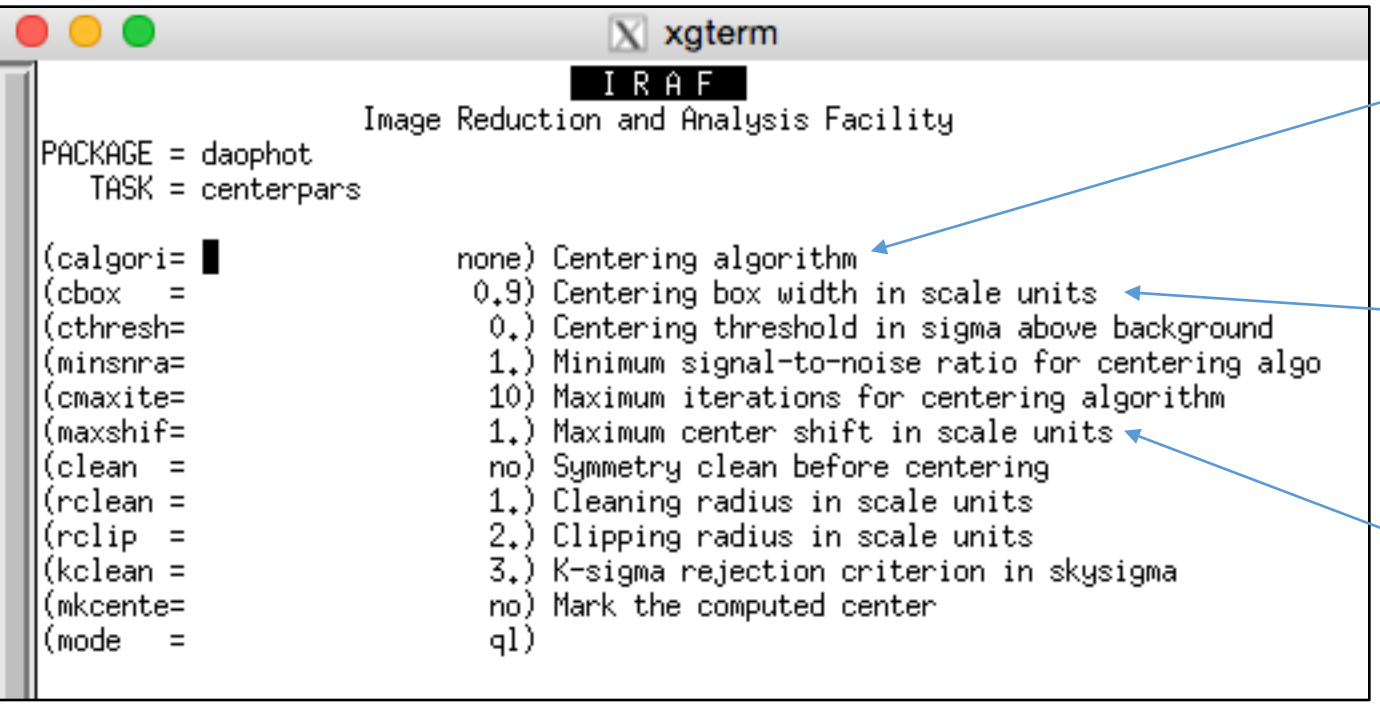
in arcseconds per pixel

in arcseconds

in seconds

not needed by phot, but stored for further calibration

http://stsdas.stsci.edu/cgi-bin/gethelp.cgi?datapars



Centering algorithm options:

none: uses initial centroids

centroid: intensity weighted means

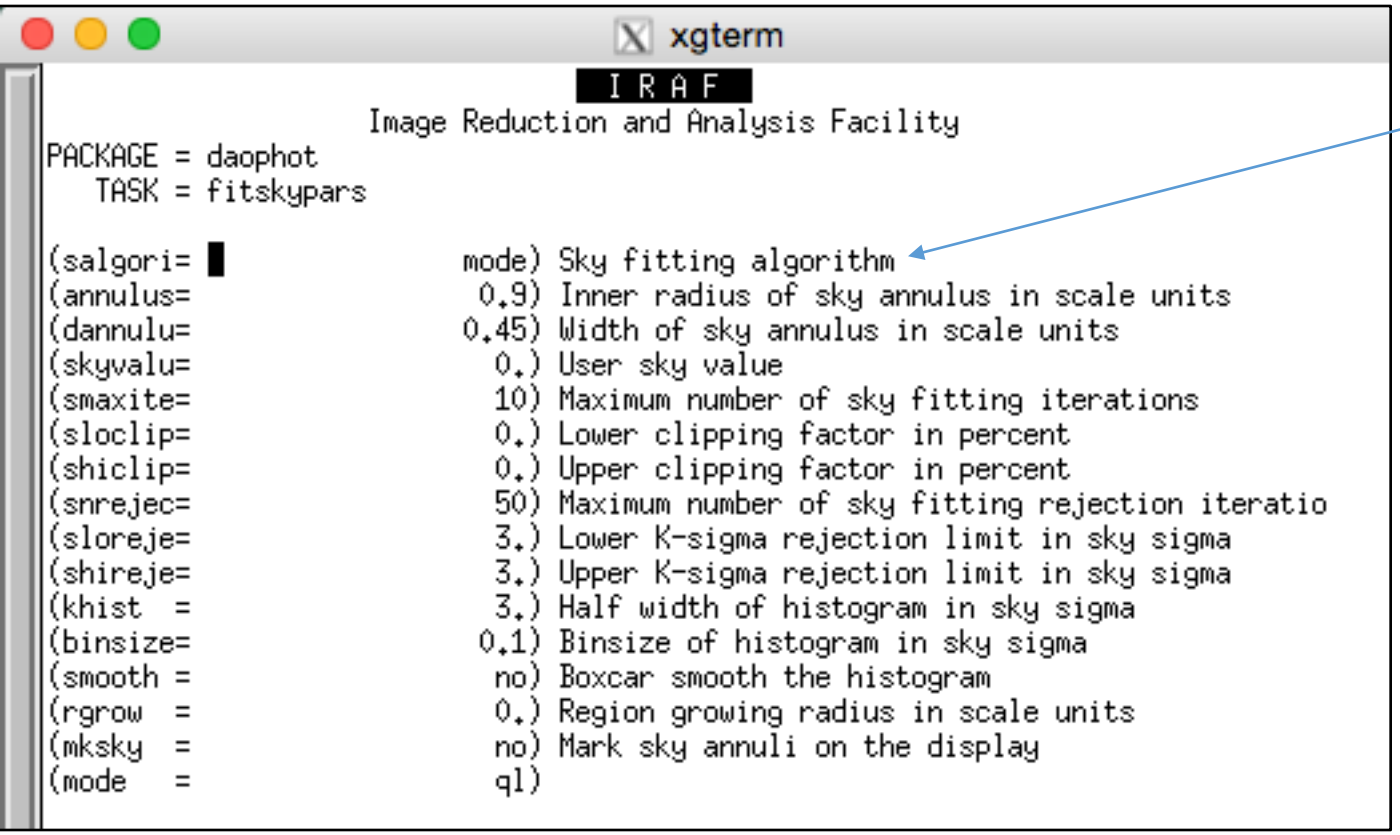
gauss: gaussian fitting

ofilter: triangular fitting

Defines the object pixels to be used in the fitting. Should be large enough to capture a majority of object's pixels, but small enough to avoid sky/noise. Recommend 2.4 to 4 times the FWHM of the PSF.

