



Pan-STARRS-1 Medium Deep Survey

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Summary

The Panoramic Survey Telescope And Rapid Response System-1 (Pan-STARRS-1, PS1) has been in full operation since Spring 2010 and concluded the PS1 Science Consortium (PS1SC) observational program in early 2014. The Medium Deep Survey (MDS) component of the program, allocated 25% of the time, regularly visited 10 fields (~7 sq. deg. each) with significant multi-wavelength overlap from previous and concurrent surveys (e.g. SDSS, DEEP2, CDFS, COSMOS, GALEX). The cadence generally includes the g,r,i,z filters for a MDS field every 3 days with a nightly stack depth of r,i to 23.5 mag and the y filter primarily during bright time over the 6-8 month season the field is visible. While data products were regularly produced for the transient event discovery and science consortium programs, development work continued to improve the single exposures though production of deep stacks for reprocessing into the final and public release. The data products, to be publicly available after the post-observing proprietary period, will be summarized.

For more details on PS1 with the Science Collaboration and Pan-STARRS visit

- <http://ps1sc.org>
- <http://pan-starrs.ifa.hawaii.edu>

Examples of science with the MDS this meeting

- Results from the Pan-STARRS1 Sky Surveys (Chambers)
- An Investigation of Quasar Variability as a Damped Random Walk in the PanSTARRS-1 Medium Deep Fields (Cunningham)
- The Pan-STARRS 1 Medium Deep Field Variable Star Catalog (Flewelling)
- Superluminous Supernovae: A Pan-STARRS1 Perspective (Lunnan)

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Data Products

The final, homogeneous reprocessing of all MD, CNP (and 3PI) data products currently in progress. The CNP is a hybrid of MD and 3PI and has been added to the MD group for a first reprocessing — while the CNP observations are similar to the 3PI, the larger number of exposures provides for a reference stack of select inputs and a much deeper stack similar to the MD fields.

Exposures are remapped (warped) onto a specific tessellation of sky cells. MD fields are each on a specific tessellation grid (will have overlapping 3PI photometry, but no mixing of pixels)

- 0.25 "/pixel, 10x10 sky cell grid over 4 degree, 80" overlap of sky cells
- dithering by mostly rotation of 8 exposures for a night
- pointing center shift for a few fields (see MD07, worst case), the edges will have exposure and stack photometry but likely missing difference image photometry

CNP uses the same tessellation as the 3PI pole-specific reprocessing, but still no mixing of pixels

- 0.25 "/pixel, 11x11 sky cell grid over 4.4 degree, 60" overlap of sky cells
- dithering over the sky cells driven by time of the night and year for exposure as grizy observed every night possible

