Photometric Calibrations

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- **PreCam photometric comparison to standards**
- **Recent reduction of photometric error**

Answering question from last week

Date	Standard Deviation (SDSS)- mag<15 – Standard, RA40to50	Standard Deviation (SDSS)- mag<15 – Science	Standard Deviation (SDSS)-NoMagCut – Standard, RA40to50	Standard Deviation (SDSS)-NoMagCut – Science
20110107	g: .06543 (26) z: .05359 (270)	g: .04363 (380) z: .05044 (384) RA0to50	g: .08883 (767) z: .08521 (856)	g: .08784 (7853) z: .07515 (2091) RA0to50
20110108	r: .03744 (80) z: .05866 (276)	r: .03757 (456) z: .04917 (788) RA0to50	r: .0962 (1224) z: .08116 (893)	r: .06973 (5579) z: .07761 (4700) RA0to50
20110112	i: .04627 (126) z: .05593 (276)	i: .04582 (975) z: .04562 (1514) RA40to50	i: .1022 (1102) z: .07933 (969)	i: .08617 (8648) z: .06198 (6396) RA40to50

(Matched star count)

- Standard vs. Science Photometry, v2, SDSS

v3 Photometry Outline

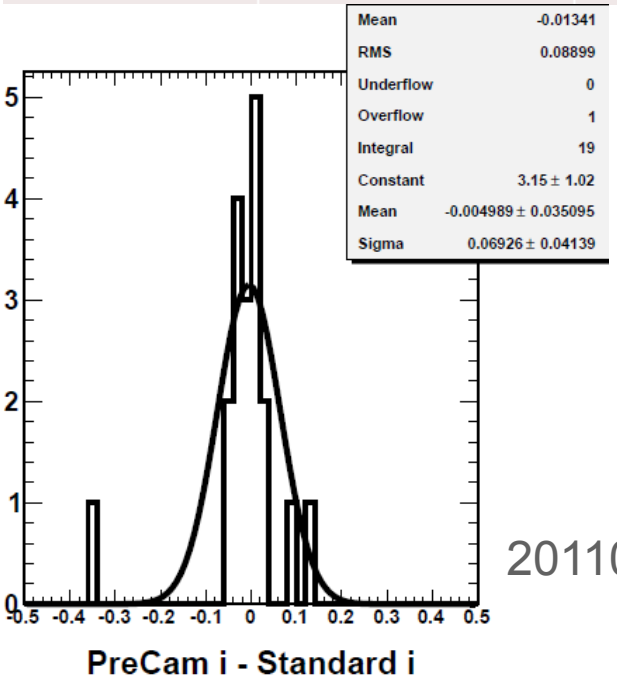
- Using FNAL v3 production
- Applying SDSS airmass correction
- Using USNO, Southern u'g'r'i'z', and SDSS standards
- Cutting USNO, Southern, and SDSS magerr<.01 for all bands

New this week:

- "v3aper10"
  - aper10 and fwhm<4.
  - stellarity > .95
  - 2010<xpos<2250 near CCD gap have been eliminated
- mag < 17 for SDSS (will also show no mag cut)
- Starflats applied to SDSS

v2aper12 vs. v3aper10 – Southern Standards

Date	Zero-Point Offset (Southern Standards) – v2, aper12	Zero-Point Offset (Southern Standards) – v3, aper10	Standard Deviation (Southern Standards) – v2, aper12	Standard Deviation (Southern Standards) – v3, aper10
20110107	g: .7747	g: .81565	g: .05225	g: .02219
20110112	g: .7955 r: .1805	g: .821 r: .16541	g: .02195 r: .04771	g: .02043 r: .01888



- Using science images
- 3 outliers are from image 21882
- Image 21882 has diagonal streak in ds9 and is not flagged in bad image filters.