Defines the maximum distance the new center can be from the original center.

http://stsdas.stsci.edu/cgi-bin/gethelp.cgi?centerpars



sky fitting algorithm options:

constant: users supplied skyvalue (large resolved objects on flat backgrounds)

file: sky values in a text file

mean: average of sky pixel distribution (regions with few background counts)

median: median of sky pixel distribution (for rapidly varying sky background)

mode: computes with mean and median (for stellar objects in crowded fields) (avoid if sky background is rapidly varying)

centroid: centroid of sky pixel histogram (for rapidly varying, crowed regions)

gauss: fits a single guassian to sky pixel histogram using non-linear least-squares

ofilter: uses optimal filtering algorithm, triangular weighting function, and histogram of the sky pixels.

crosscor: uses a cross-correlation function of sky pixel histogram and a Gaussian noise function

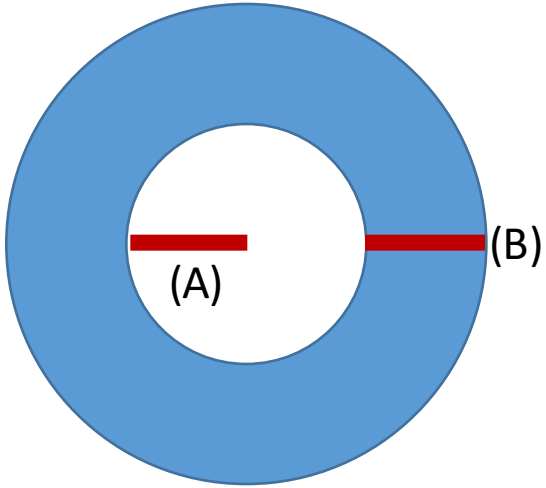
http://stsdas.stsci.edu/cgi-bin/gethelp.cgi?fitskypars

xgterm

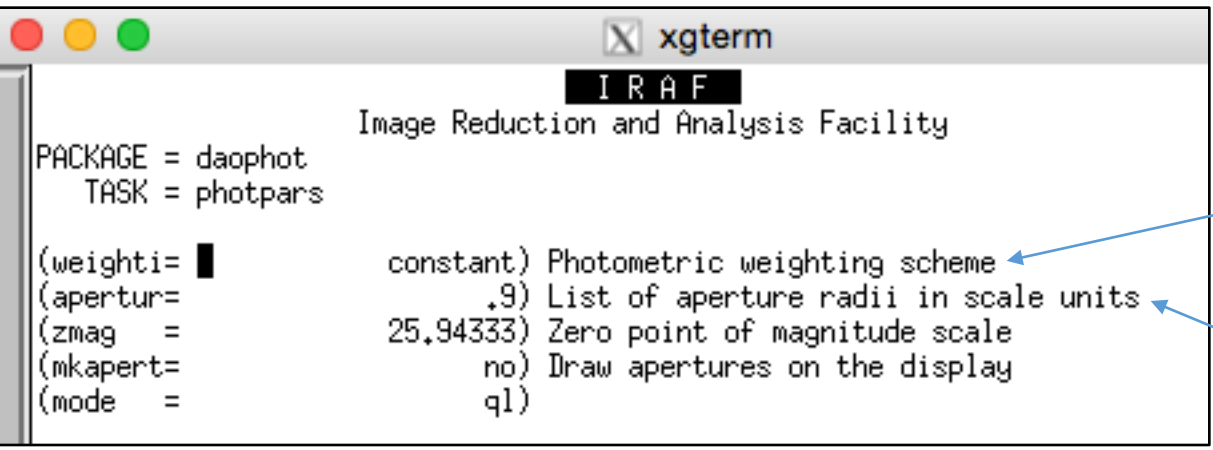
```
                                    I R A F
                     Image Reduction and Analysis Facility
PACKAGE = daophot
   TASK = fitskypars

(salgori=                  mode) Sky fitting algorithm
(annulus=                   0.9) Inner radius of sky annulus in scale units
(dannulu=                  0.45) Width of sky annulus in scale units
(skyvalu=                   0.) User sky value
(smaxite=                    10) Maximum number of sky fitting iterations
(sloclip=                   0.) Lower clipping factor in percent
(shiclip=                   0.) Upper clipping factor in percent
(snrejec=                    50) Maximum number of sky fitting rejection iteratio
(sloreje=                   3.) Lower K-sigma rejection limit in sky sigma
(shireje=                   3.) Upper K-sigma rejection limit in sky sigma
(khist  =                   3.) Half width of histogram in sky sigma
(binsize=                  0.1) Binsize of histogram in sky sigma
(smooth =                   no) Boxcar smooth the histogram
(rgrow  =                   0.) Region growing radius in scale units
(mksky  =                   no) Mark sky annuli on the display
(mode   =                   ql)
```

Inner radius of sky annulus in arcsec. (A)

Width of the sky annulus in arcsec. (B)



http://stsdas.stsci.edu/cgi-bin/gethelp.cgi?fitskypars



weight options:

