PS1 Hawaii Meeting Summary

Shaun Cole

http://ps1sc.ifa.hawaii.edu/PS1wiki/index.php/Jan2012_Presentations_Presentations

Programme

Tuesday:	PSPS and IPP workshops or tour of PS1 on Maui
Wednesday:	Survey Status; Key Project Reports 1-5
Thursday:	Key Project Reports 6-13; postgrad talks; DRAVG
Friday:	Board Meeting and Key Project Group Meetings
Saturday:	Science Council Meeting

Tuesday

Wednesday

Survey status
PSPS
Ubercalibration
Detection Efficiency
Photometric redshifts
Transient Science Server

PSPS Status

PSPS Operational Readiness Review (ORR) postponed.

PSPS Ingest Status:

Survey	PSPS catalog name	Description
3PI	PS1_3PI	Reprocessed or LAP data
Old 3PI	PS1_OLD	Data processed between from start of mission to July, 2011 This older data provides temporary access to data over much of the sky.
Small area survey	PS1_ SA3	The small area survey emulating the full three-year 3PI survey
Medium Deep	PS1_MDF	MD4 is available, with the other fields to follow

Only the last two have full attributes at present.

Pan-STARRS Science Interface

Home | Query Page | ODM | MOPS | News | Help | Profile | Logout

- ODM Query Builder
- Queued Jobs
- ODM Schema Browser
- MyDB
- Graphing

ery Builder Step 1: Choose Survey, Filters, and Tables

Survey: 3PI - PS1 3PI Surv

Filter: ☐g ☐r ☐i ☐z

Click the checkbox besic **o use for your search.**

Fundamental IPP Data Products	Derived Data Products	Observational Metadata and Supporting System MetaData Tables	Object-Detection Modifications History	Internal Tables	Difference Image Detection	
☐ Detection	☐ PPM *	☐ CameraConfig	☐ ObjectModHistory	☐ PsConstant	☐ StackDeltaAltFit *	☐ sysdiagrams
☐ DetectionCalib	☐ Photoz	☐ DetectionFlags			☐ StackHighSigDelta *	
☐ DetectionFull		☐ Filter				
☐ DetectionOrphan *		☐ FitModel				
☐ Object		☐ FrameMeta				
☐ ObjectCalColor		☐ ImageFlags				
☐ StackApFlx		☐ ImageMeta				
☐ StackB2DFit *		☐ Mask				
☐ StackDetection		☐ PhotoCal				
☐ StackDetectionCalib		☐ PhotozRecipe *				
☐ StackDetectionFull		☐ ProjectionCell				
☐ StackModelFit		☐ Region				
☐ StackOrphan		☐ RegionPatch				
		☐ SkyCell				
		☐ StackMeta				
		☐ StackToImage				
		☐ Survey				

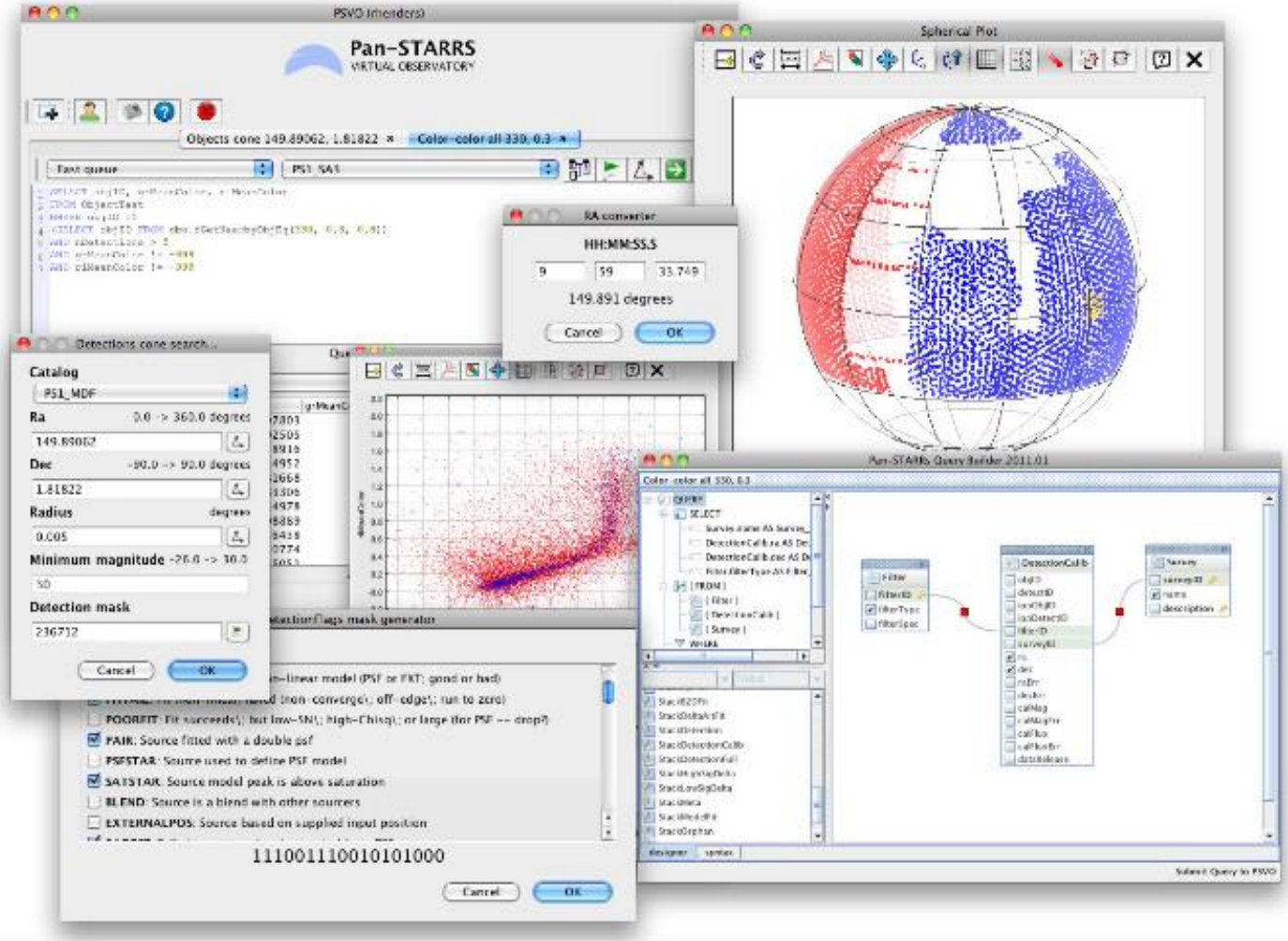
Column View Format: Column names only * Checkbox is disabled because the table is not populated at this time.

Start Over Next

Please email your comments, questions, and help inquires to pspshelp@ifa.hawaii.edu.

What is PSVO?

Pan-STARRS Virtual Observatory (PSVO) is a desktop application that aims to simplify the process of extraction and analysis of data from the PSPS database.



Ubercalibration

Finkbeiner

The photometric model:

$$N = Kf$$

A star of flux f has N counts per second

$$K = AT_aT_oT_fT_d,$$

(Aperture, throughput of atmosphere, optics, filter, detector)

Magnitude of star is defined by

$$m = -2.5 \log f/f_0$$

Where f_0 is AB reference flux. Instrumental mag is

$$m_{\rm inst} = -2.5 \log N$$

and is related to the magnitude by

$$m_{\rm inst} + Z = m$$

We refer to Z as the zeropoint for that object detection. The mean of these for an exposure is the zero point of the exposure (i.e. take out the mean flat)

Ubercalibration

Finkbeiner

The photometric model:

$$N = K f$$

A star of flu

(Aperture, throughpu
Magni

m

Where f_0 is AB

m_i

and is r

r_i

We refer to Z as the zero
of these for an exposure

The photometric model:

More specifically, we write Z in terms of the photometric parameters as:

System throughput on night *n*

Flat for season *i*

$$Z = a_n - k_n x + f_i + w(F)$$

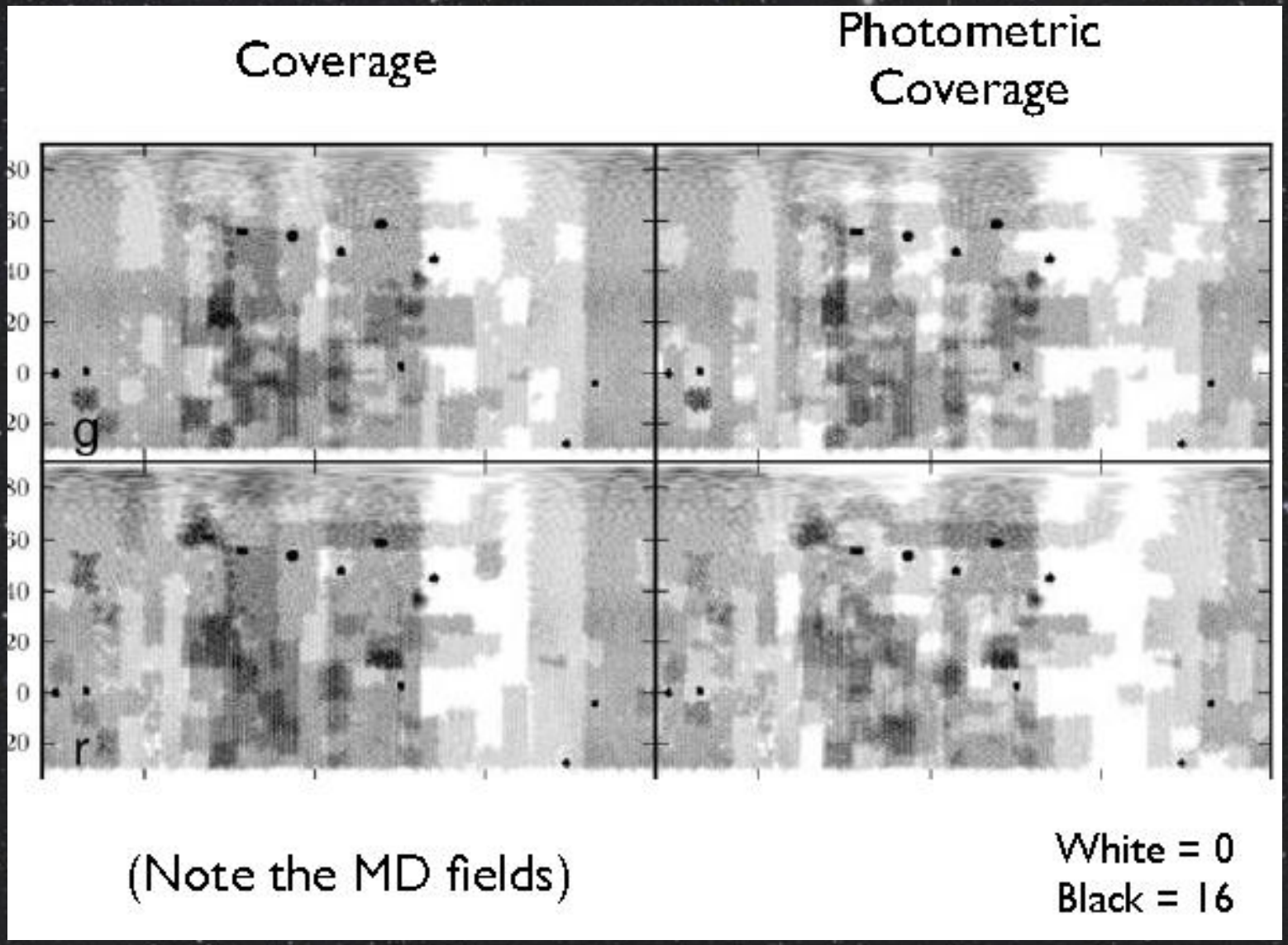
Atmospheric transparency on night *n*

Airmass of observation

Quadratic correction for FWHM

Parameter	Number	Note
a	~ 200	system (nightly)
k	~ 200	atmosphere (nightly)
f	$4 \times 60 \times 4$	illumination correction
w	2	FWHM correction (quadratic)

Ubercalibration



Ubercalibration

1.2 Residuals of photometric model

By using a rigid photometric model (one a,k per night) we assume the site, camera, etc. are stable over the course of a night. How good is this assumption?

- For each star in each exposure, compute

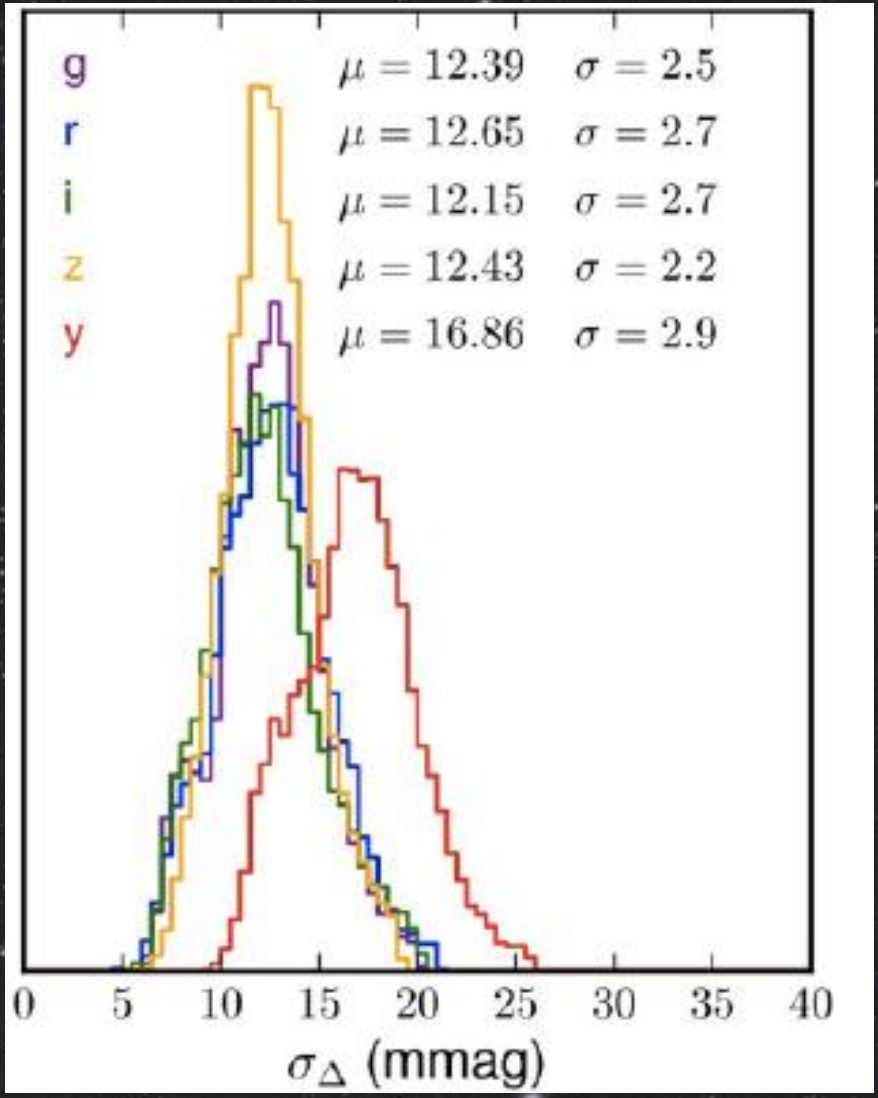
$$\Delta = m - \overline{m}$$

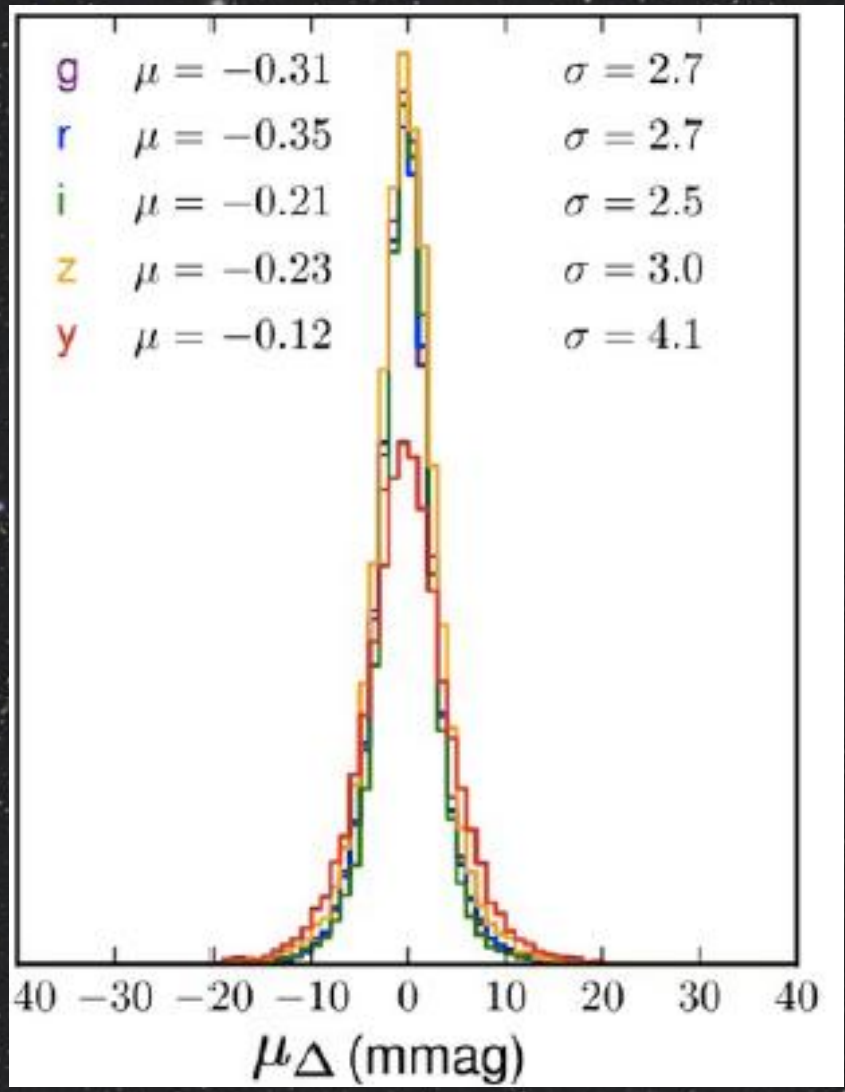
- Compute the mean and standard deviation of these *for each exposure*:

$$\mu_\Delta \text{ and } \sigma_\Delta$$

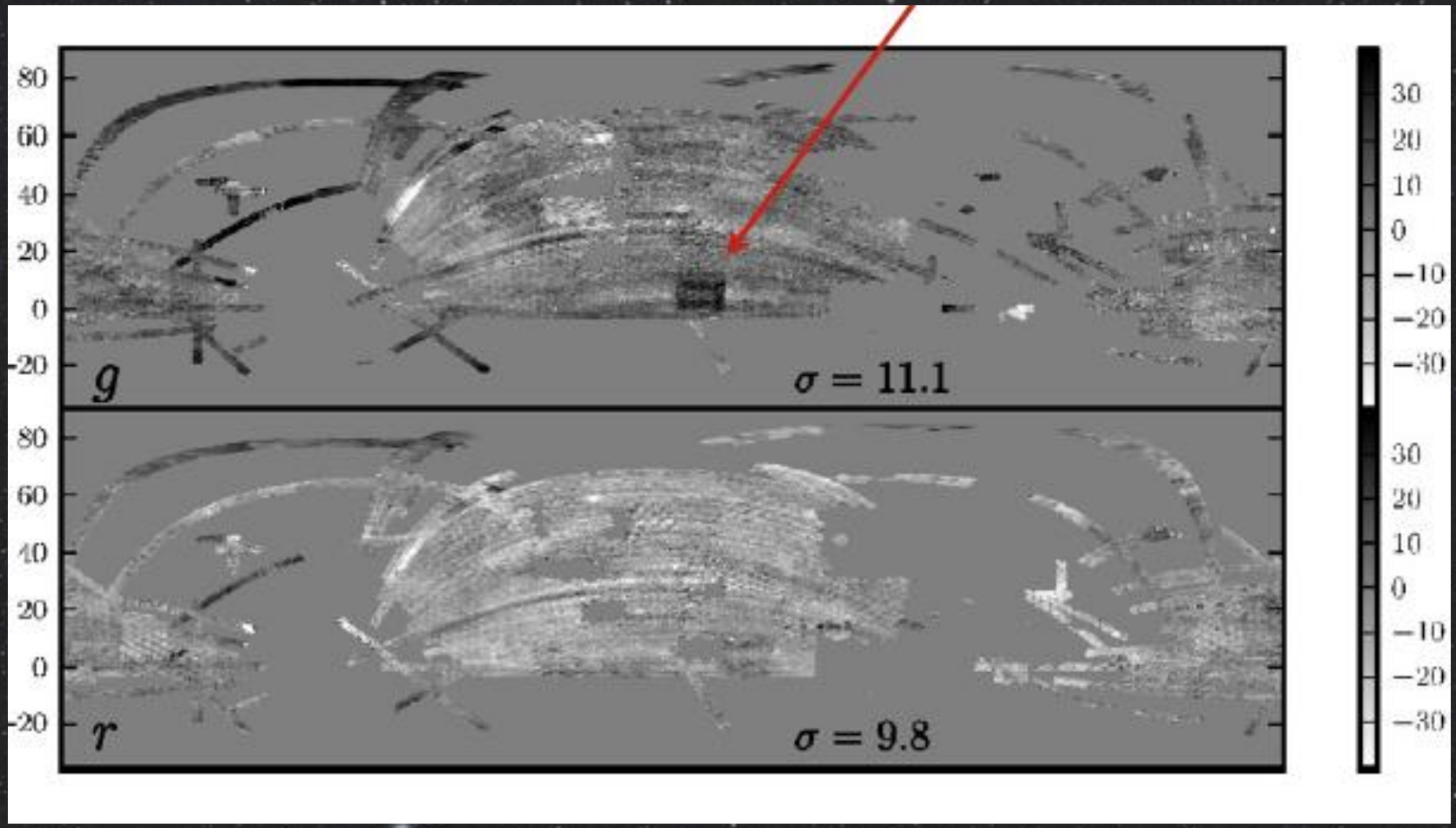
- Now look at maps and histograms of these.

Ubercalibration





Ubercalibration



Transient Science Server

Smartt &Smith

Medium Deep Pipeline

Smartt &Smith

Automated

Manual

Automated

Download IPP Diff Catalogues from Hawaii

Dump DB, Pre-Ingest Cuts, Run Classifier Algorithm, Ingest Data

Run Post-Ingest Quality Cuts & Publish (via Web) Quality Candidates

Generate Lightcurve & Scatter Plots for Quality Candidates

Request Images for Quality Candidates

Poll for & download images

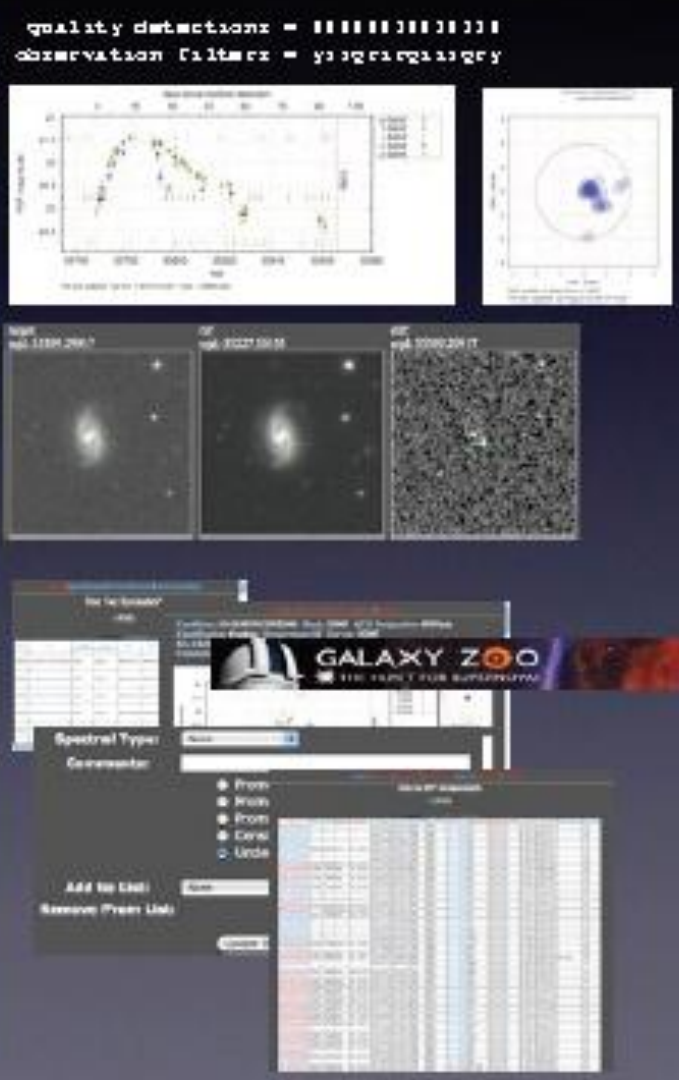
Human eyeballing (+ Galaxy Zoo?)

Promote and Assign Object Name or Discard Object

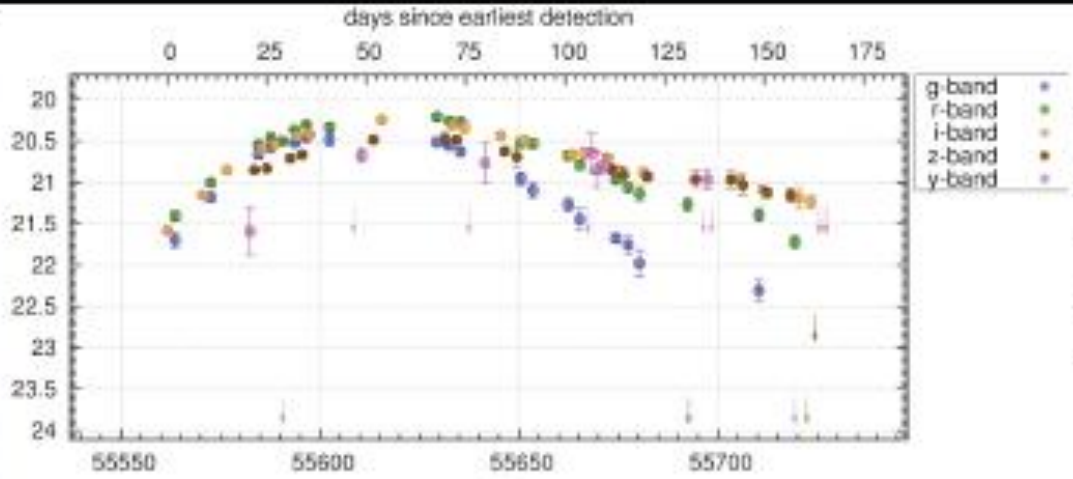
Crossmatch Promoted Objects (e.g with CfA)