20110113, v3aper10

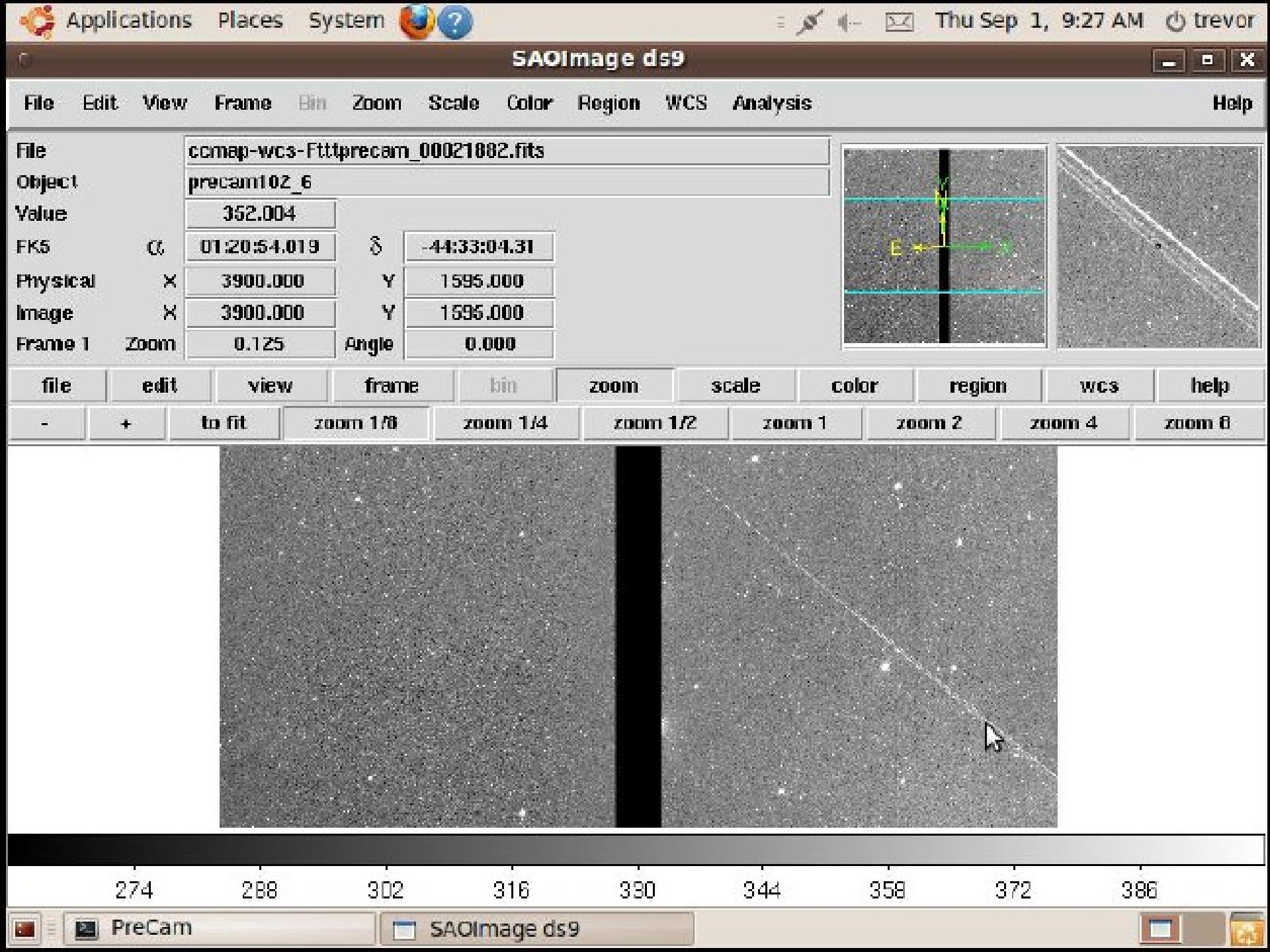

Applications
Places
System
Thu Sep 1, 9:27 AM
trevor
SAOImage ds9
File
Edit
View
Frame
Bin
Zoom
Scale
Color
Region
WCS
Analysis
Help
File
ccmap-wcs-Ftttprecam_00021802.fits
Object
precam102_6
Value
352.004
FK5
α
01:20:54.019
δ
-44:33:04.31
Physical
X
3900.000
Y
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Image
X
3900.000
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Frame 1
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Angle
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file
edit
view
frame
bin
zoom
scale
color
region
wcs
help
-
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to fit
zoom 1/8
zoom 1/4
zoom 1/2
zoom 1
zoom 2
zoom 4
zoom 8
274
288
302
316
330
344
358
372
386
PreCam
SAOImage ds9