constant: uniform weights for each pixel

cone: conical weighting function

gauss: gaussian weighting function

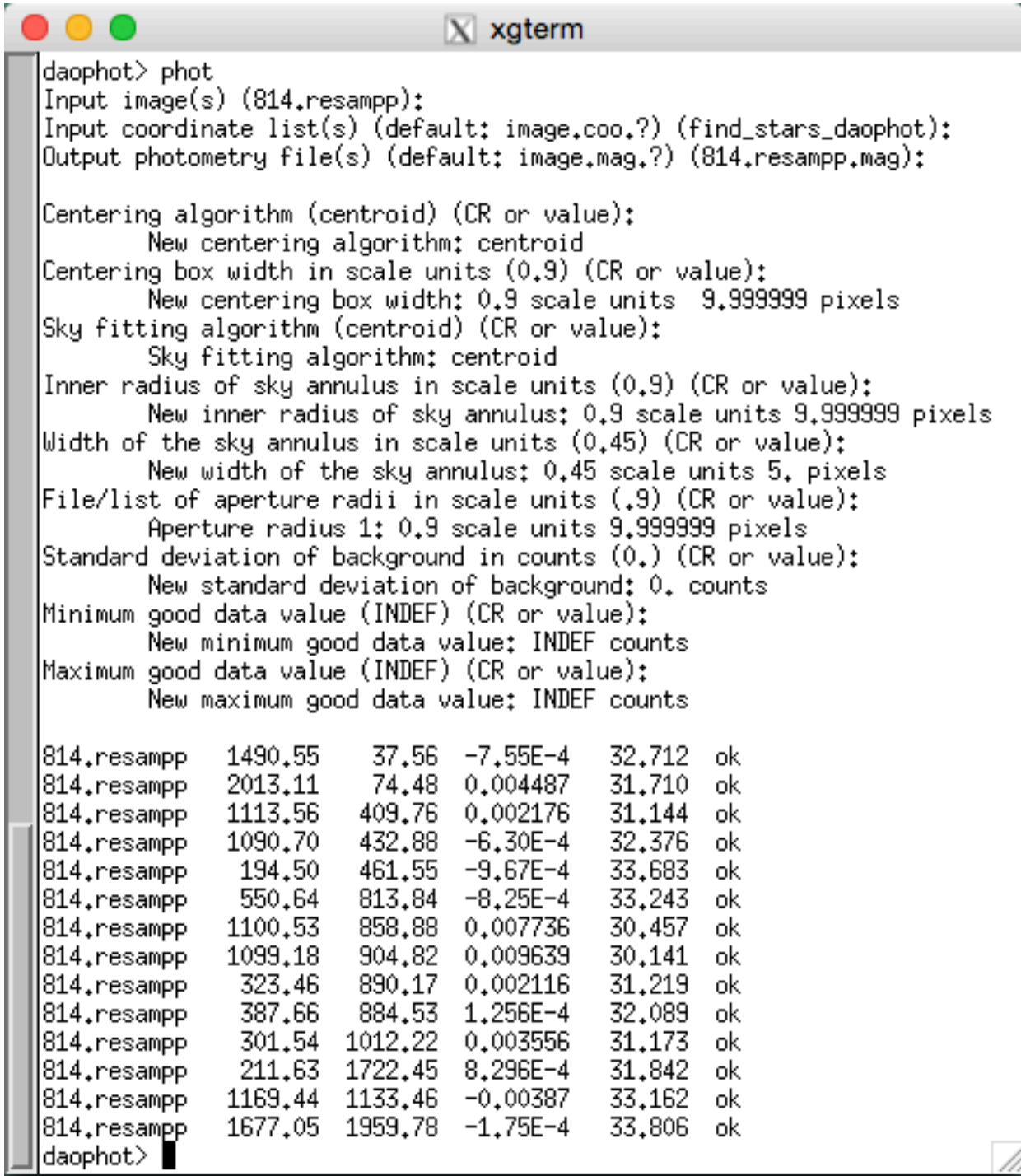
aperture radius in arcsec

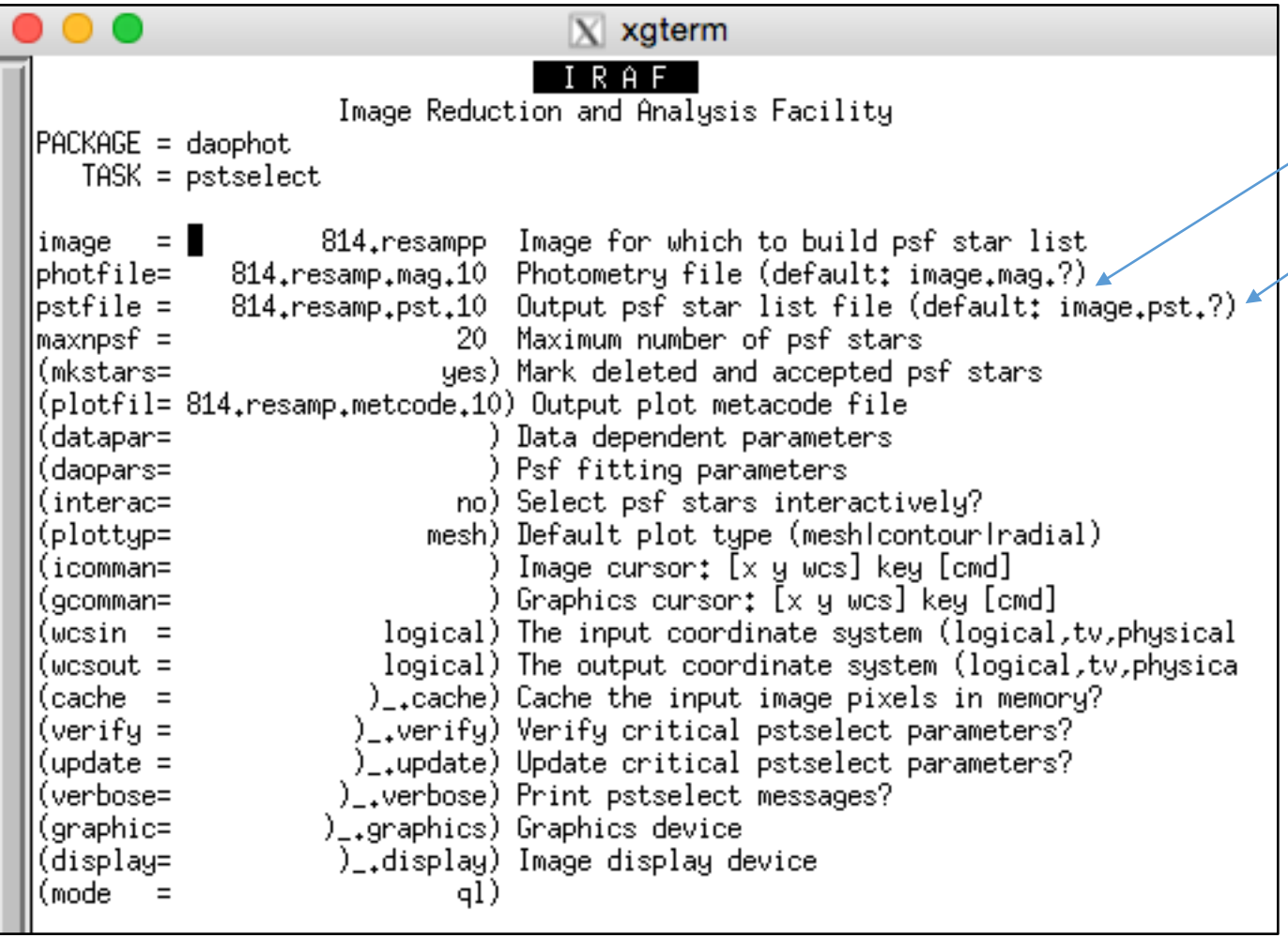
http://stsdas.stsci.edu/cgi-bin/gethelp.cgi?photpars

run phot

press enter until it runs (check inputs)

Output has one line per star. Columns are the new centroid, sky estimate, mag and ok/error

