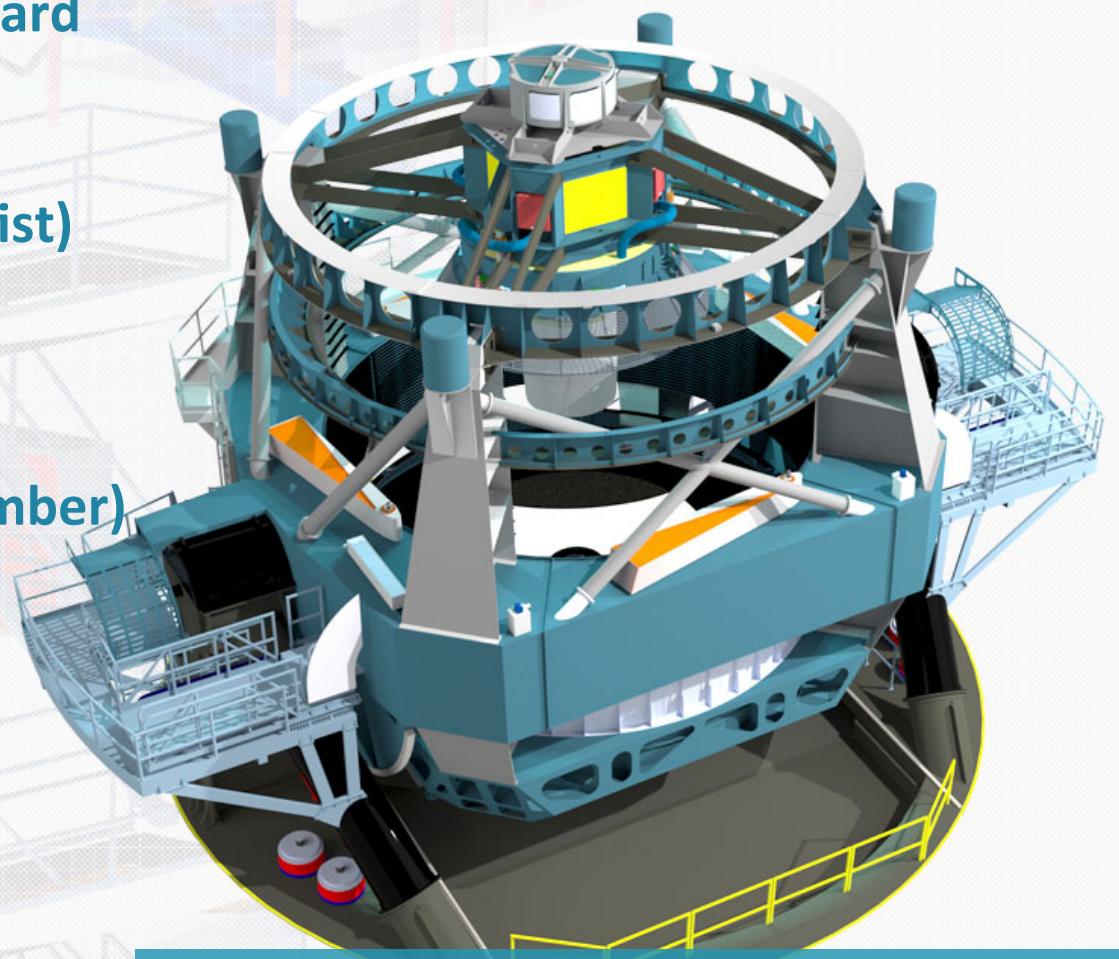


LSST Community Resources

Beth Willman
LSST Deputy Director/Steward

with special guests:
Zeljko Ivezic (project scientist)
**Michael Strauss (SAC chair,
many hats)**
**Lucianne Walkowicz
(science chair, SAC member)**

November 17, 2015

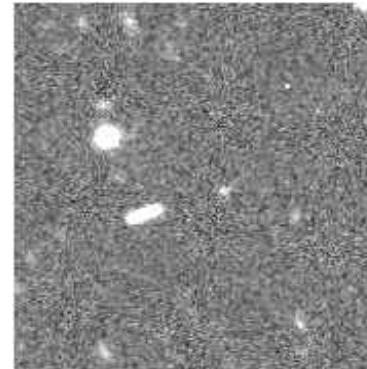


A number of slides provided by Mario Juric (UW)