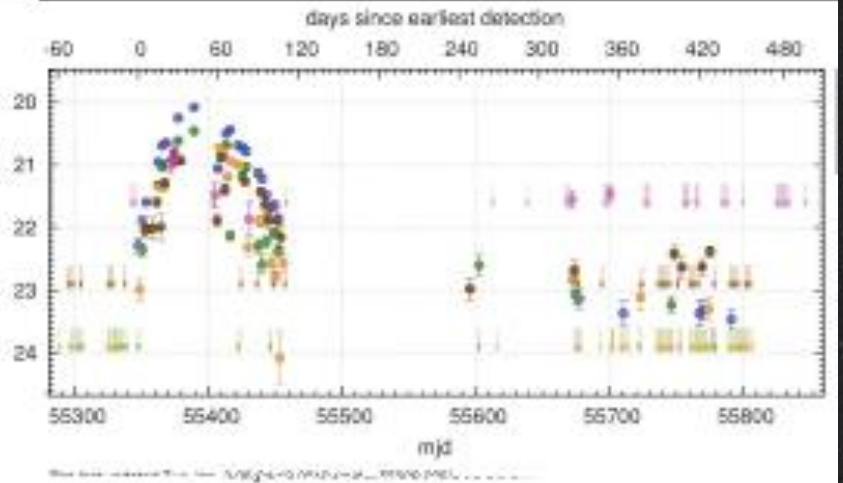
Stack-Stack diff catalogues

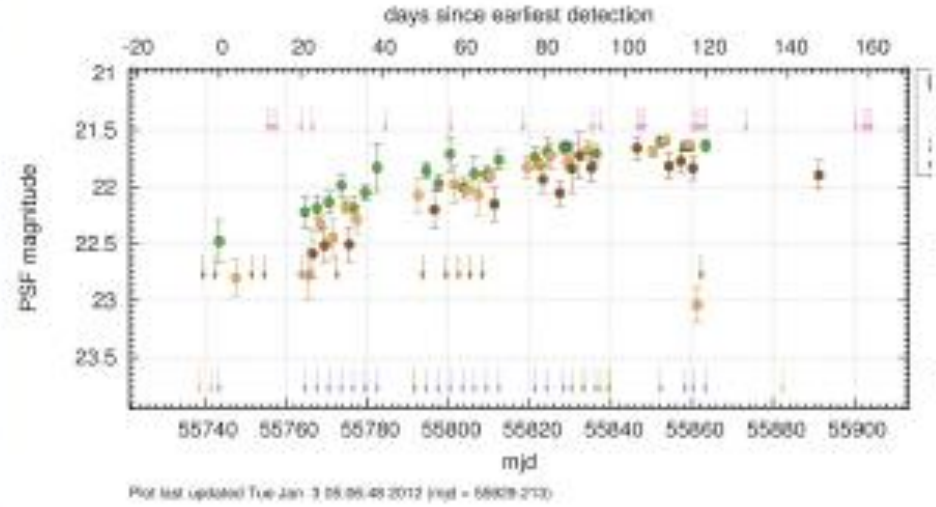
Supernova, AGN, NT, Variable Star, "Misc" Orphan, Orphan