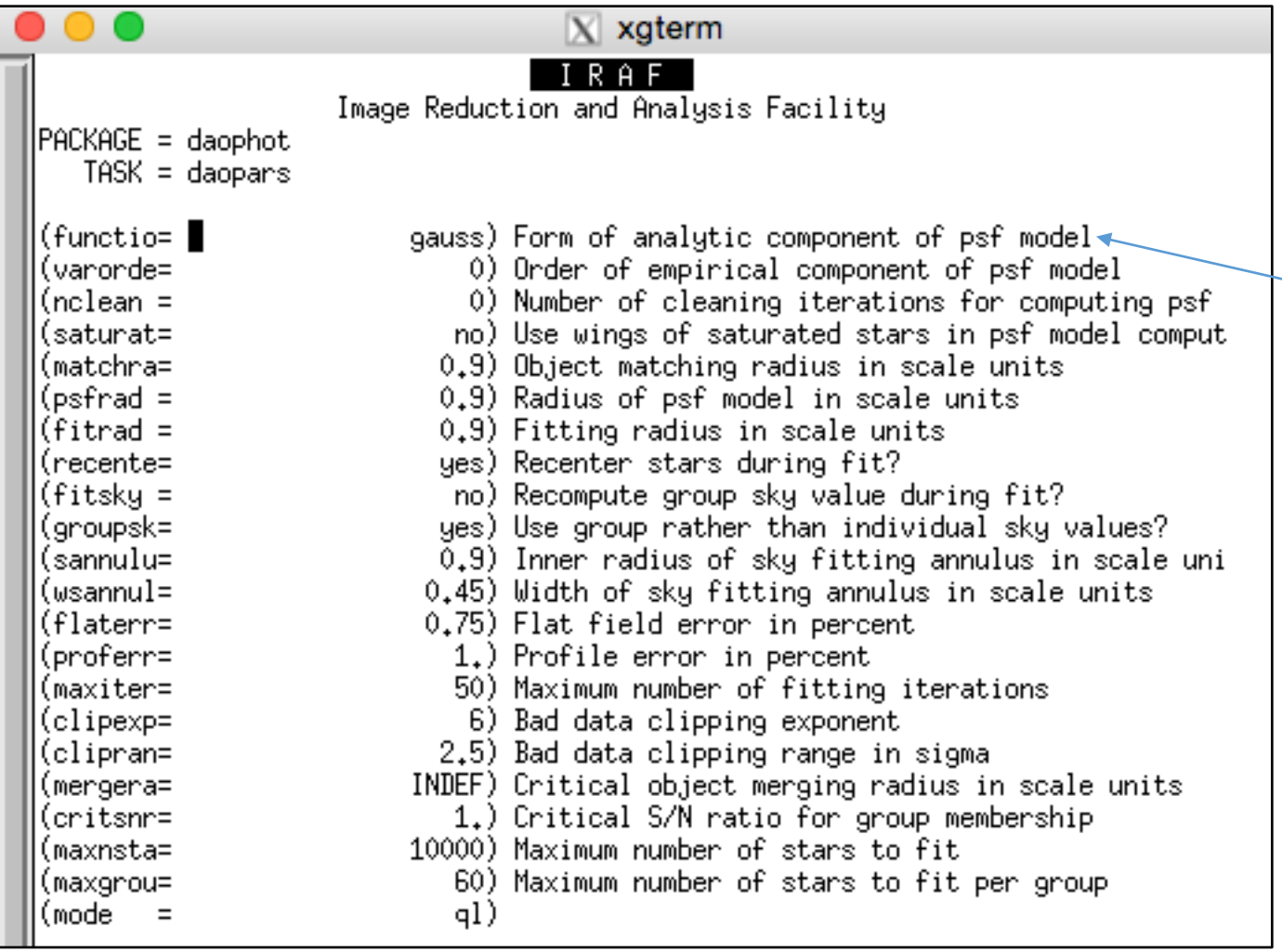




output of phot task

output of pstselect

http://stsdas.stsci.edu/cgi-bin/gethelp.cgi?pstselect



Functional form of analytic component of PSF:

gauss: elliptical Gaussian

moffat15: Moffat with beta = 1.5

moffat25: Moffat with beta = 2.5

lorentz: elliptical Lorentzian

penny1: Gaussian core with Lorentzian wings

penny2: Gaussian core with Lorentzian wings

auto: runs all six models and selects the smallest standard deviation

http://stsdas.stsci.edu/cgi-bin/gethelp.cgi?daopars

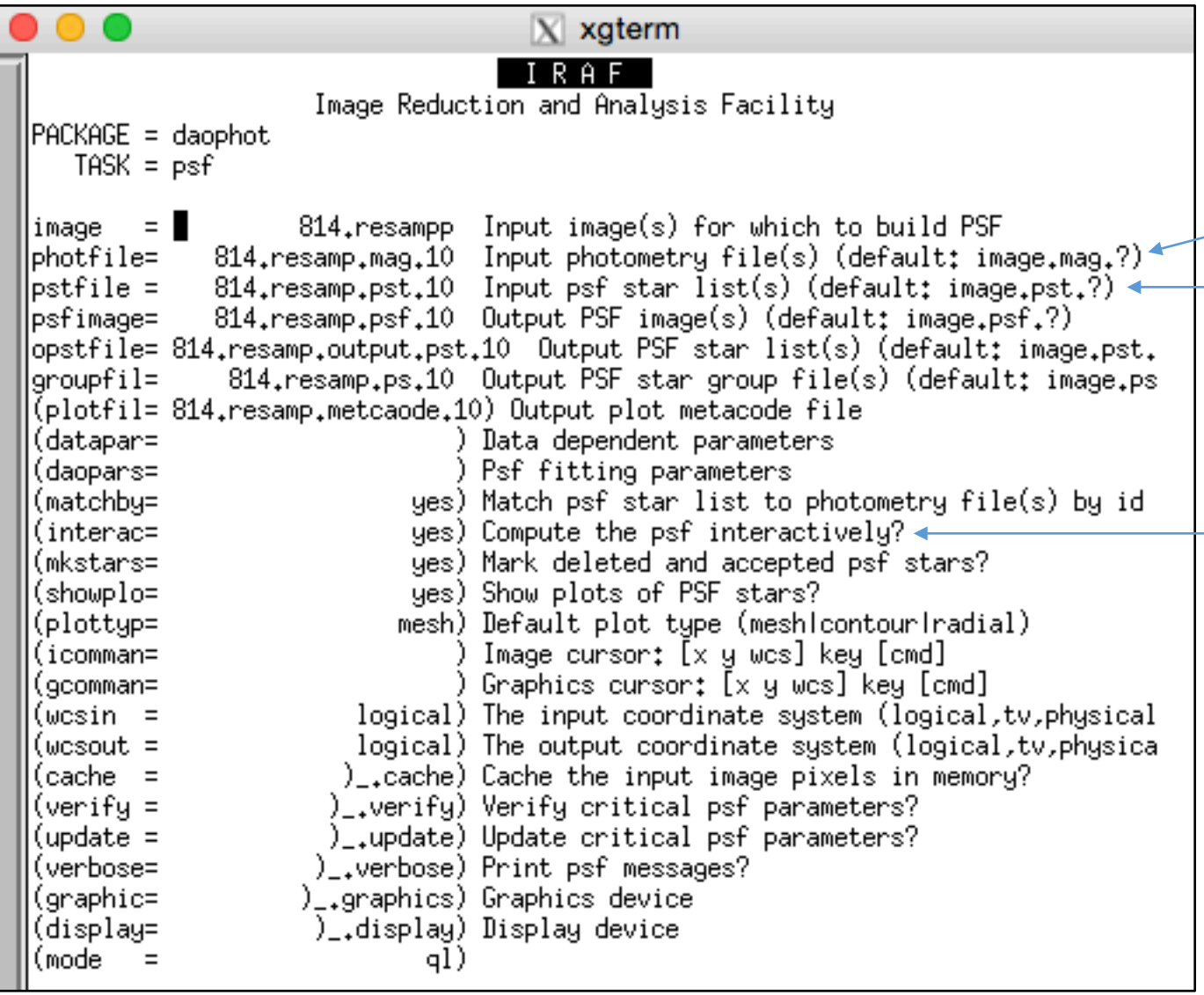
run pstselect

press enter until it runs (check inputs)

