Science Collaboration White Paper Responses

Federica Bianco
Science Collaborations Coordinator
TVS SC co-chair

LSST Science Collaborations

I serve as the LSST Science Collaborations Coordinator

over 2000 members, membership across the world

Galaxies
Sugata Kaviraj (University of Oxford)
Manda Banerji (Kavli Institute for Cosmology, Cambridge)

Stars, Milky Way, and Local Volume
John Bochanski (Rider University)
John Gizis (University of Delaware)
Nitya Jacob Kallivayalil(University of Virginia)

Solar System
Megan Schwamb (Gemini Observatory, Northern Operations Center)
David Trilling (Northern Arizona University)

Dark Energy
Eric Gawiser (Rutgers The State University of New Jersey)
Phil Marshall (KIPAC)

Active Galactic Nuclei
Niel Brandt (Pennsylvania State University)

Transients and variable stars
Federica Bianco (New York University)
Rachel Street (LCO)

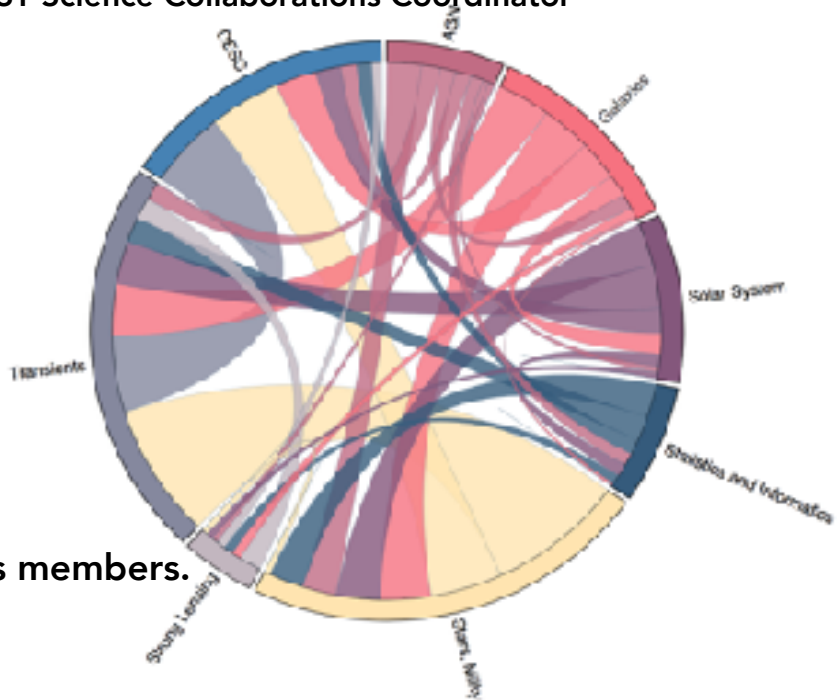
Strong Lensing
Charles Keeton (Rutgers-The State University of New Jersey)
Aprajita Verma (Oxford University)

Informatics and Statistics
Tom Loredo (Cornell University)
Chad Schafer (Carnegie Mellon University)

LSST Science Collaborations

LSST Science Collaborations

I serve as the LSST Science Collaborations Coordinator



8 SCs

size ~30 to 100s members.

Galaxies
Sugata Kaviraj (University of Oxford)
Manda Banerji (Kavli Institute for Cosmology, Cambridge)

Stars, Milky Way, and Local Volume
John Bochanski (Rider University)
John Gizis (University of Delaware)
Nitya Jacob Kallivayalil(University of Virginia)

Solar System
Megan Schwamb (Gemini Observatory, Northern Operations Center)
David Trilling (Northern Arizona University)

Dark Energy
Eric Gawiser (Rutgers The State University of New Jersey)
Phil Marshall (KIPAC)

Active Galactic Nuclei
Niel Brandt (Pennsylvania State University)

Transients and variable stars
Federica Bianco (New York University)
Rachel Street (LCO)