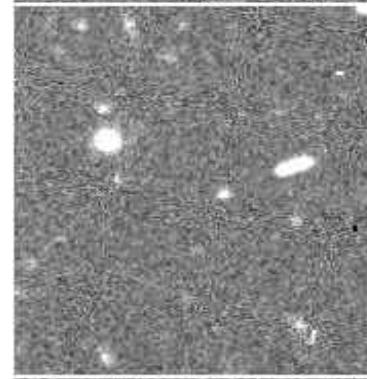
LSST designed to deliver in four key science areas



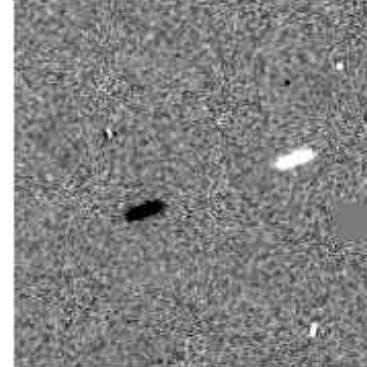
- Time domain science
 - Nova, supernova, GRBs
 - Source characterization
 - Instantaneous discovery
- Census of the Solar System
 - MBAs, NEOs, Comets
 - KBOs, Oort Cloud
- Mapping the Milky Way
 - Tidal streams
 - Galactic structure
- Dark energy and dark matter
 - Strong Lensing
 - Weak Lensing
 - Constraining the nature of dark energy



Exposure 1



Exposure 2



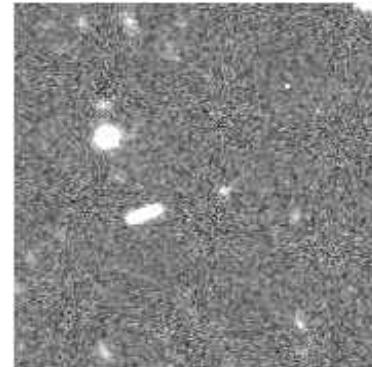
Exposure 1

Exposure 2

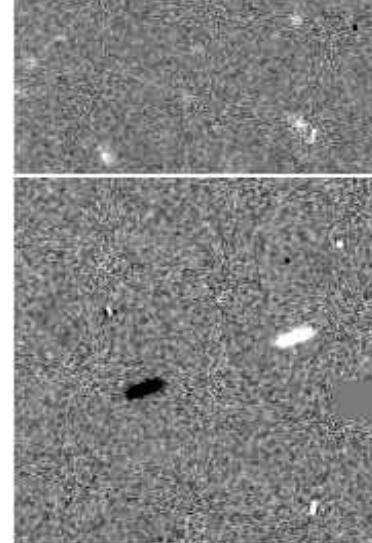
LSST designed to deliver in four key science areas



- Time domain science
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Exposure 1



Exposure 2

See Ivezić et al 2008 "LSST: From Science Drivers to Reference Design and Anticipated Data Products"

LSST: A Deep, Wide, Fast, Optical Sky Survey



8.4m telescope

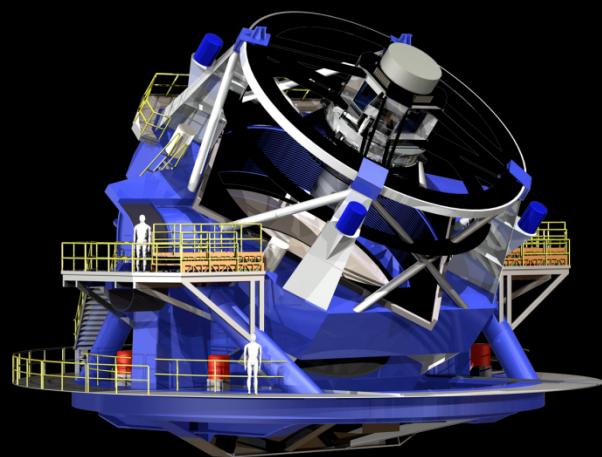
18000+ deg²

10mas astrom.