Output has one line per star.

xgterm

```
daophot> pstselect
Image for which to build psf star list (814.resampp):
Photometry file (default: image.mag.?) (814.resampp.mag):
Output psf star list file (default: image.pst.?) (814.resampp.pst):
Maximum number of psf stars (1:) (20):

Psf radius in scale units (0.9):
       New psf radius: 0.9 scale units 9.999999 pixels
Fitting radius in scale units (0.9):
       New fitting radius: 0.9 scale units 9.999999 pixels
Minimum good data value (INDEF) (CR or value):
       New minimum good data value: INDEF counts
Maximum good data value (INDEF) (CR or value):
       New maximum good data value: INDEF counts


Selecting PSF stars for image 814.resampp
       14 stars read from file 814.resampp.mag

Star 8 has been added to the PSF star list
       X: 1099.18 Y:  904.82  Mag:  30.141  Dmin: 0.01028112  Dmax: 71.346
Star 7 has been added to the PSF star list
       X: 1100.53 Y:  858.88  Mag:  30.457  Dmin: 0.007874878  Dmax: 41.09107
Star 3 has been added to the PSF star list
       X: 1113.56 Y:  409.76  Mag:  31.144  Dmin: -0.006318776  Dmax: 18.91815
Star 11 has been added to the PSF star list
       X:  301.54 Y: 1012.22  Mag:  31.173  Dmin: -0.005247901  Dmax: 18.05007
Star 9 has been added to the PSF star list
       X:  323.46 Y:  890.17  Mag:  31.219  Dmin: -0.004779264  Dmax: 21.36712
Star 2 has been added to the PSF star list
       X: 2013.11 Y:   74.48  Mag:  31.710  Dmin: -0.007373618  Dmax: 10.52026
Star 12 has been added to the PSF star list
       X:  211.63 Y: 1722.45  Mag:  31.842  Dmin: -0.006468476  Dmax: 11.36785
Star 10 has been added to the PSF star list
       X:  387.67 Y:  884.53  Mag:  32.089  Dmin: -0.009229764  Dmax: 7.273537
Star 4 has been added to the PSF star list
       X: 1090.70 Y:  432.88  Mag:  32.376  Dmin: -0.01426809  Dmax: 9.059976
Star 1 has been added to the PSF star list
       X: 1490.56 Y:   37.56  Mag:  32.712  Dmin: -0.01233304  Dmax: 4.315488
Star 13 has been added to the PSF star list
       X: 1169.44 Y: 1133.46  Mag:  33.162  Dmin: -0.01483157  Dmax: 2.736014
Star 6 has been added to the PSF star list
       X:  550.64 Y:  813.84  Mag:  33.243  Dmin: -0.01032176  Dmax: 3.57773
Star 5 has been added to the PSF star list
       X:  194.49 Y:  461.55  Mag:  33.683  Dmin: -0.0102323  Dmax: 1.685082

Star 14 has been added to the PSF star list
       X: 1677.06 Y: 1959.78  Mag:  33.806  Dmin: -0.01127388  Dmax: 2.786294

Total of 14 PSF stars selected
```



output of phot task

output of pstselect

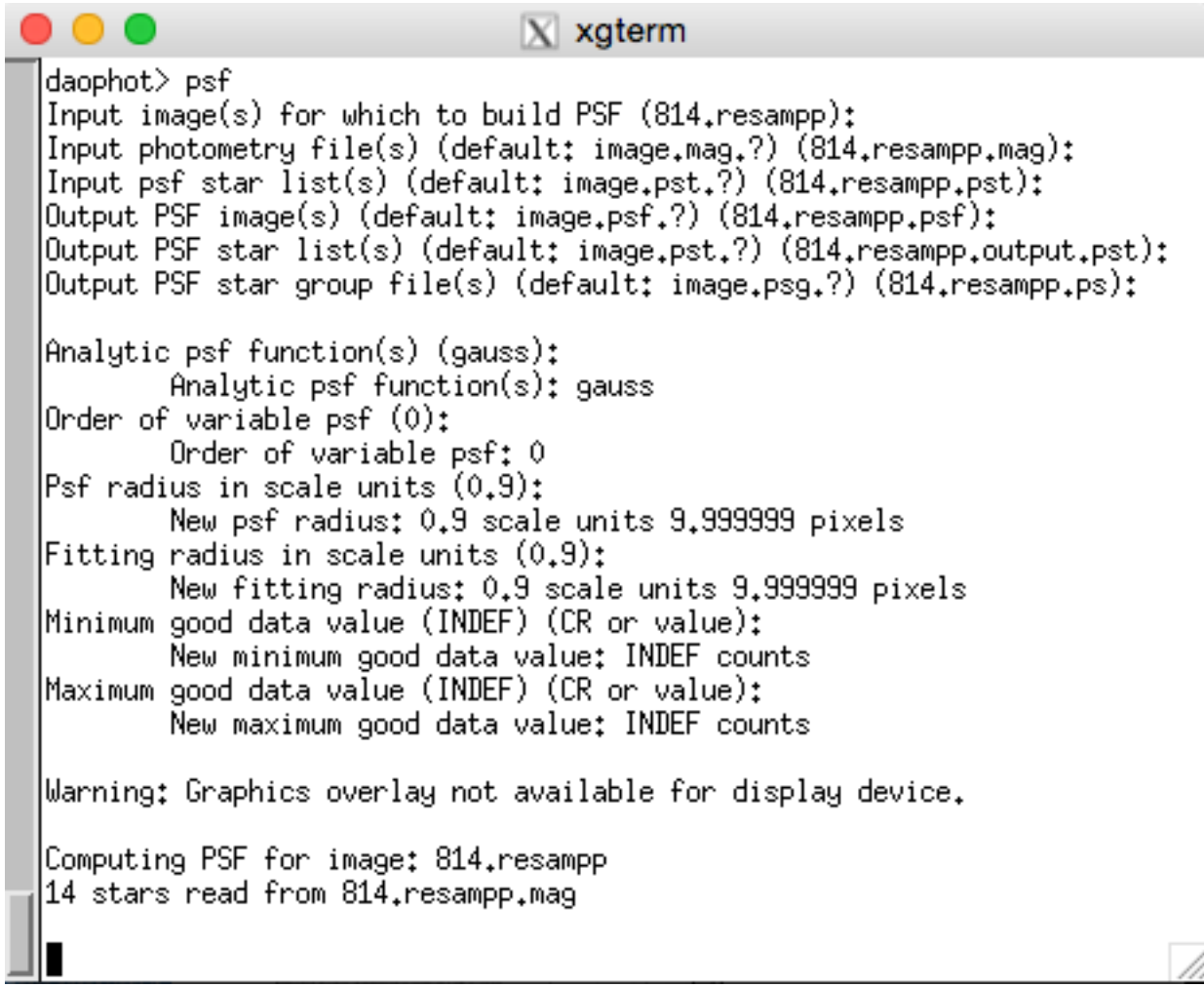
use interactive mode to select stars

http://stsdas.stsci.edu/cgi-bin/gethelp.cgi?psf

Open the input image in ds9

Run psf. Press enter until it runs (check inputs)

Apply keystrokes to the new window containing the surface plot of the stars psf.