Image and catalog products

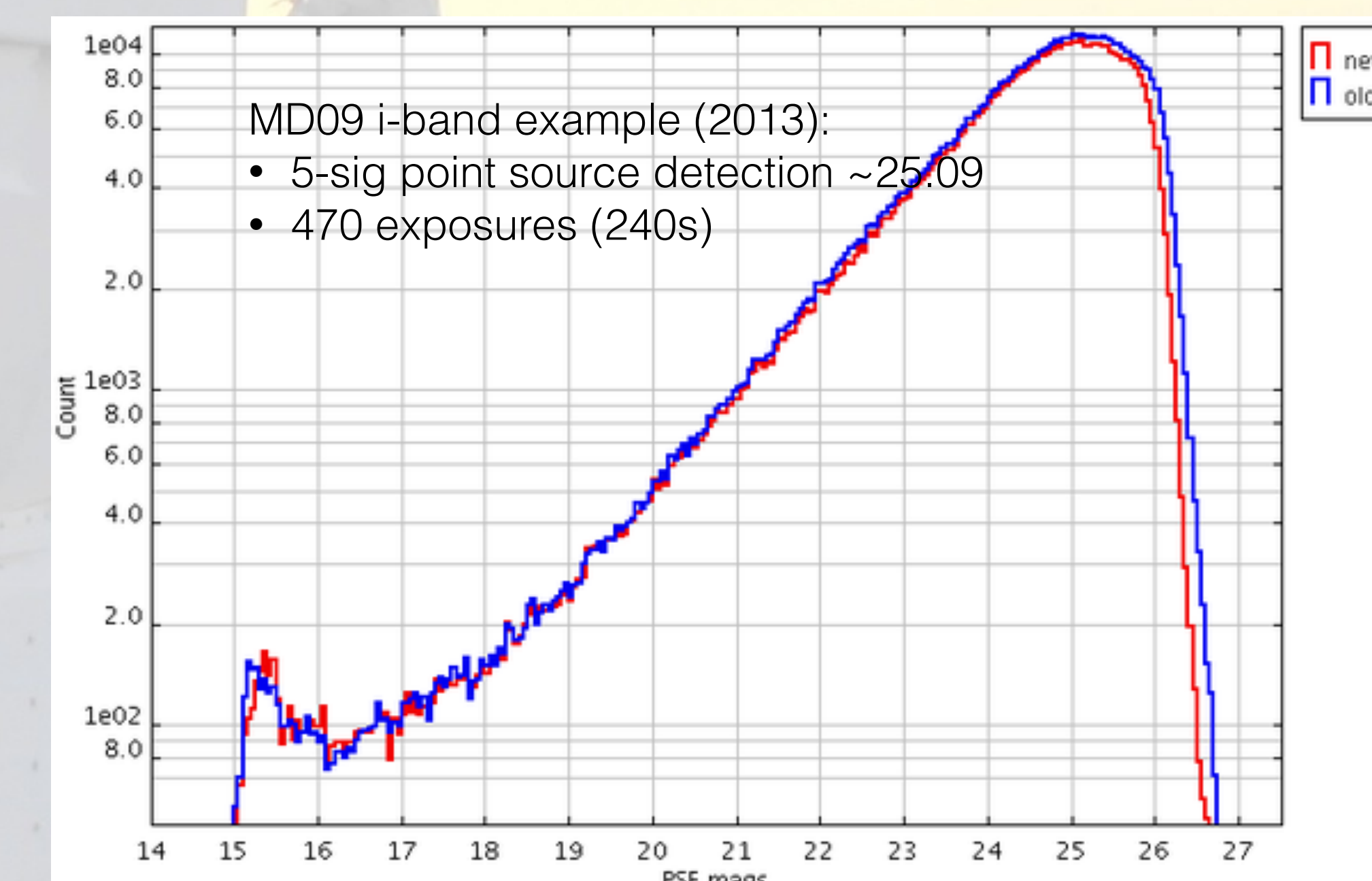
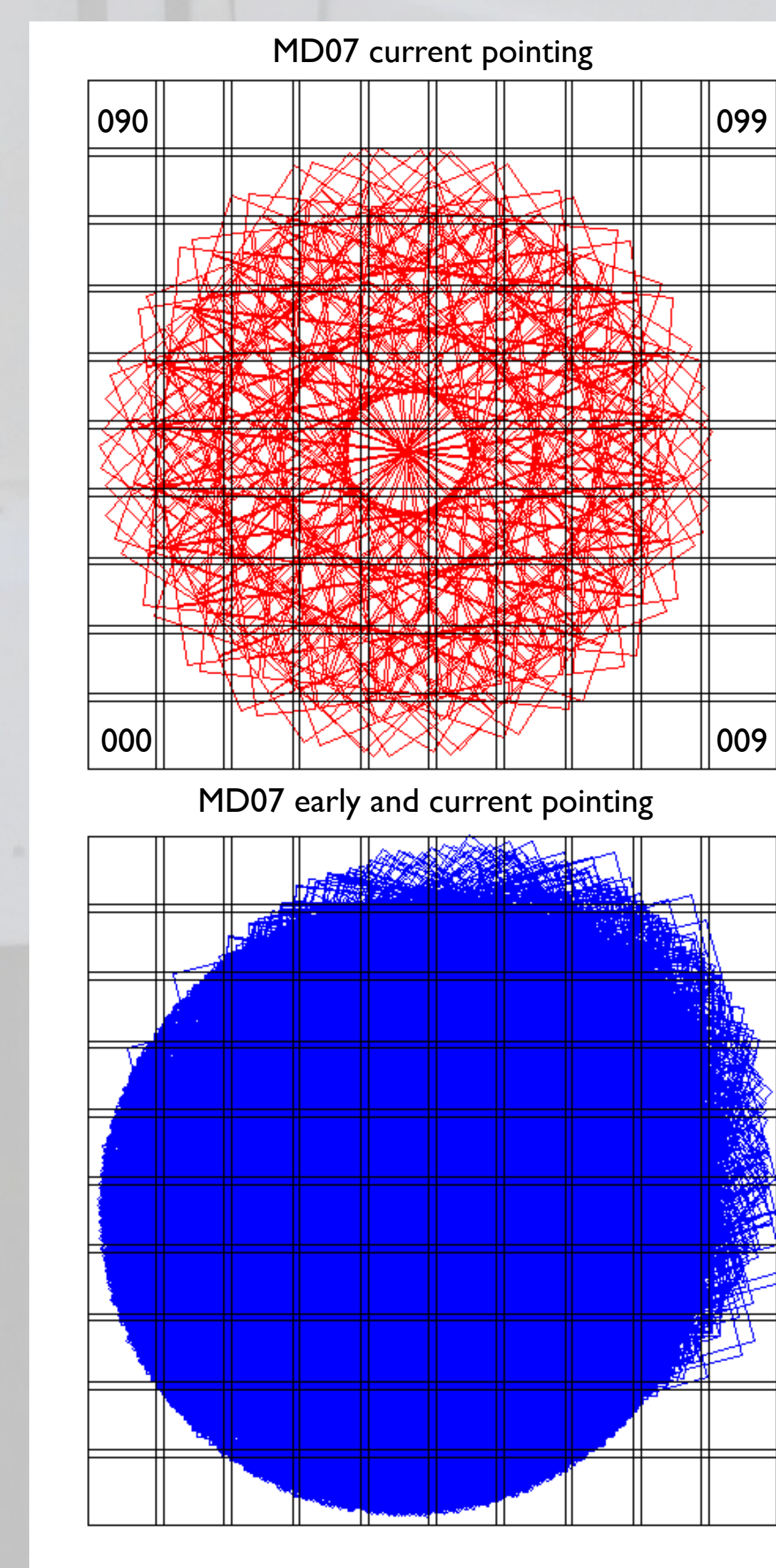
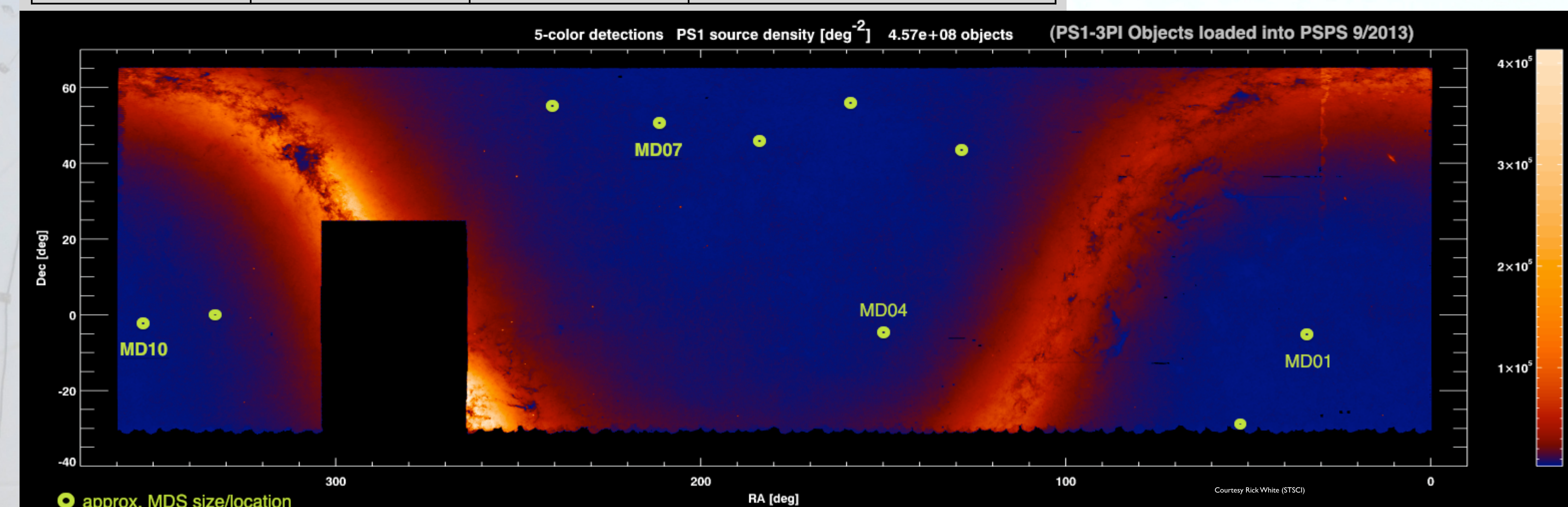
- Exposure photometry [MD,CNP,3PI] — photometry & astrometry before warping
- Stack Images with photometry for each stack type — MD04 (2014) table of depth estimates
 - Night [MD] — typically 8 exposures, possibly more on marginal nights
 - Reference [MD seasonal, CNP single] — 30–60 best exposures. For MDS, a seasonal stack is made excluding exposures for the specific field season
 - Deep [MD & CNP >400 inputs, 3PI ~30 inputs] — MD09 (2013) example plot of dynamic range and MD04 (2014) variations across the field by filter
 - IQ [MD, CNP] — 10–20 of the best exposures
- Difference Images with photometry for each type —
 - Warp-Stack [MD & CNP reference, 3PI stack]
 - Stack-Stack [MD] — night and reference stack