v3aper12 vs. v3aper10 - USNO

Date	Zero-Point Offset (USNO) – v3aper12	Zero-Point Offset (USNO) – v3aper10	Standard Deviation (USNO) – v3aper12	Standard Deviation (USNO) – v3aper10
20110107	g: 2.08978 r: 1.899857 i: 2.05227 z: 2.247	g: 2.11633 r: 1.91594 i: 2.0627 z: 2.2631	g: .02374 r: .03213 i: .03222 z: .02319	g: .04087 r: .03147 i: .0321 z: .02313
20110108	g: 2.1784 r: 1.98041 i: 2.1281 z: 2.3587	g: 2.18688 r: 2.01688 i: 2.1451 z: 2.3729	g: .07305 r: .06301 i: .05031 z: .05476	g: .08954 r: .07081 i: .05616 z: .06882
20110112	g: 2.1035 r: 1.932 i: 2.0765 z: 2.248	g: 2.117 r: 1.9487 i: 2.0932 z: 2.26117	g: .03165 r: .05489 i: .04316 z: .04514	g: .02735 r: .0459 i: .04856 z: .04277
20110113	g: 2.08618 r: 1.90392 i: 2.05038 z: 2.21058	g: 2.09419 r: 1.9133 i: 2.05038 z: 2.2271	g: .02186 r: .02544 i: .02691 z: .02033	g: .027 r: .025758 i: .02254 z: .01456

- Using standard images
- Starflats not applied

- 8 better, 8 worse

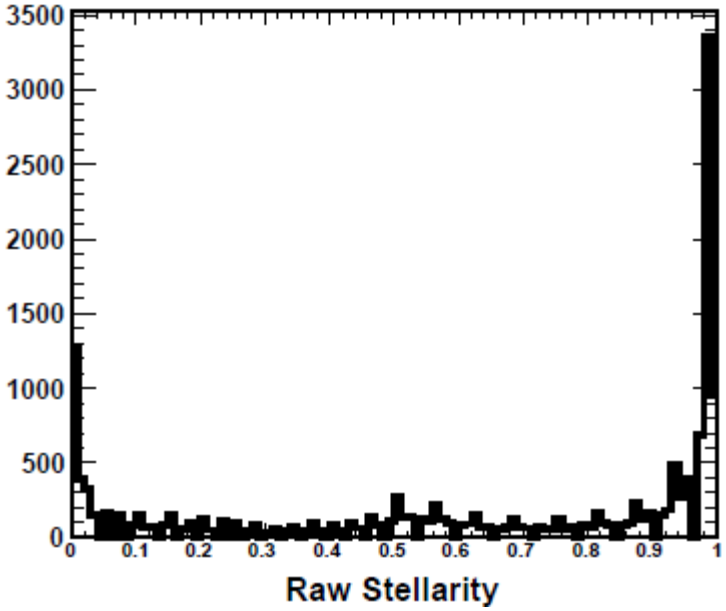
- Recent cuts do not help bright stars

- Object count is lower as well

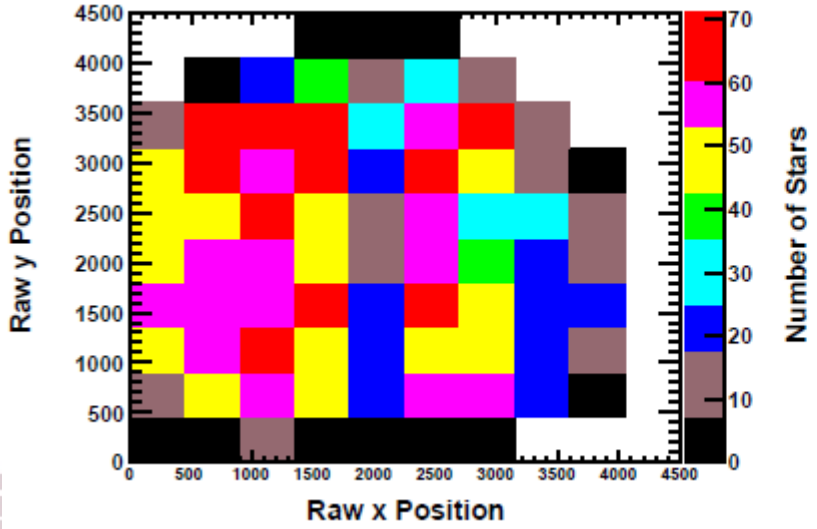
Evaluation of photometric error improvement per cut