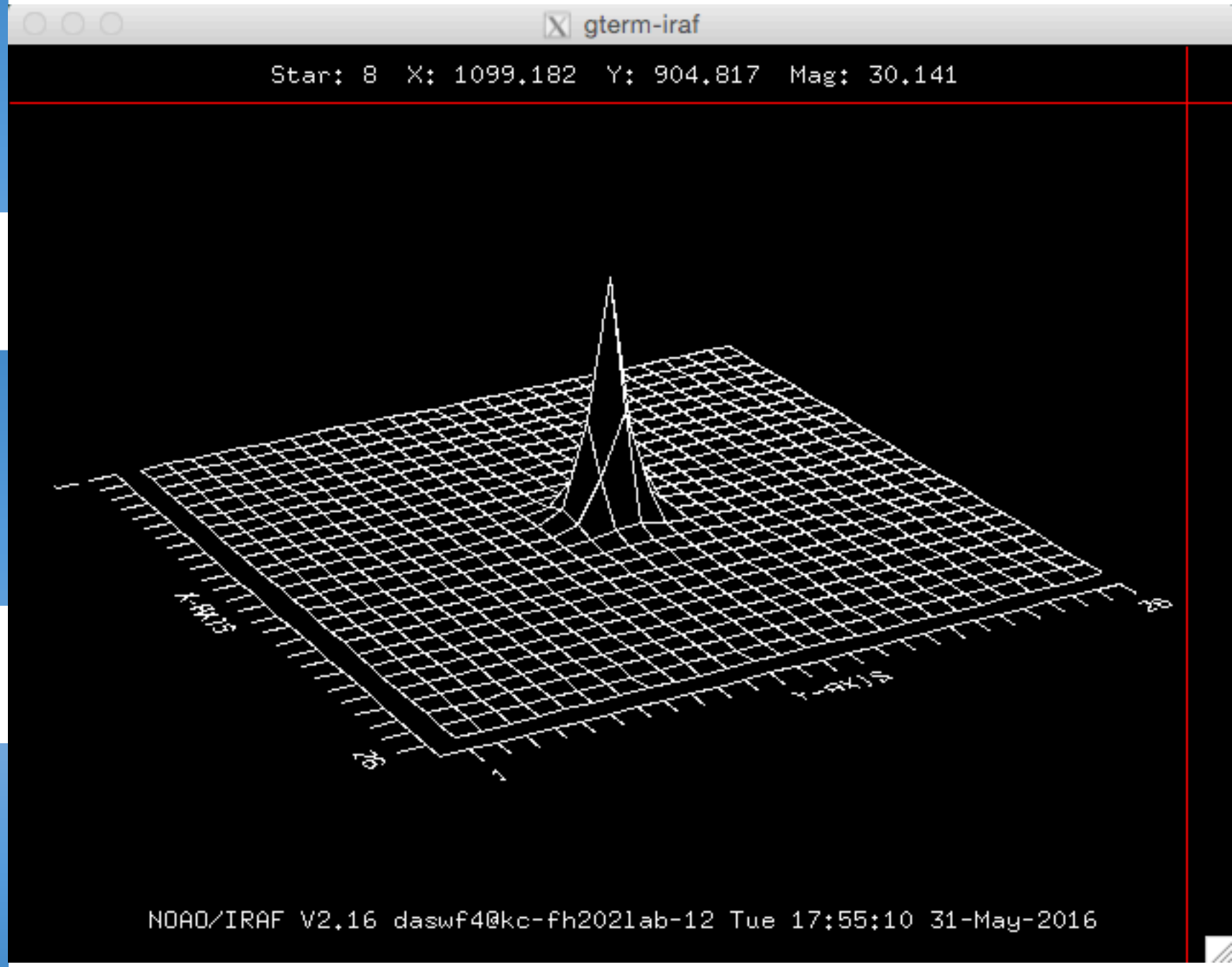


psf interactive mode

Select new window. Use key strokes to accept or decline stars

a = accept

d = decline

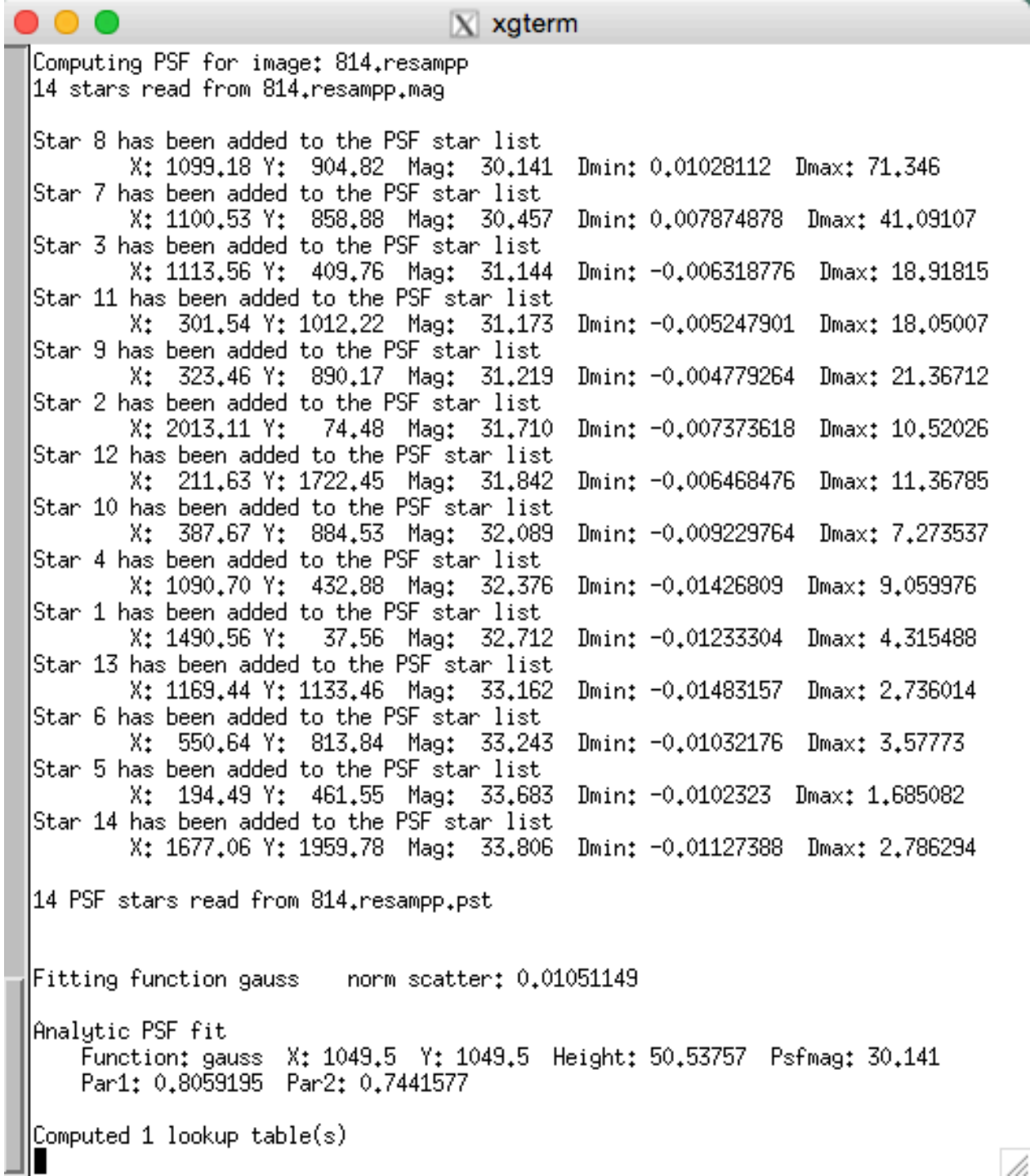


After accepting or declining the stars, select ds9 window

Hit f to fit. Output in xgterm should appear.