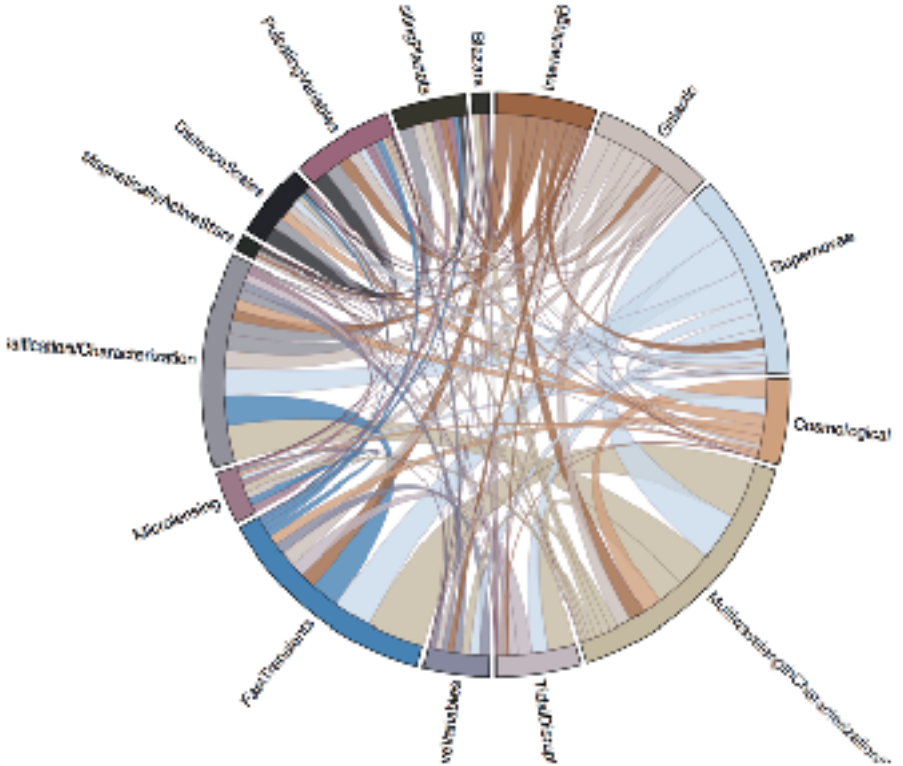
Strong Lensing
Charles Keeton (Rutgers-The State University of New Jersey)
Aprajita Verma (Oxford University)

Informatics and Statistics
Tom Loredo (Cornell University)
Chad Schafer (Carnegie Mellon University)