r<24.5 (<27.5@10yr)

ugrizy

0.5-1% photometry

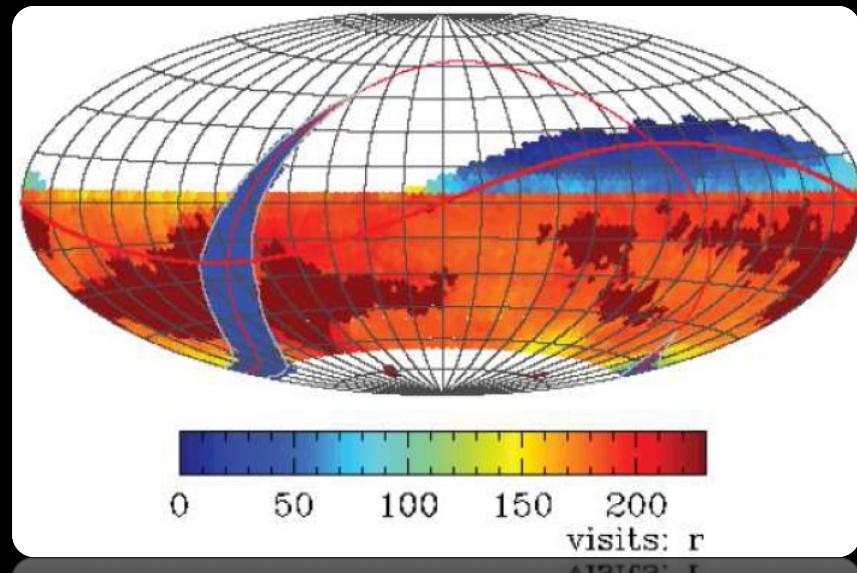


3.2Gpix camera

30sec exp/4sec rd

15TB/night

37 B objects

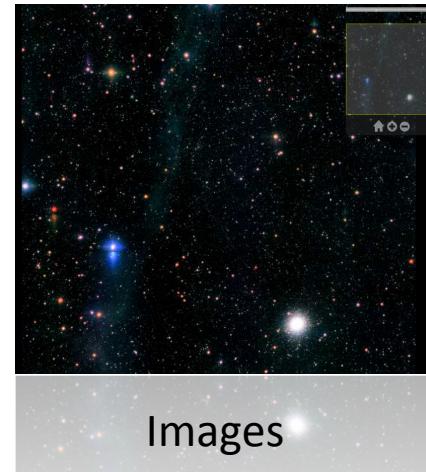
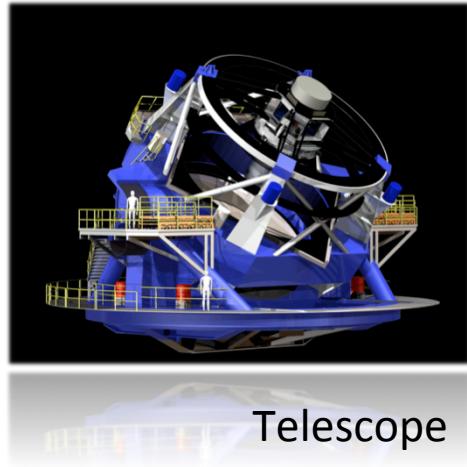


Imaging the visible sky, once every 3 days, for 10 years (825 revisits)

LSST: Turning the Sky into a Database



- The LSST is an integrated survey system. The Observatory, Telescope, Camera and Data Management system are all built to support the LSST survey. There's no PI mode, proposals, or time.
- **The ultimate deliverable of LSST is not the telescope, nor the instruments; it is the fully reduced data.** Science will come from survey catalogs and images.