Hit w in ds9 window in write the .psf

Hit q in the ds9 window, and then xgterm, to quit

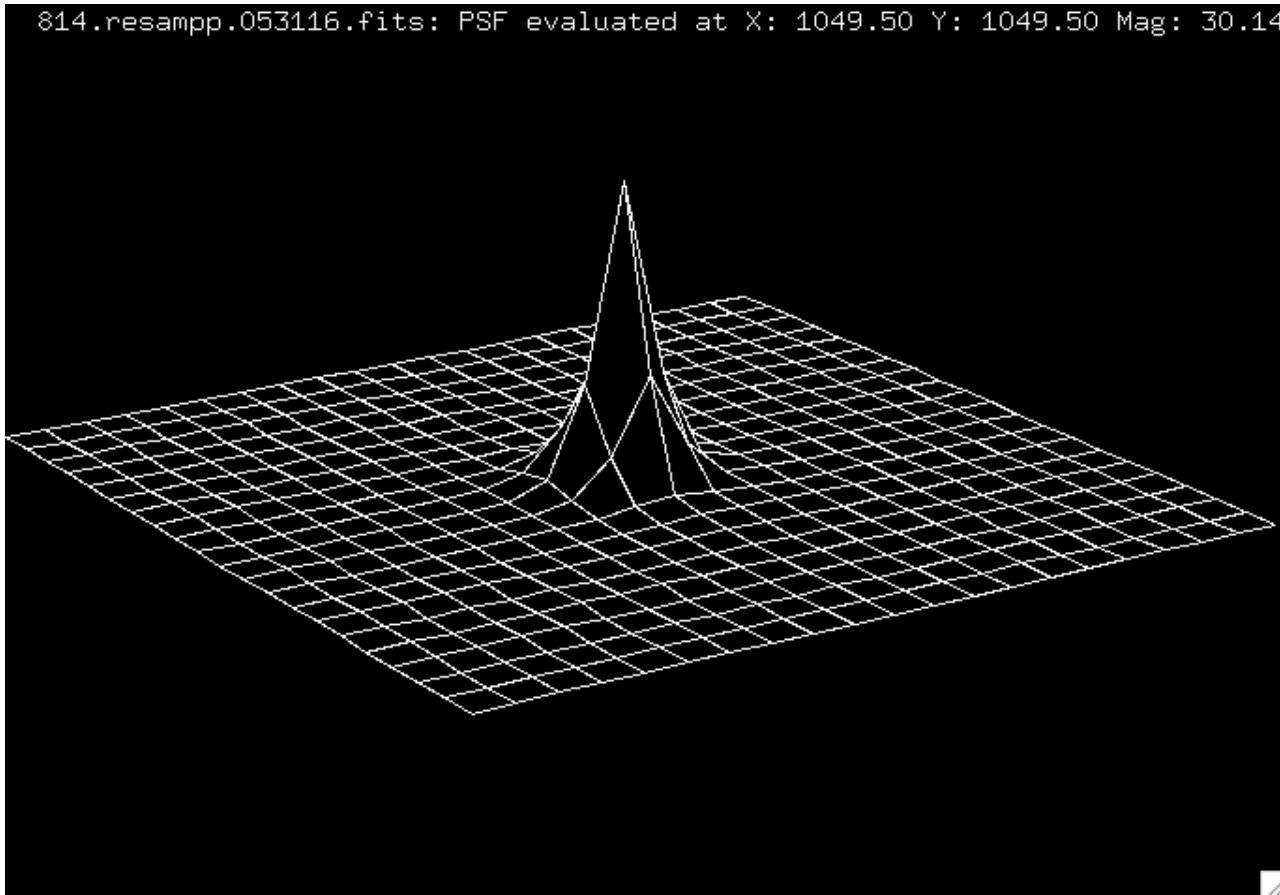


Save the output psf as .fits

Give a visual check to the psf.fits

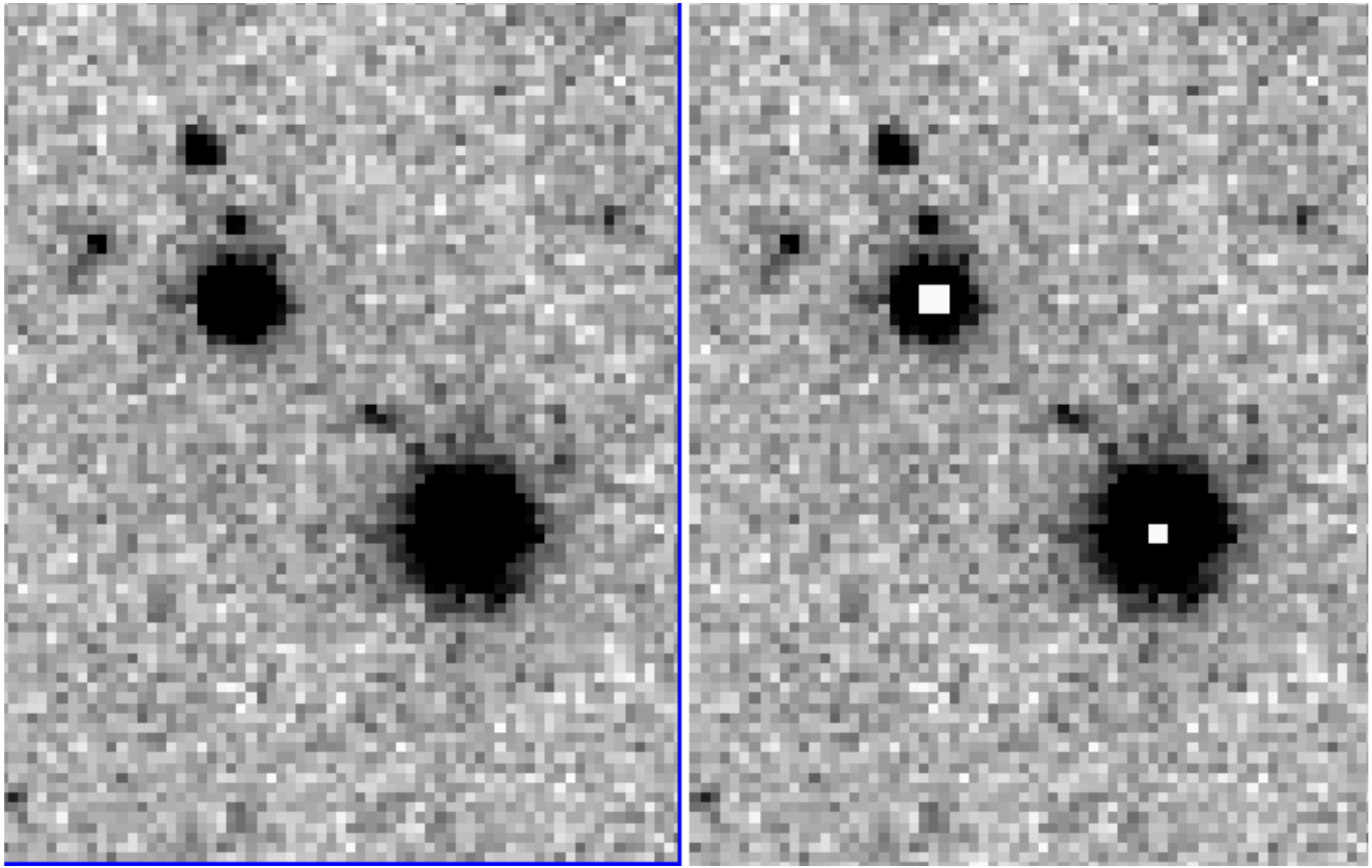
Run Allstar to check psf fit and residual

```
daophot> seepsf 814.resampp.psf.fits[1] 814.resampp.053116.fits
```



```
                    Image Reduction and Analysis Facility
PACKAGE = daophot
   TASK = allstar

image   =     814.resampp.fits  Image corresponding to photometry
photfile=      814.resampp.mag  Input photometry file (default: image.mag.?)
psfimage= 814.resampp.053116.fits  PSF image (default: image.psf.?)
allstarf=          814.allstar  Output photometry file (default: image.als.?)
rejfile =          814.rejects  Output rejections file (default: image.arj.?)
subimage=       814.subtracted  Subtracted image (default: image.sub.?)
(datapar=                     ) Data dependent parameters
(daopars=                     ) Psf fitting parameters
(wcsin  =              logical) The input coordinate system (logical,tv,physical
(wcsout =              logical) The output coordinate system (logical,tv,physica
(wcspsf =            )_.wcspsf) The psf coordinate system (logical,tv,physical)
(cache  =                 yes) Cache the data in memory?
(verify =            )_.verify) Verify critical allstar parameters?
(update =            )_.update) Update critical allstar parameters?
(verbose=           )_.verbose) Print allstar messages?
(version=                   2) Version
(mode   =                  ql)

daophot> allstar
Image corresponding to photometry (814.resampp.fits):
Input photometry file (default: image.mag.?) (814.resampp.mag):
PSF image (default: image.psf.?) (814.resampp.053116.fits):
Output photometry file (default: image.als.?) (814.allstar):
Subtracted image (default: image.sub.?) (814.subtracted):
Output rejections file (default: image.arj.?) (814.rejects):

Recenter the stars (yes):
        Recenter the stars: yes
Use group sky values (yes):
        Use group sky values: yes
Refit the sky (no):