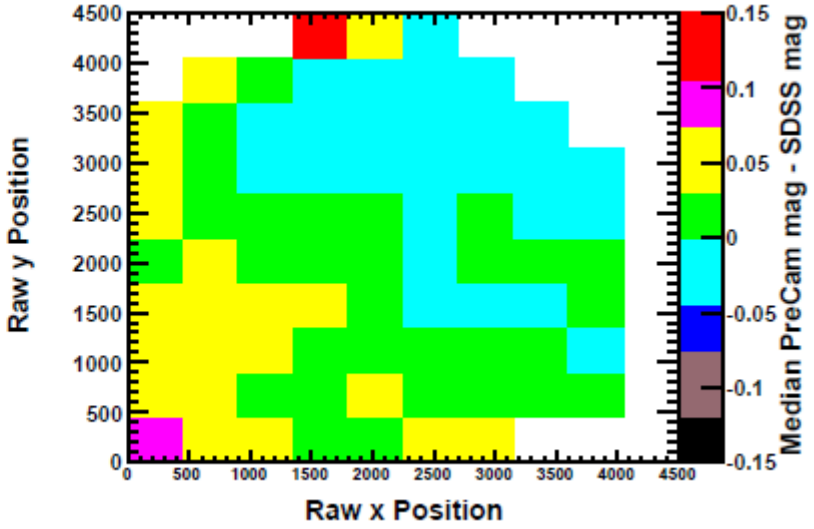
Version	Standard Deviation
v2aper12	.06973
v3aper12	.06871
v3aper12, stellarity > .95	.04901
v3aper10, stellarity > .95	.048496
v3aper10, stellarity > .95, fwhm < 4.	.048434
v3aper10, stellarity > .95, fwhm < 4. , pixels cut	.048447
v3aper10, stellarity > .95, fwhm < 4. , pixels cut, starflats	.040106
v3aper10, stellarity > .95, fwhm < 4. , pixels cut, starflats, mag < 17.	.03838