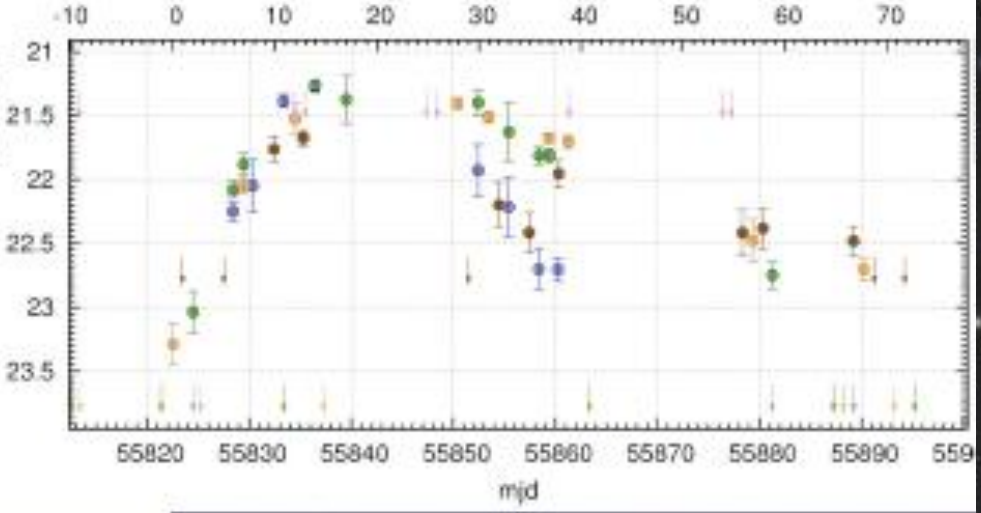


IPP LCs – good for science selection



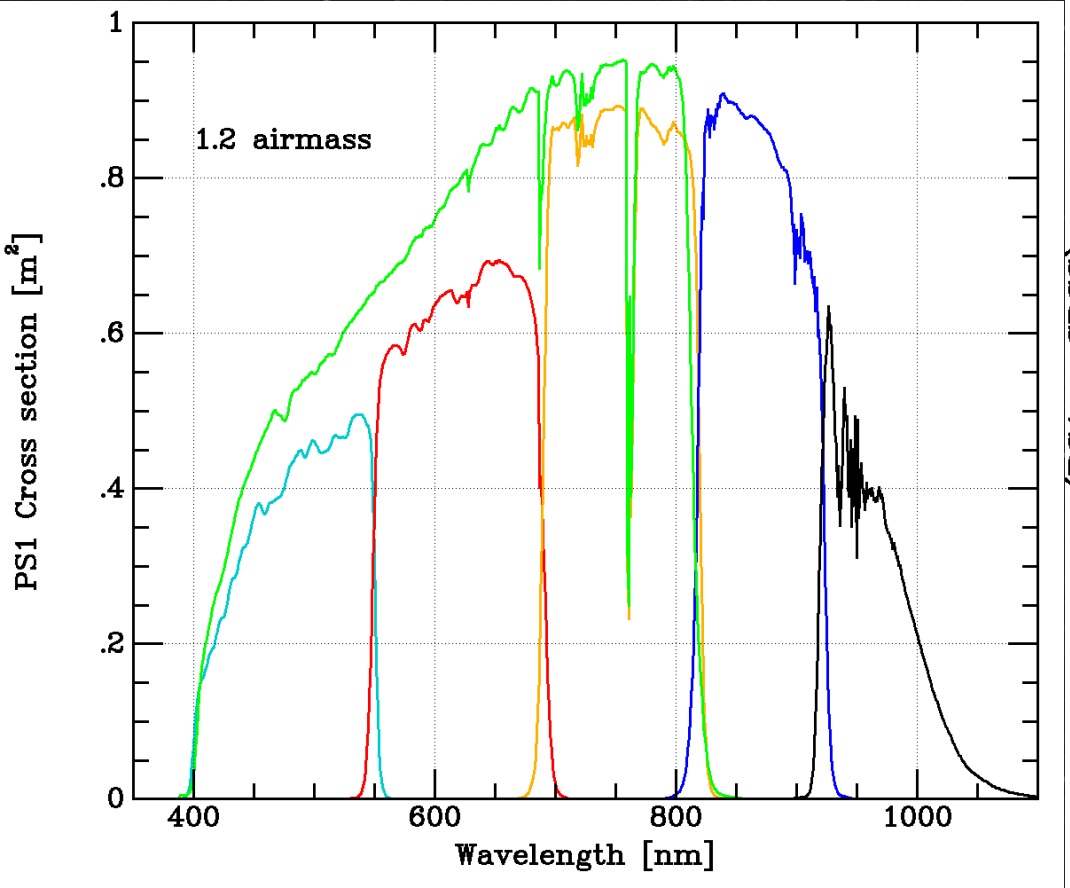


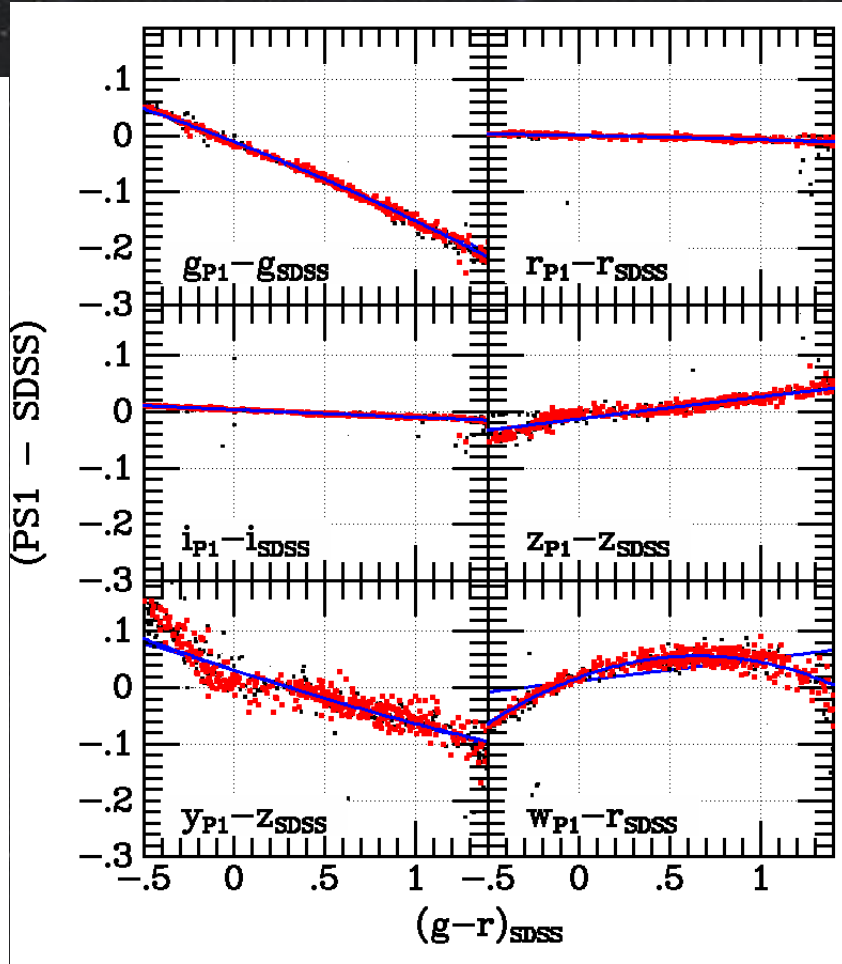




Photometric Calibration

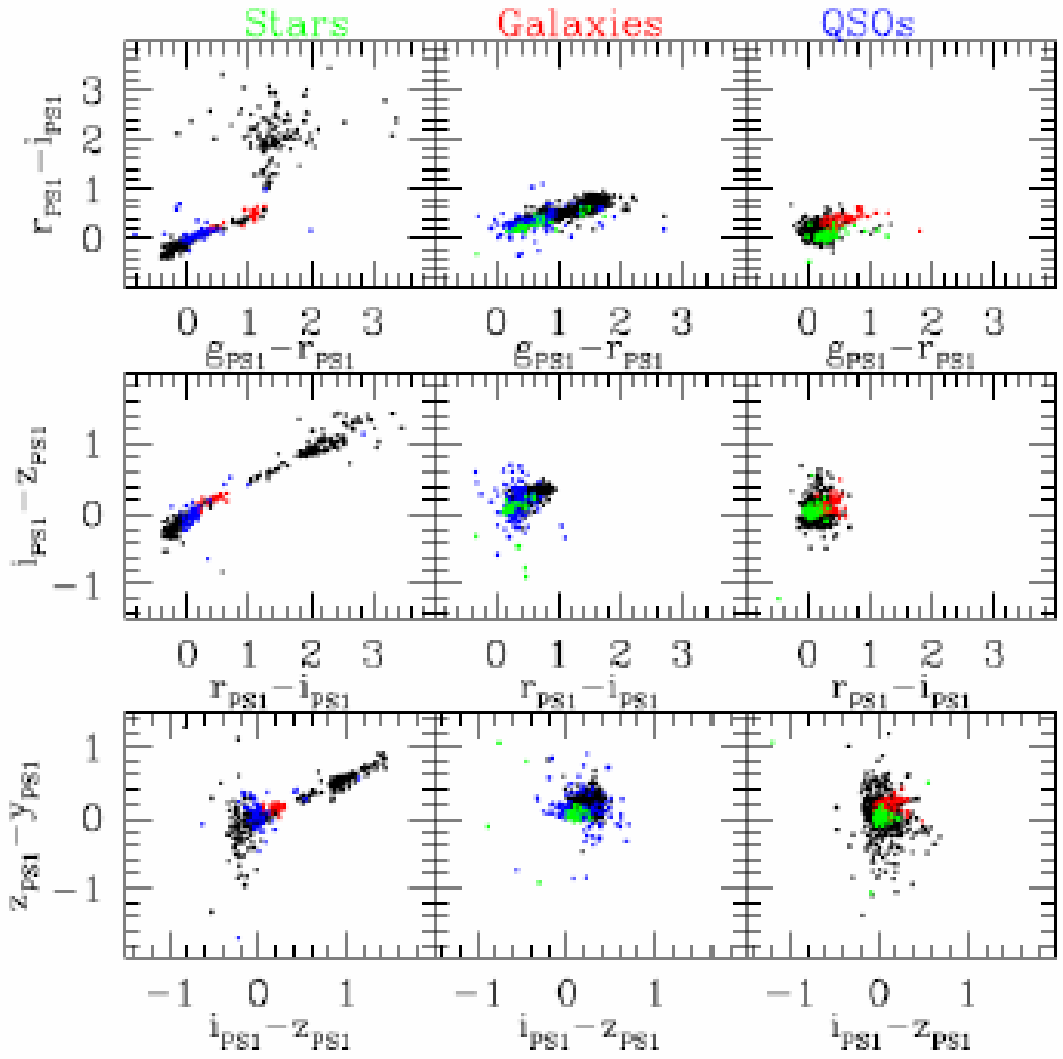
John Tonry





PanDiSC Results in the MDFs using SLOAN spectroscopy

True classes	N_{tot}	Star	Galaxy	Quasar
Star	449	381	21	47
		0.849	0.047	0.104
Galaxy	4750	38	4605	107
		0.008	0.970	0.022
Quasar	550	47	44	459
		0.085	0.080	0.835



Roberto Saglia

False positives:

1% for galaxies

19% for stars
(without galaxies: 10%)

28% for QSOs
(without galaxies: 8.5%)

[based on Tonry's reduction of MDFs]

Selection of KP science snippets

KP1: inner solar system

- 173 NEOs were discovered by PS1 in 2011
  - 11 with H magnitude brighter than 18.3 (diameter > approximately 1 km)
  - 16 Potentially Hazardous Asteroids (PHAs) (H < 22.0 (diameter > 150 m and passes closer than 0.05 AU to Earth)

Month	Number of NEOs
January	22
February	8
March	9
April	21
May	3
June	5
July	24
August	17
September	32
October	18
November	8
December	6

Telescope	PHA	NEA	H<18.3
G96 (Catalina Sky Survey)	34	367	7
703 (Catalina Sky Survey)	22	179	13
F51 (PS1)	16	173	11
704 (LINEAR)	11	70	2
691 (Spacewatch)	8	28	1
E12 (CSS – Uppsala Schmidt)	6	38	5
Others	4	41	1
Total	**101**	**896**	**40**

Richard Wainscoat

KP2: Outer Solar System

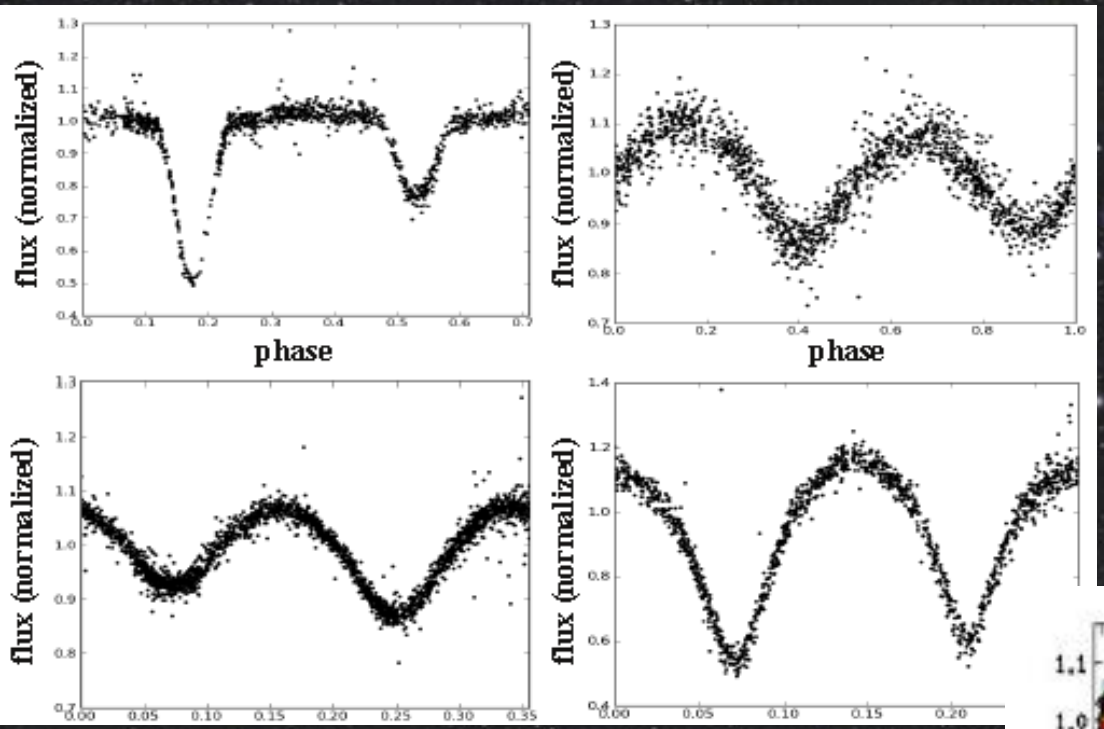
Summary

- We have reported the objects to the Minor Planet Center. These include ten new Kuiper belt objects and one Centaur, found in a small subset of the data. Just the tip of the iceberg. These objects range in magnitude from 21 to 23 in the w filter, corresponding to diameters from 300 to 500 km.
- We have found a comparable number of additional objects, in a similar number of fields, during recent pipeline development that have not yet been reported.
- We are also rediscovering lost Kuiper belt objects, those found in earlier surveys but whose orbits are so poorly known that they cannot be tracked.