        Refit the sky: no
Psf radius in scale units (0.9):
        New psf radius: 0.9 scale units 9.999999 pixels
Fitting radius in scale units (0.9):
        New fitting radius: 0.9 scale units 9.999999 pixels
Maximum group size in number of stars (60):
        New maximum group size: 60 stars
Minimum good data value (INDEF) (CR or value):
        New minimum good data value: INDEF counts
Maximum good data value (INDEF) (CR or value):
        New maximum good data value: INDEF counts
```

```
NITER = 1
NITER = 2
FITTING:   ID:     3  XCEN:  1113.56  YCEN:   409.76  MAG:    31.15
NITER = 3
NITER = 4
NITER = 5
FITTING:   ID:    14  XCEN:  1677.06  YCEN:  1959.78  MAG:    33.73
NITER = 6
NITER = 7
NITER = 8
NITER = 9
NITER = 10
NITER = 11
NITER = 12
NITER = 13
NITER = 14
NITER = 15
NITER = 16
NITER = 17
NITER = 18
NITER = 19
NITER = 20
NITER = 21
NITER = 22
NITER = 23
NITER = 24
NITER = 25
NITER = 26
REJECTING: Star ID: 5 is too faint
NITER = 27
NITER = 28
NITER = 29
NITER = 30
NITER = 31
NITER = 32
NITER = 33
NITER = 34
NITER = 35
NITER = 36
NITER = 37
NITER = 38
NITER = 39
NITER = 40
NITER = 41
NITER = 42
NITER = 43
NITER = 44
NITER = 45
NITER = 46
NITER = 47
NITER = 48
NITER = 49
NITER = 50
FITTING:   ID:     1  XCEN:  1490.56  YCEN:    37.56  MAG:    33.62
FITTING:   ID:     2  XCEN:  2013.11  YCEN:    74.48  MAG:    31.45
FITTING:   ID:     4  XCEN:  1090.70  YCEN:   432.88  MAG:    32.27
FITTING:   ID:     6  XCEN:   550.64  YCEN:   813.84  MAG:    32.77
FITTING:   ID:     7  XCEN:  1100.53  YCEN:   858.88  MAG:    29.85
FITTING:   ID:    10  XCEN:   387.67  YCEN:   884.53  MAG:    31.64
FITTING:   ID:     9  XCEN:   323.46  YCEN:   890.17  MAG:    31.01
FITTING:   ID:     8  XCEN:  1099.18  YCEN:   904.82  MAG:    30.02
FITTING:   ID:    11  XCEN:   301.54  YCEN:  1012.22  MAG:    30.35
FITTING:   ID:    13  XCEN:  1169.44  YCEN:  1133.46  MAG:    34.03
FITTING:   ID:    12  XCEN:   211.63  YCEN:  1722.45  MAG:    31.55
```



A bad fit because the magnitudes were too faint. Fix magnitudes, repeat process, and check subtracted residuals again.