20110108 SDSS r-band science images



Pixels cut: 2010<xpos<2250





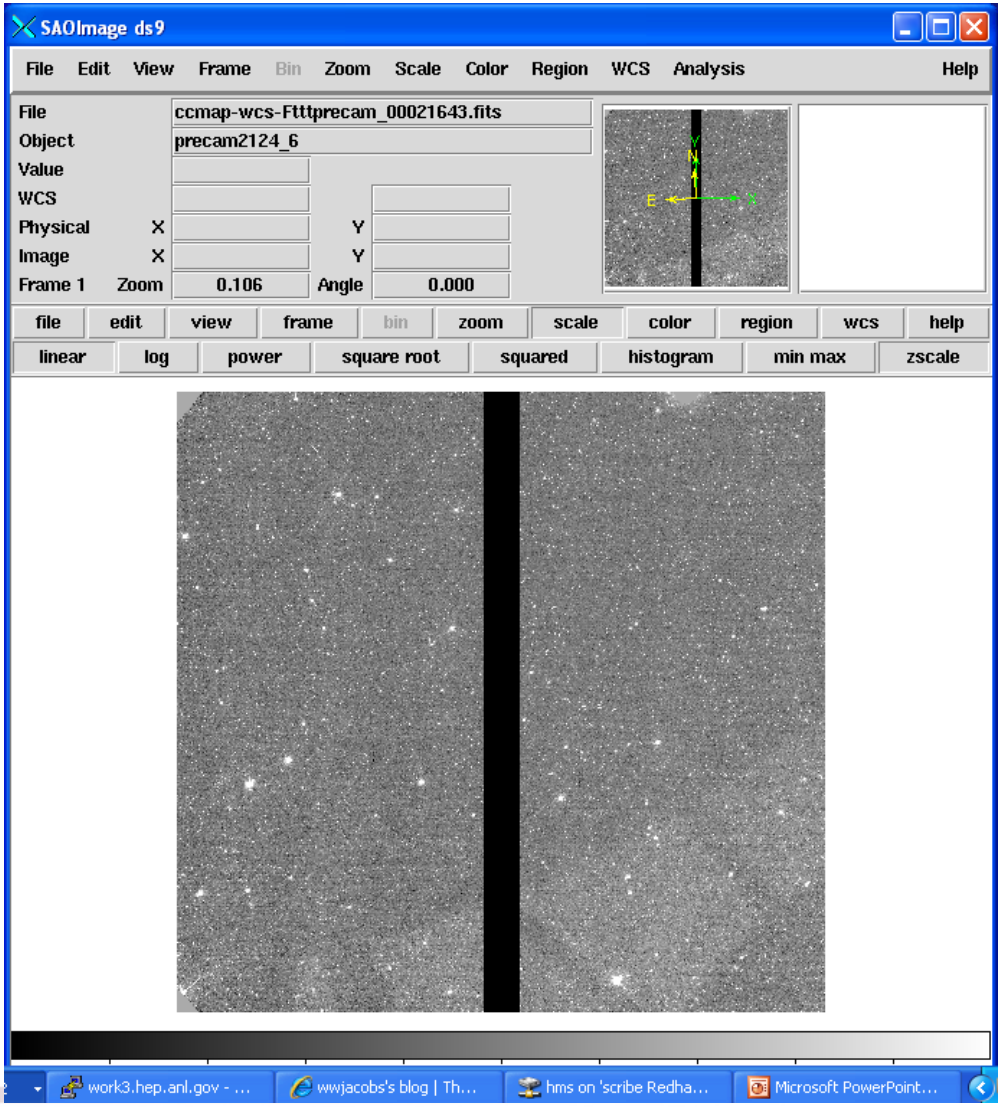
v2aper12 vs. v3aper10 - SDSS

Date	Zero-Point Offset (SDSS), v2 aper12	Zero-Point Offset (SDSS), v3 aper10	Standard Deviation (SDSS)-NoMagCut, v2 aper12	Standard Deviation (SDSS)-NoMagCut, v3 aper10	Standard Deviation (SDSS)- mag<17, v3 aper10
20110107	g: .83159 z: -.74	g: .81859 z: -.71	g: .08784 z: .07515 RA0to50	g: .04731 z: .0446 RA0to50	g: .04554 z: .0445 RA0to50
20110108	r: .21637 z: -.686	r: .22637 z: -.6552	r: .06973 z: .07761 RA0to50	r: .04011 z: .04484 RA0to50	r: .03838 z: .04484 RA0to50
20110112	i: .03895 z: .-.7865	i: .03044 z: .-.7645	i: .08617 z: .06198 RA40to50	i: .0485 z: .03803 RA40to50	i: .04832 z: .03803 RA40to50

- Using science images
- Starflats have been applied

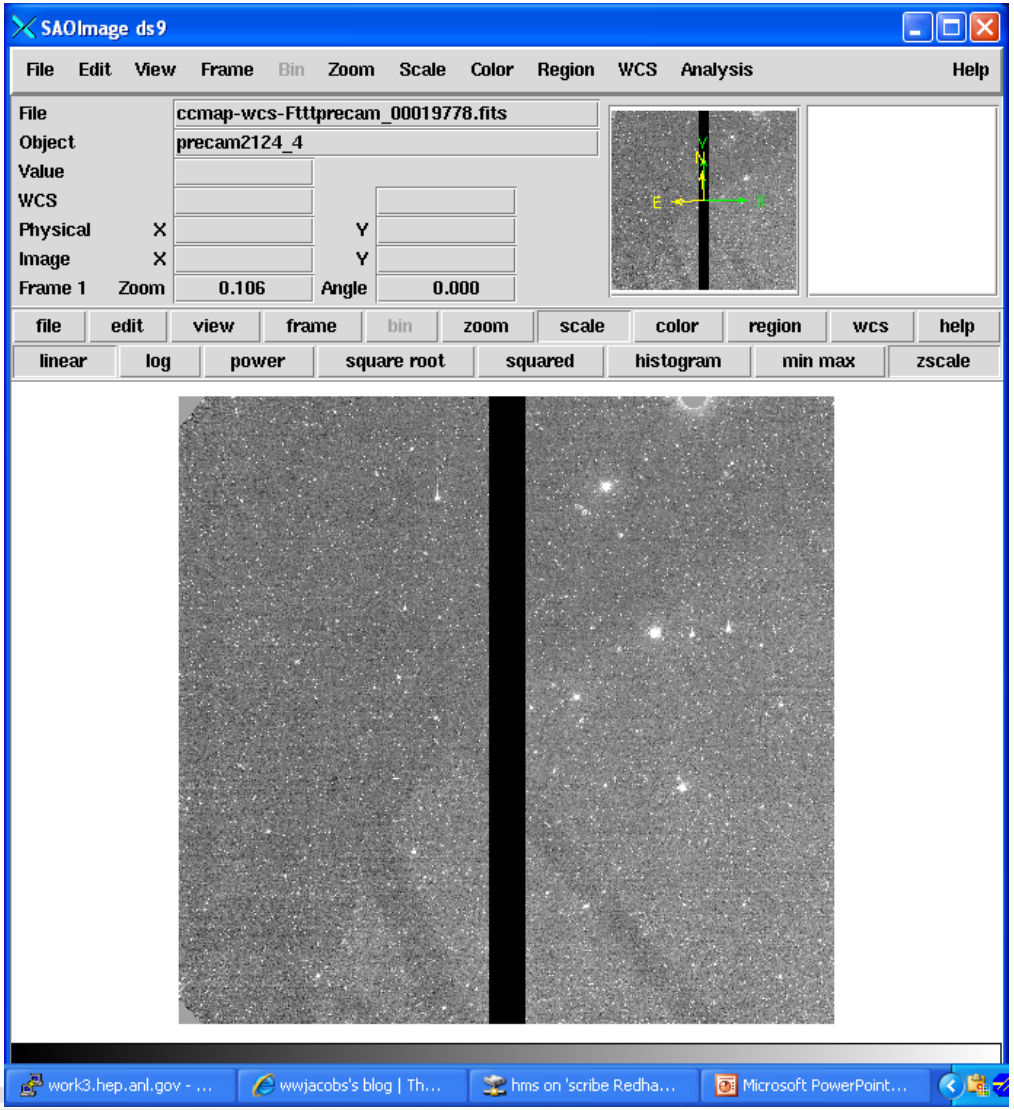
Hal Spinka investigating bad-image filtering