LSST Science Collaborations

Transients and Variable Stars
LSST Science Collaboration

I serve as the LSST Science Collaborations Coordinator and Chair of the TVS SC

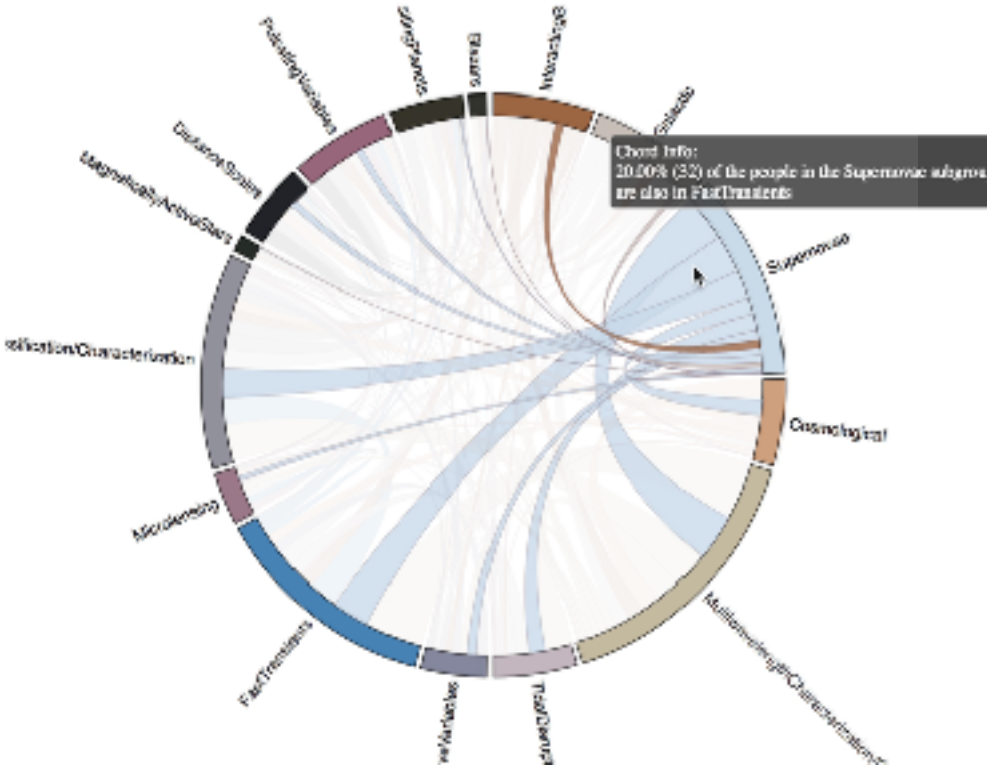


over 250 members
experts on transient astronomy
from planetary transits
to supernovae and gravitational waves

LSST Science Collaborations

Transients and Variable Stars
LSST Science Collaboration

I serve as the LSST Science Collaborations Coordinator and Chair of the TVS SC

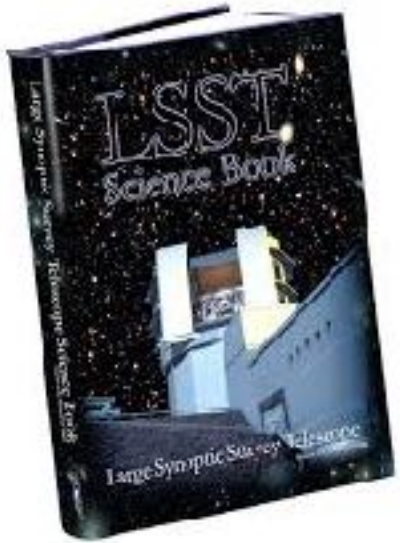


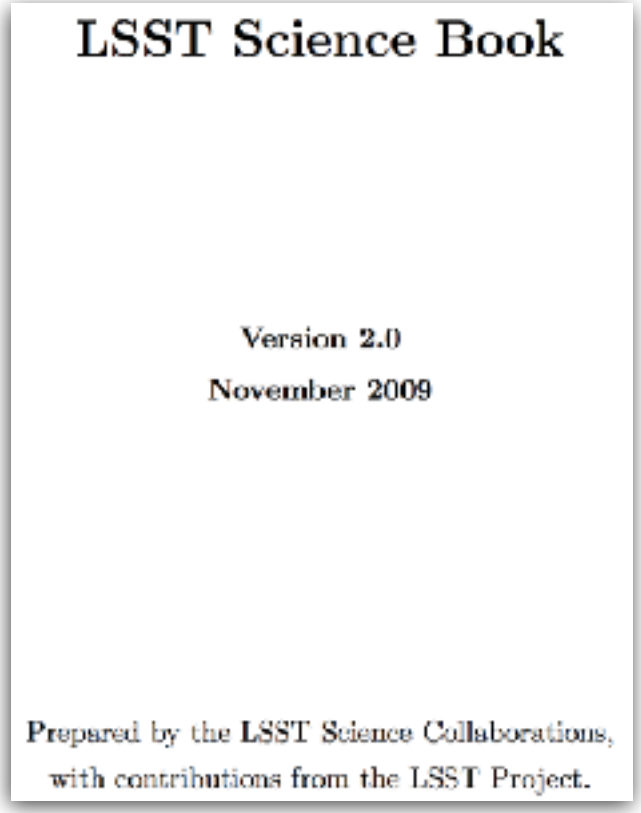
over 250 members
experts on transient astronomy
from planetary transits
to supernovae and gravitational waves