All photometry end products will be publicly accessible via the PSPS database at STSCI with final photometric and astrometric calibrations (coming soon, Spring 2015).

Medium Deep Survey Fields

Field	RA (J2000)	Dec	Overlaps
MD01	02:24:50	-04:35:00	XMM-LSS-DXS/VVDS-02h
MD02	03:32:24	-28:08:00	CDGS/GOODS/GEMS
MD03	08:42:22	+44:19:00	IFA/Lynx
MD04	10:00:00	+02:12:00	COSMOS
MD05	10:47:40	+58:05:00	Lockman-DXS
MD06	12:20:00	+47:07:00	NGC4258
MD07	14:14:49	+53:05:00	DEEP2/Groth Strip
MD08	16:11:09	+54:57:00	EliasNI-DXS
MD09	22:16:45	+00:17:00	SA22-DXS/VVDS-22h
MD10	23:29:15	-00:26:00	DEEP2-Field 3
CNP	—	+89:22:00	North Celestial Pole Calib. Field

Survey	EXPTIME [seconds]	FWHM [median(sigma)] "
MDS	gr: 113, izy: 240	1.52(0.53), 1.44(0.53), 1.41(0.49), 1.13(0.5), 1.13(0.53)
CNP	grizy: 30	2.18(0.59), 1.64(0.59), 1.72(0.54), 1.52(0.57), 1.39(0.51)
3PI	grizy: 43,40,45,30,30	1.30(0.72), 1.18(0.65), 1.10(0.62), 1.07(0.6), 1.02(0.59)



MD04 (2014)	g (N)	r (N)	i (N)	z (N)	y (N)
night (typical)	~24.6 (8)	~23.6 (8)	~23.8 (8)	~23.2 (8)	~22.0 (8)
reference (yr3)	24.5 (30)	24.4 (31)	24.5 (36)	23.9 (33)	22.8 (34)
deep	25.8 (507)	25.6 (506)	25.9 (636)	24.9 (594)	23.9 (386)

Field MD04 (grizy) 5-sig point source Deep Stack (2014)

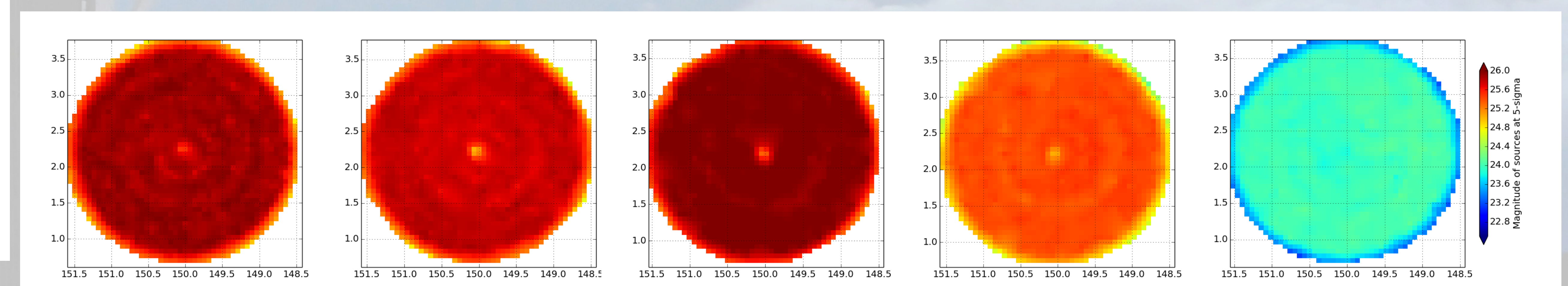


Photo Credit: Rob Raskowski, PS1SC



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http://svn.pan-starrs.ifa.hawaii.edu/trac/ipp/wiki/MediumDeepFields/ps1md_poster_aas225w2015.pdf