- Image 21643, airmass = 1.6, 12 Jan., g-band
- v3 header flags 1 1 1 1 1
- v3 header mean sky values 13.086 14.136 13.290 13.038 12.956
- v3 header std. dev. values 2.618 3.139 2.636 2.338 2.299



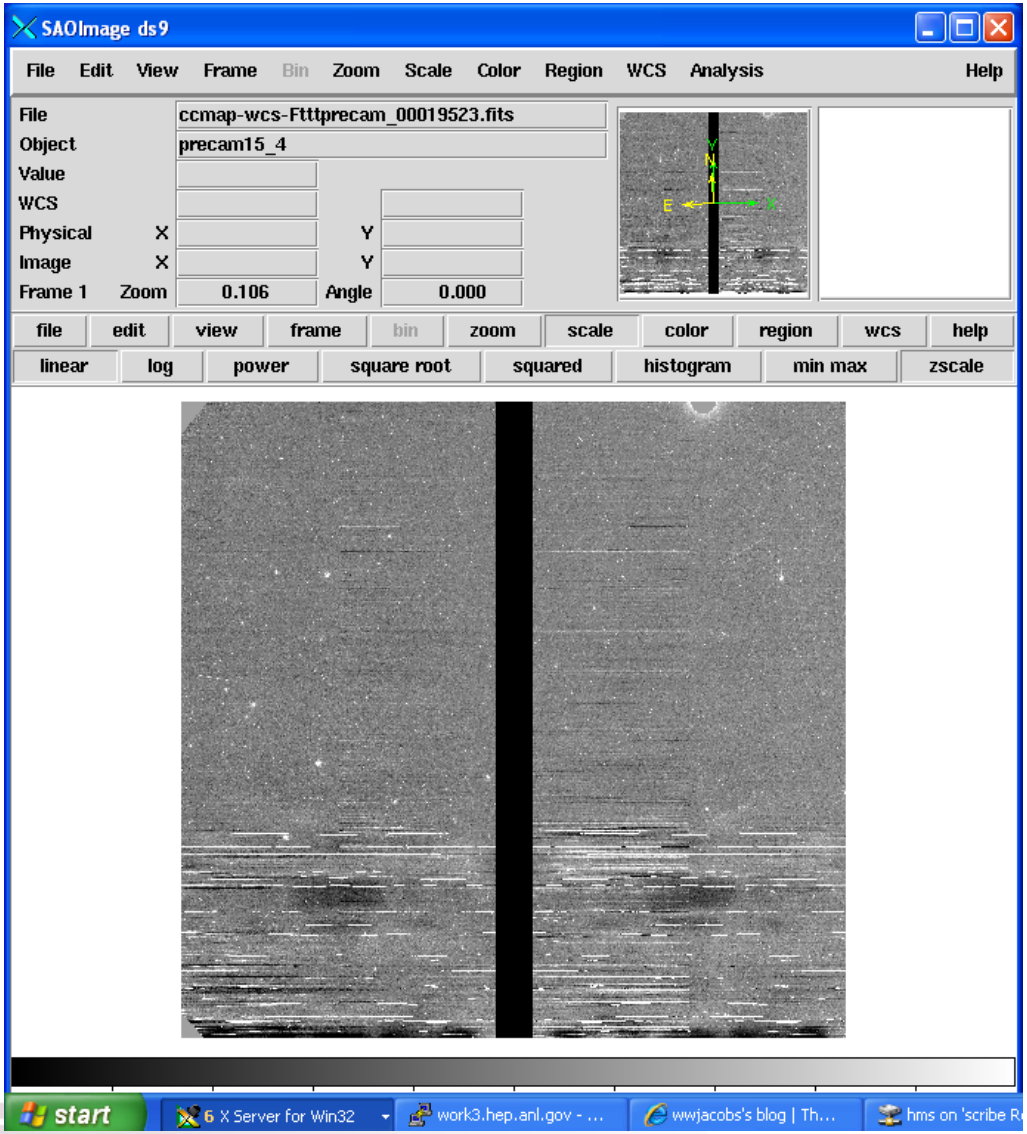
Hal Spinka investigating bad-image filtering