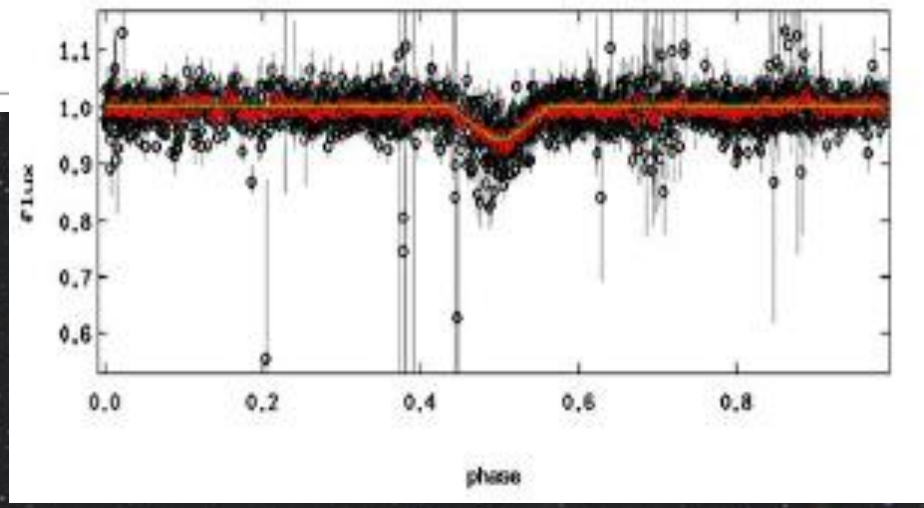
In the coming months

- Scale up our search to the full 3pi data set. The parallelization is "straightforward," but more work is still required.
- Focus on the bright end of the TNO distribution, then on the fainter objects.
- Evaluate our detection efficiency through a combination of (1) a control population of synthetic moving objects injected into the source lists, (2) detections of known ISS and OSS objects, and (3) the detection efficiency and mask information provided by IPP.