Catalogs

Table 4: Level 2 Catalog Object Table

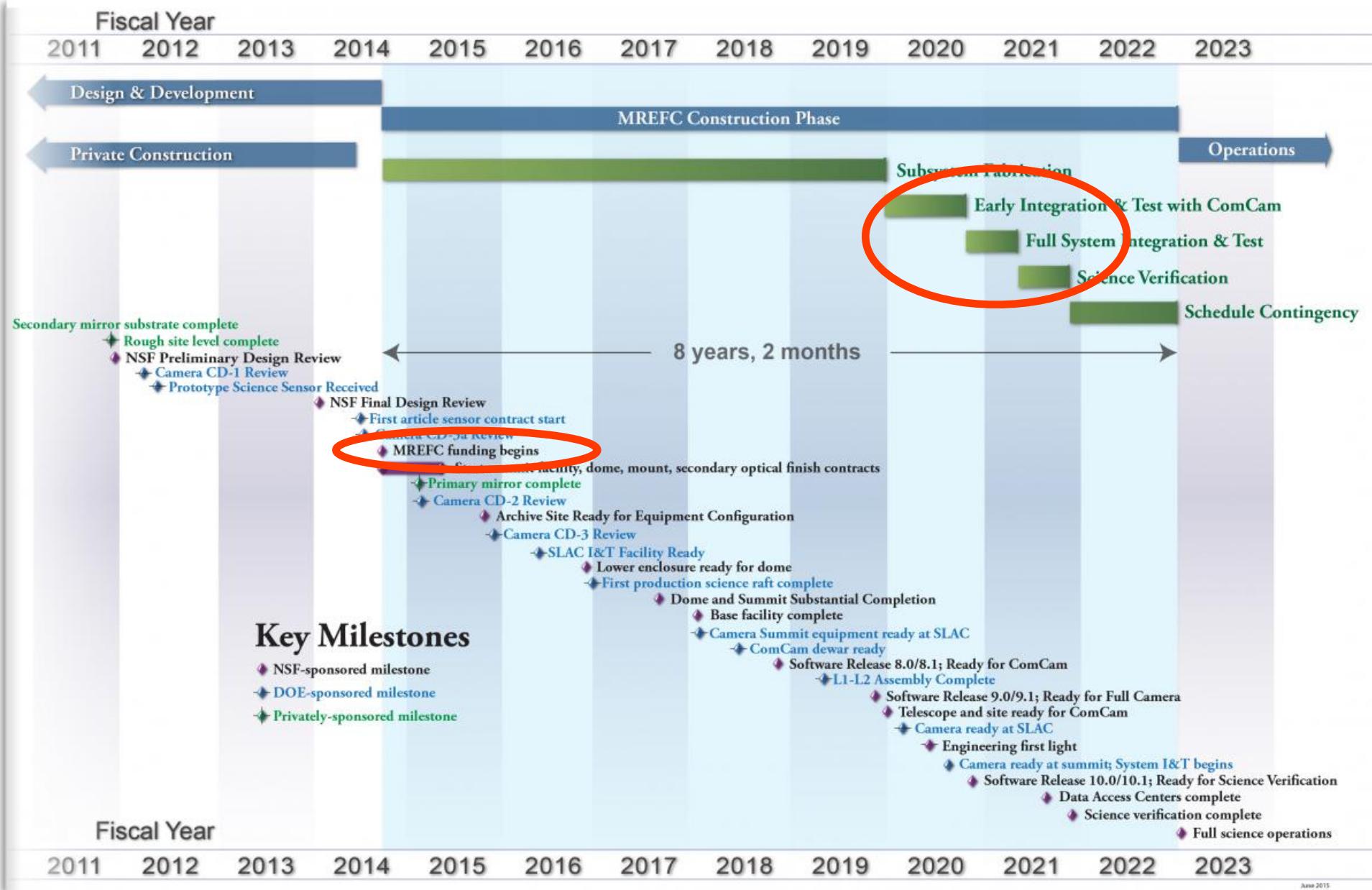
Name	Type	Unit	Description
psRadecTai	double	time	Point source model: Time at which the object was at position <code>radec</code> .
psPm	float[2]	mas/yr	Point source model: Proper motion vector.
psParallax	float	mas	Point source model: Parallax.
psFlux	float[ugrizy]	nmgy	Point source model fluxes ⁵⁸ .
psCov	float[66]	various	Point-source model covariance matrix ⁵⁹ .
psLnL	float		Natural <i>log</i> likelihood of the observed data given the point source model.
bdRadec	double[2]	degrees	B+D model ⁶⁰ : (α, δ) position of the object at time <code>radecTai</code> , in each band.



Key LSST Deliverables to Community

- **Within 60 seconds of each observation:** A real-time stream of observation reports (transient alerts) with information about astrometry, photometry, image cutouts, and shape (including trailing, direction of motion).
- **Every day:** A stream of linked *tracks* reported to the Minor Planet Center. A catalog of (heliocentric) orbits for LSST-discovered objects.
- **Annually:** Precisely calibrated photometric catalog (ugrizy bands) accurate to 5mmag (systematics limited), with every data release.

Details: The Data Products Definition Document, <http://ls.st/dpdd>





- July 2014 construction start date
- 7 years until full ops, 6 years until science verification, 4 years until first light
- How are we all going to get science ready?