- Image 19778, airmass = 1.4, 7 Jan., g-band
- v3 header flags 1 1 1 1 1
- v3 header mean sky values 13.357 14.663 14.251 13.474 13.111
- v3 header std. dev. values 3.013 3.620 3.030 2.697 2.628



Hal Spinka investigating bad-image filtering

- Image 19523, airmass = 1.6, 7 Jan., g-band
- v3 header flags -1 -1 -1 1 1
- v3 header mean sky values 29.564 27.357 28.771 28.357 28.517
- v3 header std. dev. values 35.087 61.991 31.598 7.626 7.144



Backup Slides

v2 Photometry (Standard images only)

Date	Zero-Point Offset (USNO)	Standard Deviation (USNO)	Zero-Point Offset (Southern Standards)	Standard Deviation (Southern Standards)	Zero-Point Offset (SDSS)- RA40to50	Standard Deviation (SDSS)- mag<15	Standard Deviation (SDSS)-NoMagCut
20110107	g: 2.0893 r: 1.90057 i: 2.05227 z: 2.247	g: .02637 r: .03763 i: .03222 z: .02319	g: 2.0802 r: 1.91872 i: 2.05298 z: 2.263	g: .03066 r: .04228 i: .02944 z:.04915	g: 2.18 r: 1.9346 i: 2.07891 z: 2.2993	g: .06543 r: .04305 i: .0507 z: .05359	g: .08883 r: .09251 i: .09442 z: .08521
20110108	g: 2.1784 r: 1.98041 i: 2.1281 z: 2.3587	g: .07305 r: .06301 i: .05031 z: .05476	g: 2.12746 r: 1.93014 i: 2.24 z: 2.3044	g: .03001 r: .04205 i: .04874 z: .03008	g: 2.1617 r: 1.94502 i: 2.10669 z: 2.3456	g: .05267 r: .03744 i: .05214 z: .05866	g: .1049 r: .0962 i: .1026 z: .08116
20110112	g: 2.1035 r: 1.932 i: 2.0765 z: 2.248	g: .03165 r: .05726 i: .04092 z: .04534	g: 2.07424 r: 1.905615 i: 2.06179 z: 2.20772	g: .02947 r: .03492 i: .03674 z: .03856	g: 2.11098 r: 1.92785 i: 2.07017 z: 2.25469	g: .04387 r: .03982 i: .04627 z: .05593	g: .08872 r: .08219 i: .1022 z: .07933
20110113	g: 2.0825 r: 1.90392 i: 2.04527 z: 2.209913	g: .02462 r: .02494 i: .02666 z: .02033	g: 2.07 r: 1.9016 i: 2.06527 z: 2.20766	g: .02925 r: .03603 i: .04309 z: .03544	g: 2.08906 r: 1.9282 i: z: 2.2664	g: .06184 r: .03924 i: z: .06304	g: .08927 r: .08873 i: z: .08991