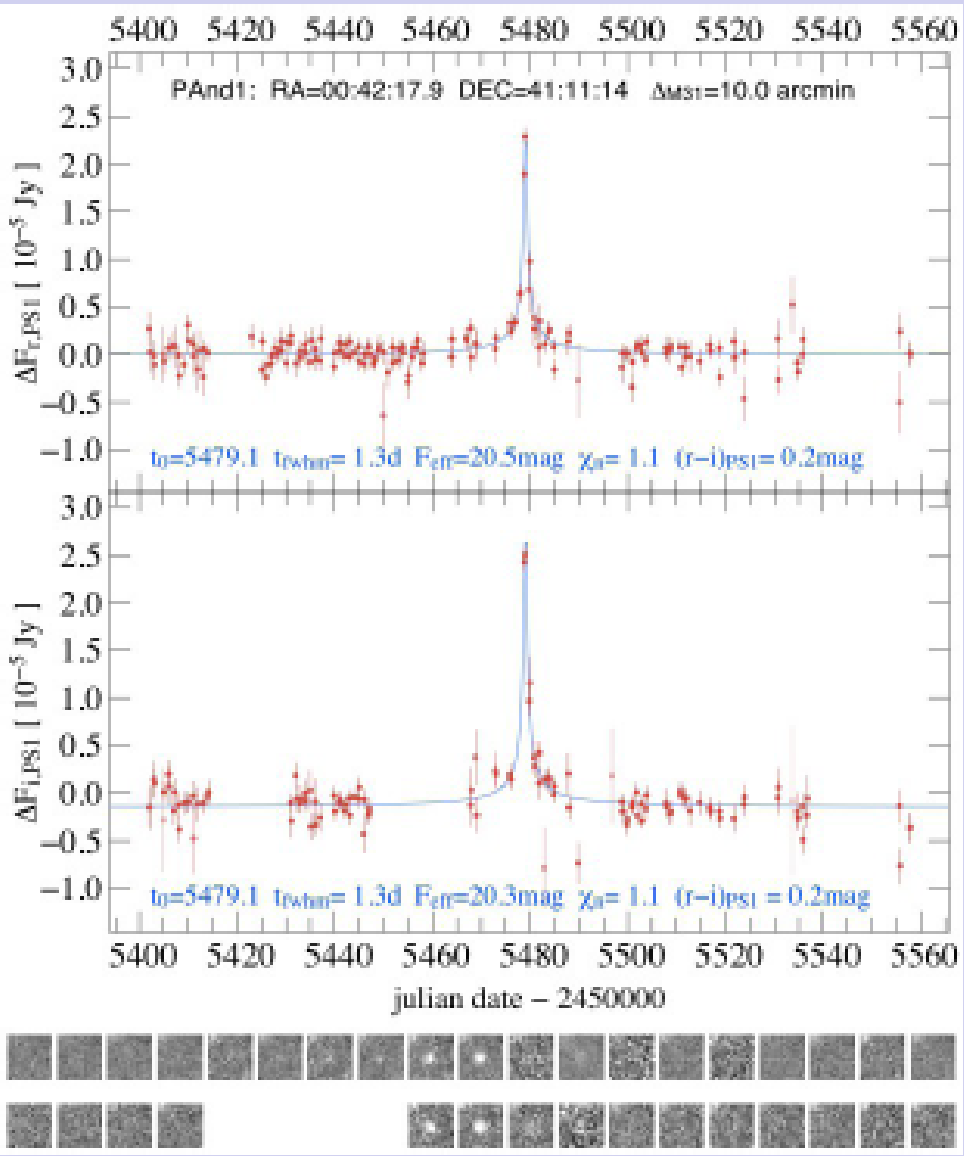
KP4:Pan-Planets

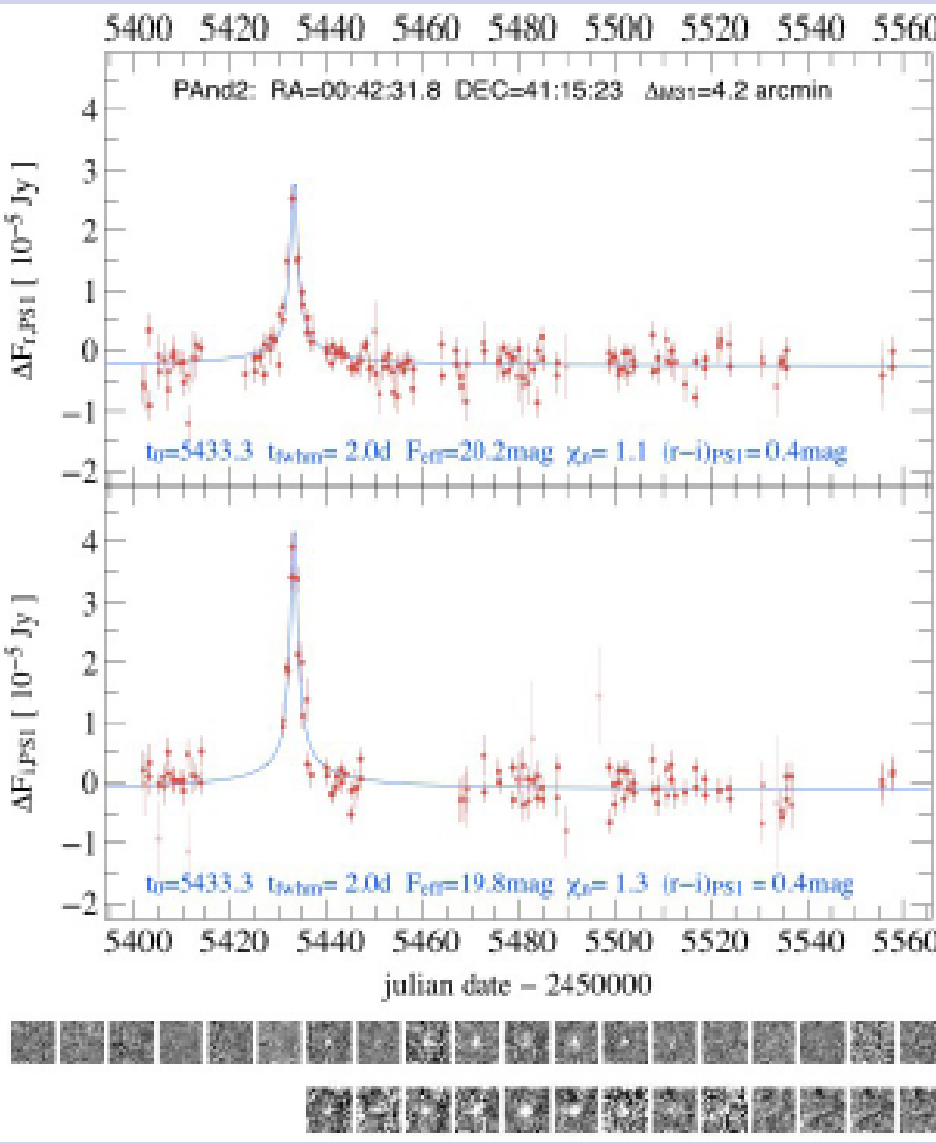


Johannes koppenhoefer



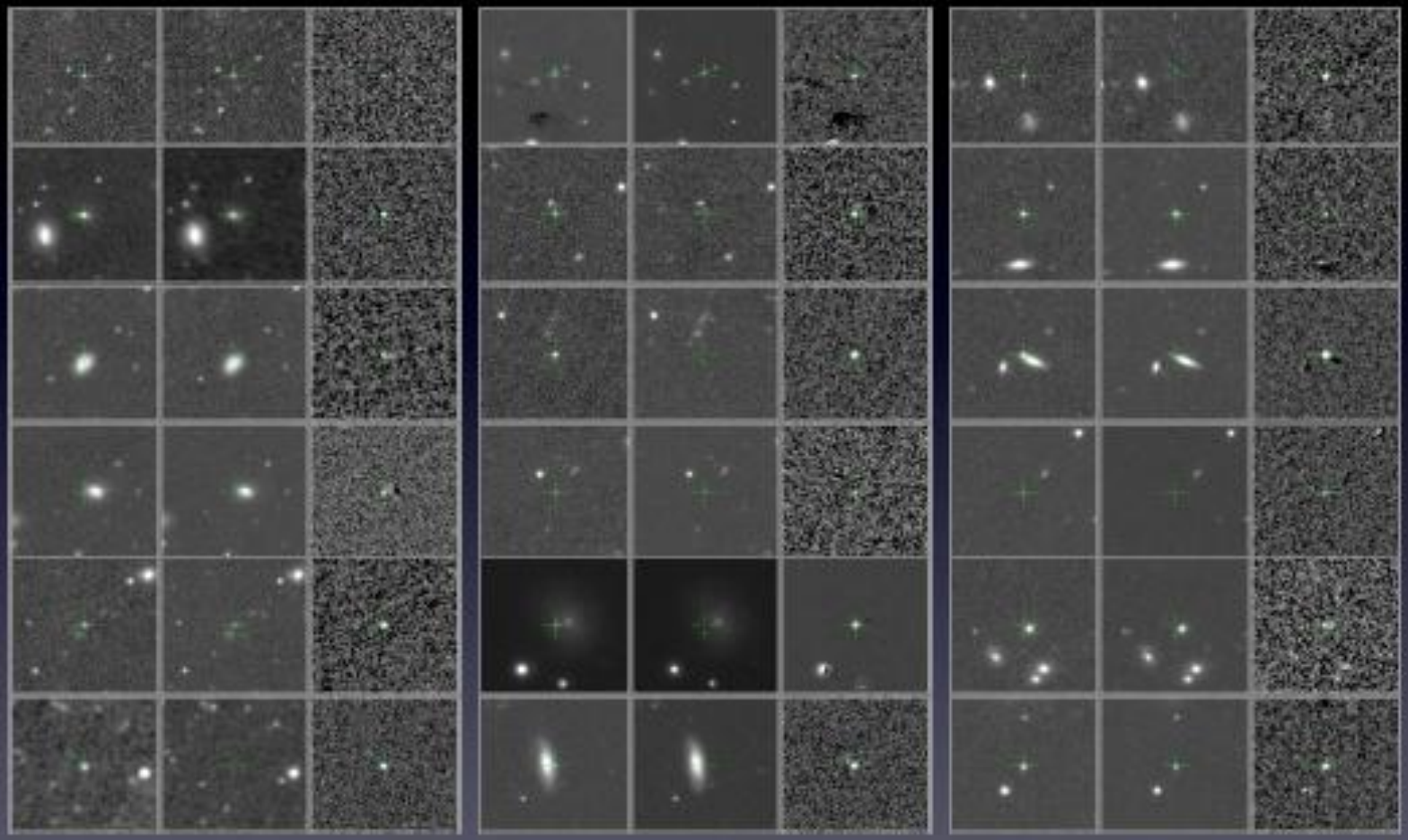
microlensing candidate PAnd 1 + 2





KP7:explosive transients Stephen Smartt

~3x10^3 *transients*, ~250 spectroscopically Confirmed SNe

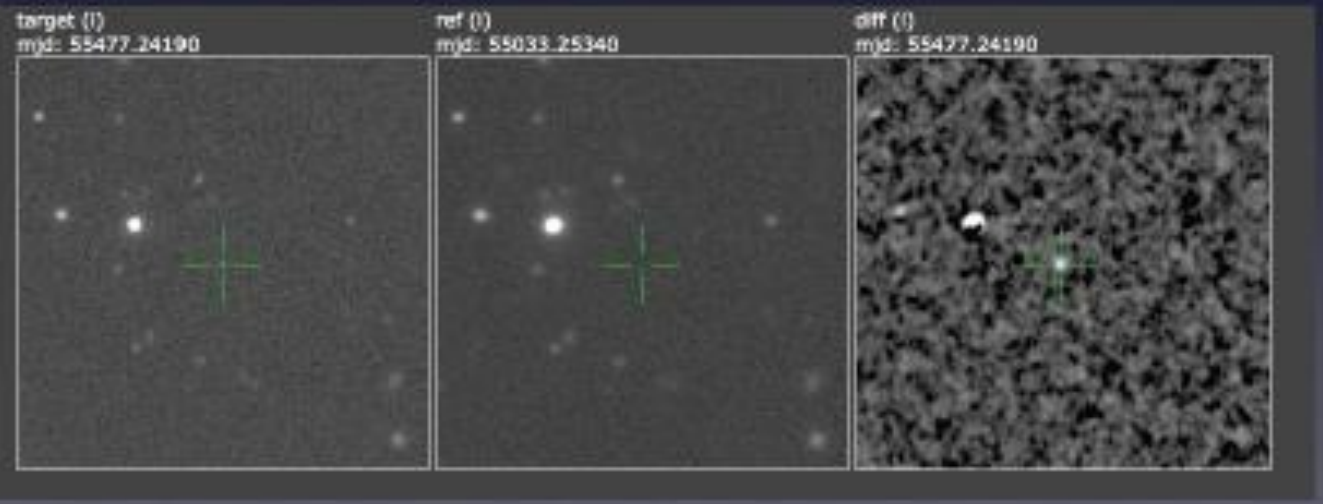


Photpipe team :Huber, Rest, Narayan, Stubbs, Wood-Vasey, Chornock, Foley, Berger, Rodney ++

QUB Team :Smartt,Smith, Kotak, McCrum, Fraser , Magil, Valenti, Botticella, Pastorello, Young

Search for Orphans

- PS1-11zd
- Type Ia, z=0.1 ; same as "host"
- Offset by ~25kpc



- PS1-10awh
- Type I SN at z=0.9
- No obvious host – even in deep stacks

>3.5" from any catalogued star or galaxy, to $r \approx 23.5$

254 orphans from 1.25yr : Matt McCrum talk, paper in prep

KP9

- Short-term projects:
  - MD-based (taking advantage of depth and readiness)
    - Outer asymmetry and LSB fractional flux
    - Radial profiles for disk galaxies (hopefully with Magnier u-band imaging)
  - 3pi-based opportunities (for now just link with other individual projects)
- Long-term projects starting already:
  - 3pi panchromatic *nearby* galaxy atlas and derivatives
  - Tully distance catalog
  - Almost... "Pan-squared" (tied to SDSS main galaxy sample, needs vetted extended source params or multi-component galfit)
  - Not quite... galaxy stacking analysis (needs uber-IPP pixel data)

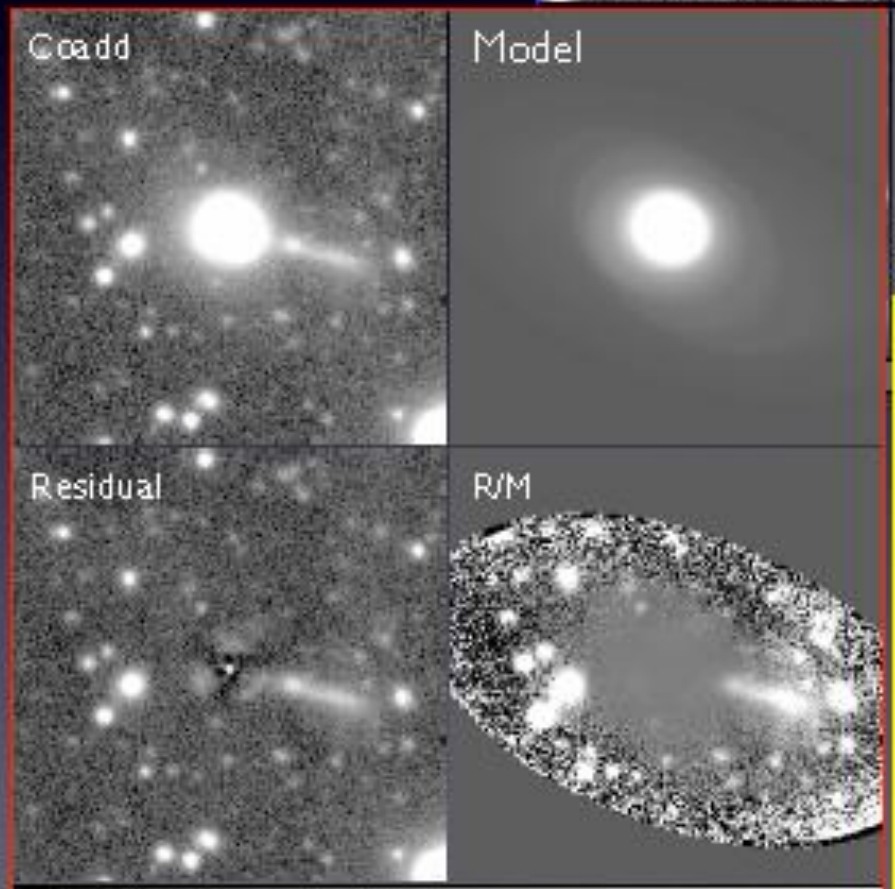
- Outer asymmetry and LSB fractional flux
  - Sample - SDSS spectroscopically-confirmed galaxies with r(Petro) > 2" positioned in Pan-STARRS1 MD fields (MD03...MD10) however we later throw away galaxies with neighboring star, possible companion R<200 kpc, or outside the range of 0.15 < z < 0.40.
  - Data - fully calibrated MD stamps from Tonry for ~700 final targets
    - Then we create a weighted-coadd of *gri* bands to maximize sensitivity w.r.t. ETG-colored features
    - Coadd surface brightness lim. ~29+ AB mag / sq. arcsec, but SB dimming!
  - Analysis Method
    - Isophotal ellipse fitting, allowing PA, ellipticity, and position to vary with r
    - Iterative (*SExtractor* <--> *ellipse*) contamination source masking
    - Asymmetry finally calculated using only pixels with R = 25-50, 50-75 kpc