Community Engagement - Communication



- Increased accessibility of key project information at www.lsst.org
- DPS Town Hall in November 2015, AAS Town Hall in January 2016
- Weekly email – Anyone can subscribe
- Email exploder anyone can subscribe to [soon]
- Co-chair'ing a community-based case study of the OIR system needed to maximize LSST science



Community Engagement - Participate

- Participate in a community study of Observing Strategy (a white paper to be on arXiv [~end 2015/early 2016] but the process won't end there). Contribute science-driven metrics of survey performance (Zeljko Ivezic)
- Interact with the Science Advisory Committee (Renu Malhotra is a local member! Michael Strauss and Lucianne are here today)
- Join a Science Collaboration
- Use LSST's science requirements and data products definitions documents to make predictions for LSST science
- Use LSST's publicly available software and simulation products now

Community Engagement – A Community Forum



Screenshot of the LSST Community forum interface on a Mac OS X browser window.

The URL in the address bar is community.lsst.org.

The page title is "LSST Community".

Header navigation links: all categories, all tags, Latest (highlighted in red), New (7), Unread (7), Top, Categories, Bookmarks, and a "New Topic" button.

Table headers: Topic, Category, Users, Replies, Views, and Activity.

Table data:

Topic	Category	Users	Replies	Views	Activity
Welcome to community.lsst.org	Staff	2	1	18	Aug 5
Missing from the DRP Plan 4	Data Management	5	13	95	17m
MOPs production • new	DM System Specifications	3	5	21	1h
Single-frame processing sketch • new	Data Management	6	17	29	11h
LSE-75: 3 Wavefront image archive access • new	DM System Specifications	4	9	26	17h
icd					
Short notice: talking about single-frame processing at Princeton	Data Management	3	1	73	21h
algorithms					
Creating a Nebula instance: a recipe	Data Management	4	4	71	1d
Simulation of effective filters per visit?	Simulations	5	6	116	1d
throughput, filter					

Bottom left of the window: "Display a menu".

<http://community.lsst.org>



Community Engagement – Coordination w/ OIR System



There will be a science-driven, community-based study of the *The O/IR Capabilities Needed to Maximize LSST Science* (organized by NOAO and LSST). This will build on the Elmegreen report and NOAO's 2013 *Spectroscopy in the Era of LSST* workshop.

A Kavli Futures workshop in Spring 2016 will facilitate progress on this study; Community input will be gathered far in advance of this workshop.