v3 Photometry

- No correction for illumination

Date	Zero-Point Offset (USNO)	Standard Deviation (USNO)	Zero-Point Offset (Southern Standards)	Standard Deviation (Southern Standards)	Zero-Point Offset (SDSS)- RA40to50	Standard Deviation (SDSS)- mag<15	Standard Deviation (SDSS)-NoMagCut
20101215			g: 2.3372 r: 2.1269 i: 2.2864 z: 2.5072	g: .05323 r: .05176 i: .05021 z: .06227	g: 2.17425 r: 1.95941 i: 2.12993 z: 2.32859	g: .05258 r: .04194 i: .0581 z: .05982	g: .08925 r: .09445 i: .1065 z: .08172
20110107	g: 2.08978 r: 1.899857 i: 2.05227 z: 2.247	g: .02374 r: .03213 i: .03222 z: .02319	g: 2.0802 r: 1.91872 i: 2.05298 z: 2.263	g: .02843 r: .04228 i: .02944 z: .04915	g: 2.0645 r: 1.9346 i: 2.07891 z: 2.2993	g: .04711 r: .04305 i: .05134 z: .05304	g: .09277 r: .09258 i: .09468 z: .08514
20110108	g: 2.1784 r: 1.98041 i: 2.1281 z: 2.3587	g: .07305 r: .06301 i: .05031 z: .05476	g: 2.12746 r: 1.93154 i: 2.24 z: 2.3044	g: .03003 r: .04221 i: .04874 z: .03008	g: 2.1617 r: 1.94502 i: 2.10669 z: 2.3456	g: .05267 r: .03744 i: .05214 z: .05843	g: .1057 r: .09614 i: .1025 z: .07865
20110112	g: 2.1035 r: 1.932 i: 2.0765 z: 2.248	g: .03165 r: .05489 i: .04316 z: .04514	g: 2.07424 r: 1.905615 i: 2.06179 z: 2.21012	g: .02947 r: .03518 i: .03624 z: .03695	g: 2.11098 r: 1.92643 i: 2.07017 z: 2.25469	g: .04387 r: .03939 i: .04554 z: .05621	g: .08868 r: .08243 i: .102 z: .08538
20110113	g: 2.08618 r: 1.90392 i: 2.05038 z: 2.21058	g: .02186 r: .02544 i: .02691 z: .02033	g: 2.07 r: 1.89748 i: 2.06527 z: 2.20684	g: .03127 r: .03662 i: .04353 z: .03638	g: 2.143606 r: 1.9298 i: z: 2.26745	g: .02575 r: .04268 i: z: .06571	g: .09088 r: .08401 i: z: .0936

v3 vs. v2, Photometry Comparison

Date	Standard Deviation (USNO) – v2	Standard Deviation (USNO) – v3	Standard Deviation (Southern Standards) – v2	Standard Deviation (Southern Standards) –v3	Standard Deviation (SDSS) – v2, mag<15	Standard Deviation (SDSS) – v3, mag<15	Standard Deviation (SDSS) – v2, NoMagCut	Standard Deviation (SDSS) – v3, NoMagCut
20110107	g: .02637	g: .02374	g: .03066	g: .02843	g: .06543	g: .04711	g: .08883	g: .09277
	r: .03763	r: .03213	r: .04228	r: .04228	r: .04305	r: .04305	r: .09251	r: .09258
	i: .03222	i: .03222	i: .02944	i: .02944	i: .0507	i: .05134	i: .09442	i: .09468
	z: .02319	z: .02319	z:.04915	z:.04915	z: .05359	z: .05304	z: .08521	z: .08514
20110108	g: .07305	g: .07305	g: .03001	g: .03003	g: .05267	g: .05267	g: .1049	g: .1057
	r: .06301	r: .06301	r: .04205	r: .04221	r: .03744	r: .03744	r: .0962	r: .09614
	i: .05031	i: .05031	i: .04874	i: .04874	i: .05214	i: .05214	i: .1026	i: .1025
	z: .05476	z: .05476	z: .03008	z: .03008	z: .05866	z: .05843	z: .08116	z: .07865
20110112	g: .03165	g: .03165	g: .02947	g: .02947	g: .04387	g: .04387	g: .08872	g: .08868
	r: .05726	r: .05489	r: .03492	r: .03518	r: .03982	r: .03939	r: .08219	r: .08243
	i: .04092	i: .04316	i: .03674	i: .03624	i: .04627	i: .04554	i: .1022	i: .102
	z: .04534	z: .04514	z: .03856	z: .03695	z: .05593	z: .05621	z: .07933	z: .08538
20110113	g: .02462	g: .02186	g: .02925	g: .03127	g: .06184	g: .02575	g: .08927	g: .09088
	r: .02494	r: .02544	r: .03603	r: .03662	r: .03924	r: .04268	r: .08873	r: .08401
	i: .02666	i: .02691	i: .04309	i: .04353	i:	i:	i:	i:
	z: .02033	z: .02033	z: .03544	z: .03638	z: .06304	z: .06571	z: .08991	z: .0936

- Blue: Decrease in sigma, Red: Increase in sigma