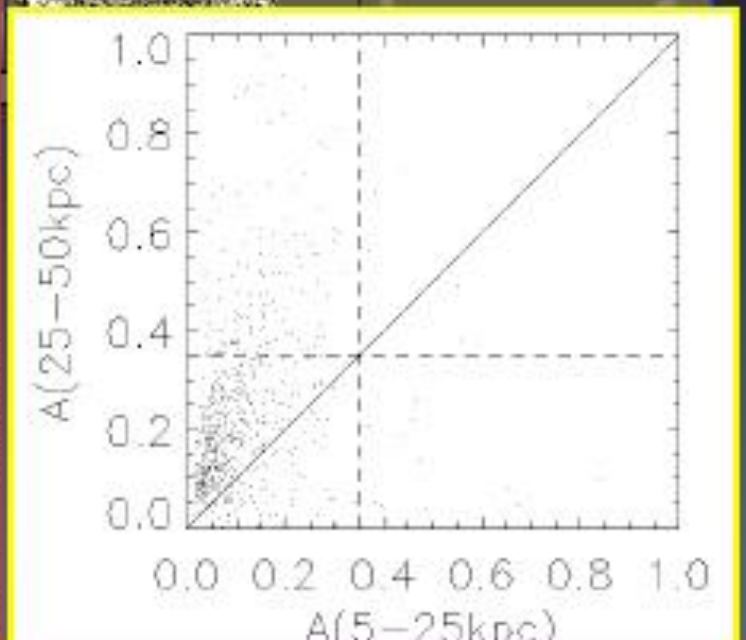
David Thilker
Johns Hopkins

Pan-STARRS
PS1 Science Consortium

PS1SC meeting
5 Jan 2012

$$A_{\rm abs} = \frac{\Sigma\,|I_o - I_\phi|}{2\Sigma\,|I_o|}$$





DRAVG

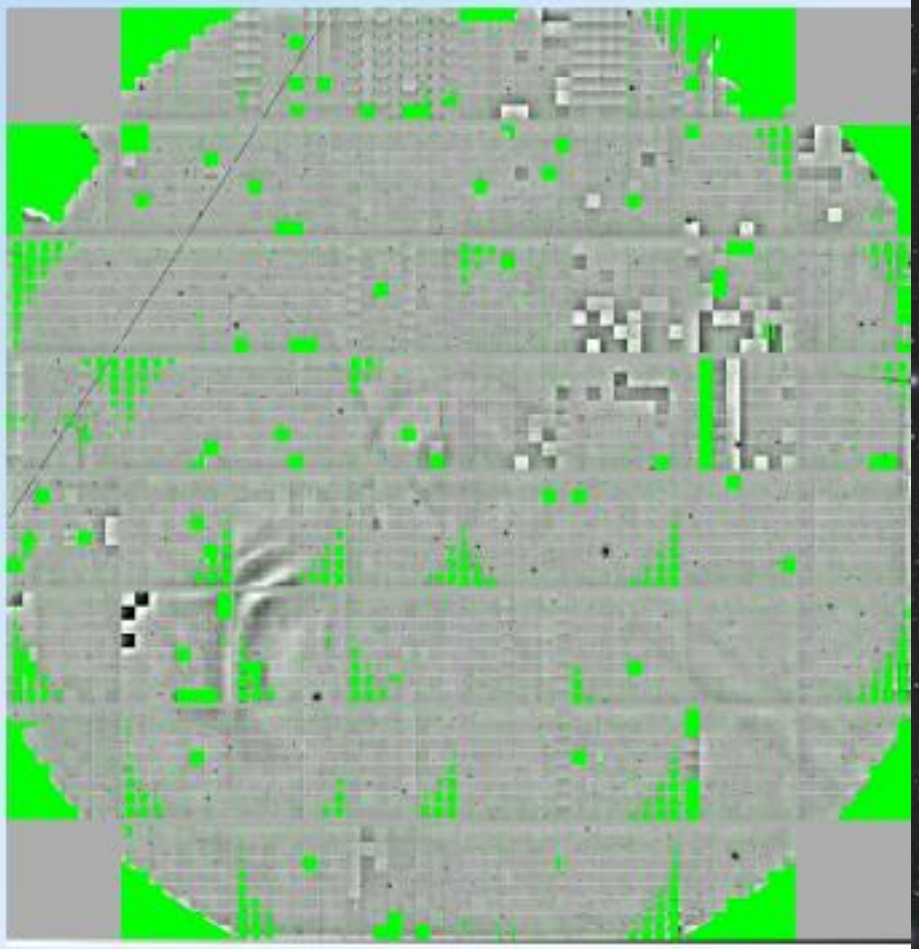
Items for the PS1 Consortium meeting (Jan 5th) [edit]

1. Membership
2. Meeting time/frequency
3. Future work
   - Information/documentation - yes please!
   - Extended source - feedback from people who are using Sextractor etc
   - Convolved stacks/static sky - no testing yet - simple inspection of the images? - NGC samples for testing? - request for PS server to return mosaiced areas.
   - PSPS testing - call for people with database experience - what features are needed astronomically? VO? How to make best science use of the existing parameters in PSPS. Do different surveys present the same interface? Representative from each KP needed.
   - Star/galaxy separation - do we need more parameters out of IPP? Compare with SDSS. Combine photometric and morphological parameters?
   - Using refstacks to clean up individual exposure (then regenerate stacks) - maybe try on MDs?
   - Convolution direction for diffs - fix on its way.
   - 3-pi diffs - coming soon
   - Forced photometry - needs a fix, should also be available soon for stacks
4. Progress with current issues: Stellar faint end bias - could be Poisson v constant again. Kron mags - check backgrounds, Ubercal - PSPS can cope - do image headers get corrected?, Systematic error field in PSPS? Background & false positives - new footprint stacks.

Background Issue

Processing Improvements : Linearity & Background

- We correct for non-linearity but...
- Not all cells corrected well, so...
- we make a second crude correction, but...
- we applied it too liberally



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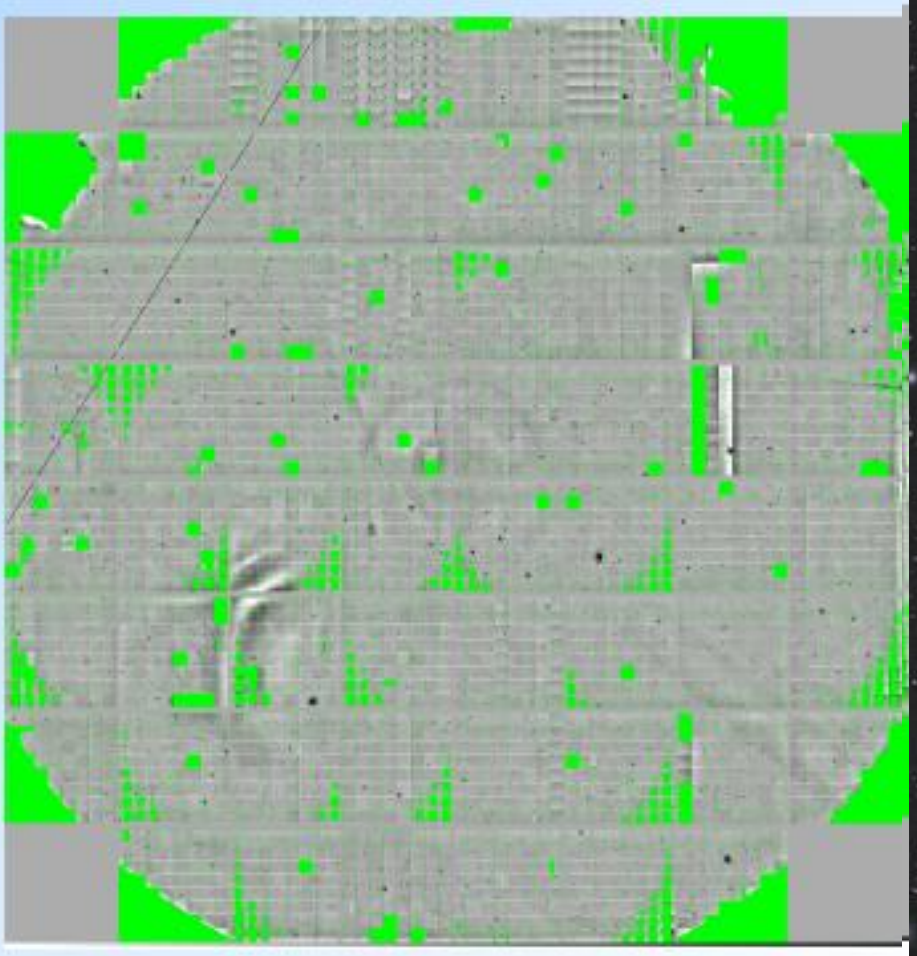

Plans

Original funding period will end in October 2012

NSF proposal (mid-Feb submission) to secure part of the funding to continue to October 2013/January 2014

Prioritizing
- i) Background pattern issue
- ii) Adoption of ubercalibration zeropoints

Early Data release: photometric ladder

Formation of PSPS working group (Chair: Roberto Saglia)

Next consortium meeting here in Durham: 26th-29th June 2012
Following meeting Taiwan autumn/winter 2012