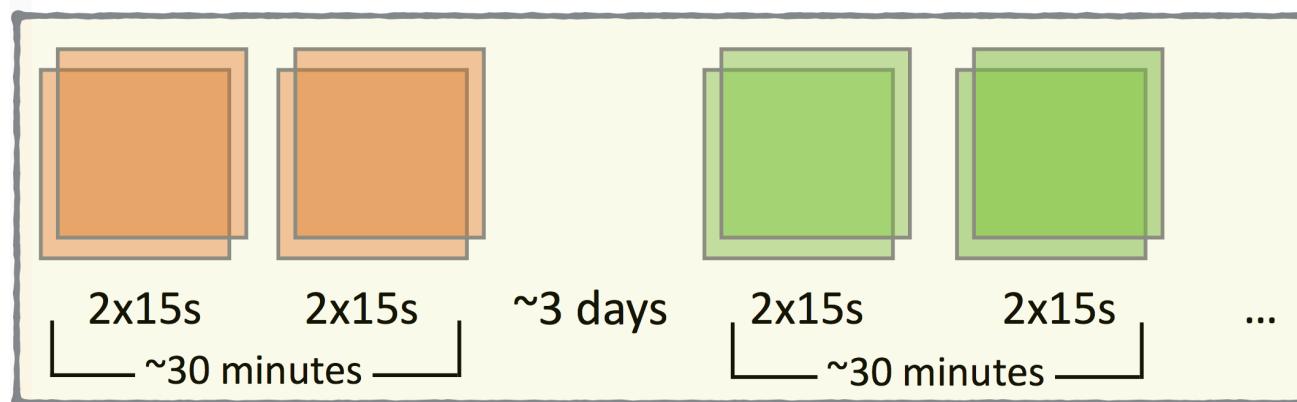
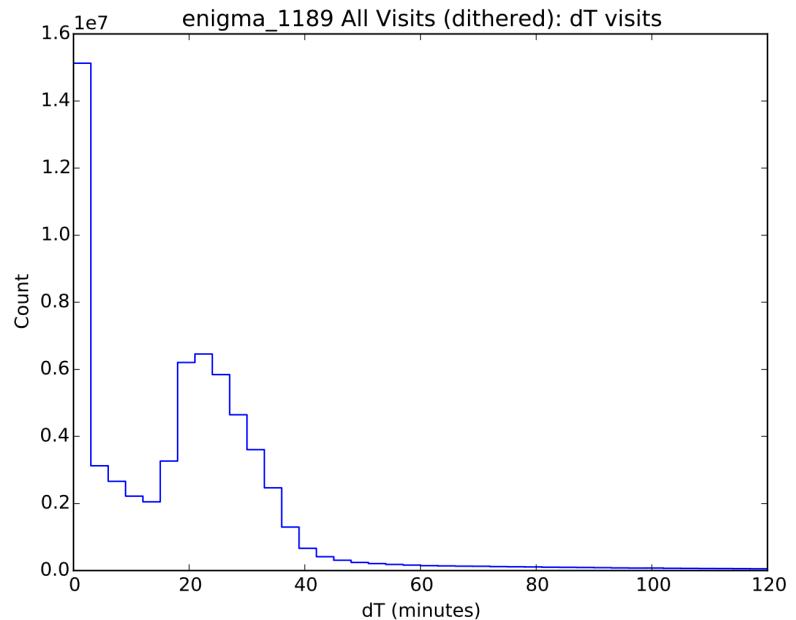
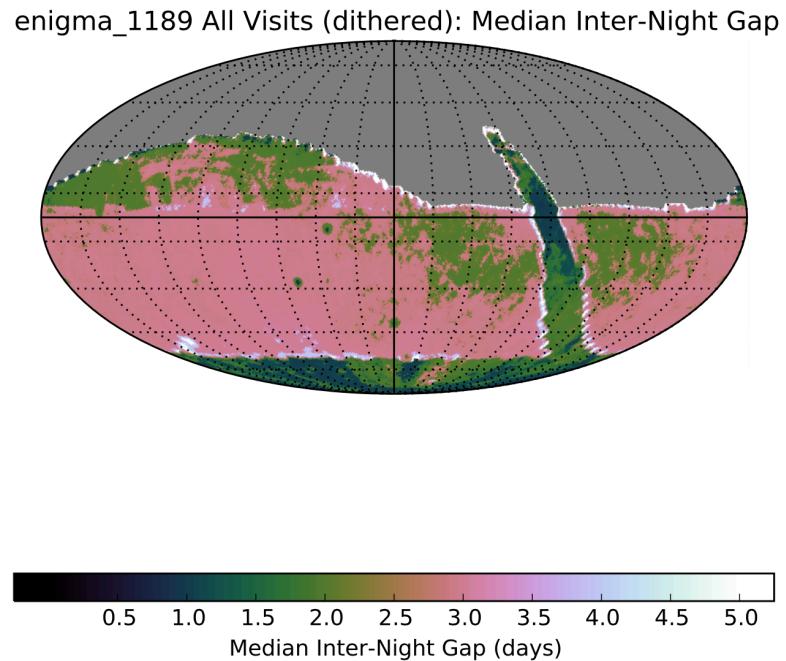
The results of this study will be presented in a report.

Joan Najita (NOAO) and B. Willman (LSST/Steward) are co-chair'ing

From Jim Ulvestad, August 2015:

In this letter, AST asks NOAO in collaboration with the LSST Project Office (LSSTPO), under the management of Association of Universities for Research in Astronomy (AURA), to pursue an initial implementation of OIR System Report recommendations 2, 3, and 4a-d through a joint NOAO-LSST workshop on fully realizing LSST-enabled science.

LSST Observing Strategy



1 visit = 2x15s back-to-back exposures
 2 visits per night (30-60 minutes)
 Revisit ~3-4 days

Planetary science & LSST



10-100x increase in sample size for every small body population in the Solar System

	Currently Known*	LSST Discoveries**	Median number of observations ⁺	Observational arc length ⁺
Near Earth Objects (NEOs)	13,209	100,000	(D>250m) 60	6.0 years
Main Belt Asteroids (MBAs)	643,099	5,500,000	(D>500m) 200	8.5 years
Jupiter Trojans	6,384	280,000	(D>2km) 300	8.7 years
TransNeptunian Objects (TNOs) + Scattered Disk Objects (SDOS)	2,027	40,000	(D>200km) 450	8.5 years

* As reported by the MPC ** Expected by end of survey +For the brightest objects (near 100% completeness)

Plus: comets, irregular satellites, Earth minimoons and temporary satellites ..