LSST Science Collaborations

LSST Science Collaborations

I serve as the LSST Science Collaborations Coordinator and Chair of the TVS SC




LSST Science Book

Version 2.0

November 2009

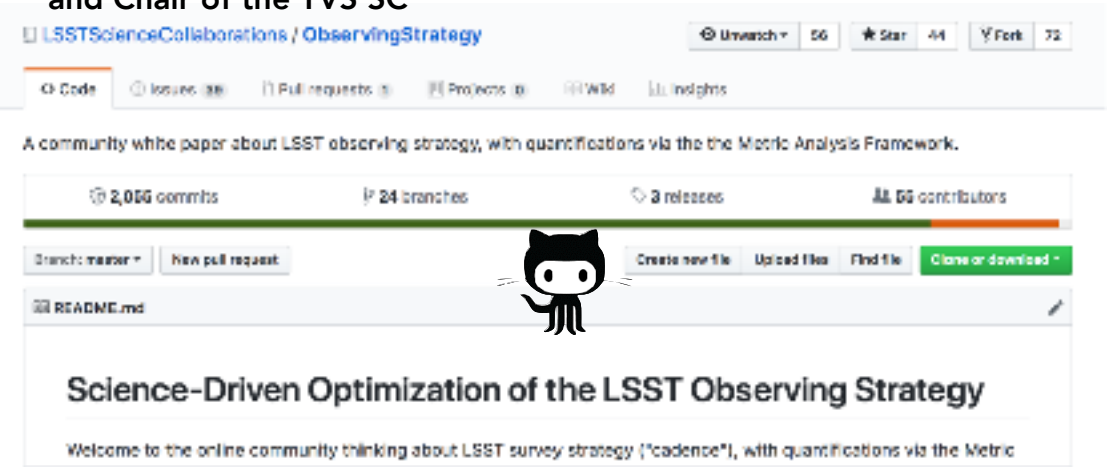
Prepared by the LSST Science Collaborations,
with contributions from the LSST Project.

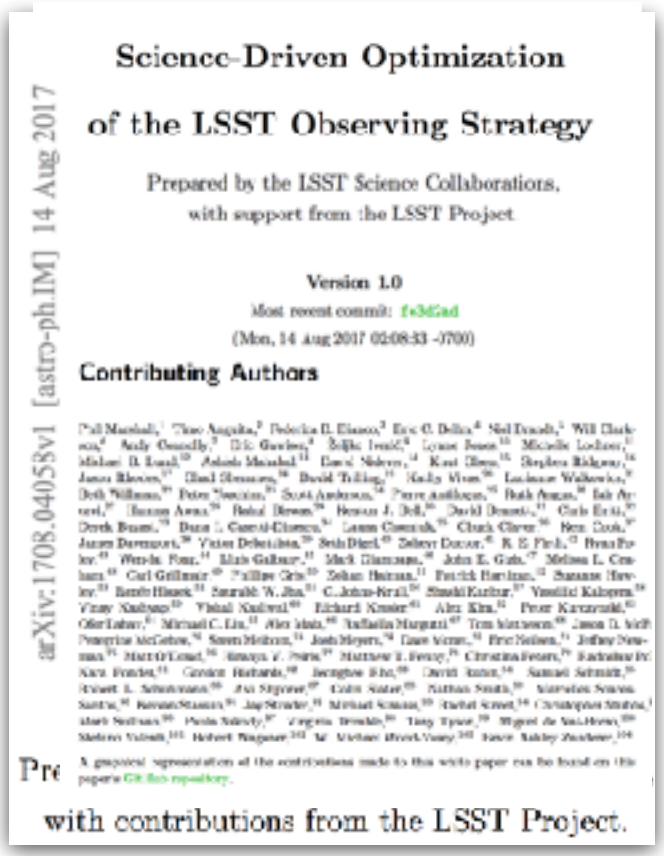
SCs advise the LSST Project on strategy design prepare the scientific community for LSST

LSST Science Collaborations

LSST Science Collaborations

I serve as the LSST Science Collaborations Coordinator and Chair of the TVS SC





SCs advise the LSST Project on strategy design prepare the scientific community for LSST

Call for White Papers on Cadence Optimization

Call for White Papers on LSST Cadence Optimization

The LSST science community is invited to play a key role in the definition of LSST's Observing Strategy.

HOW?

By submitting white papers to help refine the 'main survey' and fully define the use of 10–20% of time expected to be devoted to various 'mini surveys' including:

- the Deep Drilling mini-surveys
- 'Target of Opportunity' programs

Details are provided in the **Call for White Papers on LSST Cadence Optimization** available here http://ls.st/doc-28382

WHEN?

The deadline for white paper submission is November 30, 2018. For submission details, please see Call above.

this is a call to propose observing strategies for LSST

- ***Wide Fast Deep***,
- ***Minisureys***,
- ***Deep Drilling Fields,*** *and*
- ***Targets of Opportunity***

https://www.lsst.org/call-whitepaper-2018

Call for White Papers on Cadence Optimization

Call for White Papers on LSST Cadence Optimization

Željko Ivezić, Lynne Jones, Tiago Ribeiro,
the LSST Project Science Team,
and the LSST Science Advisory Committee

Document-28382

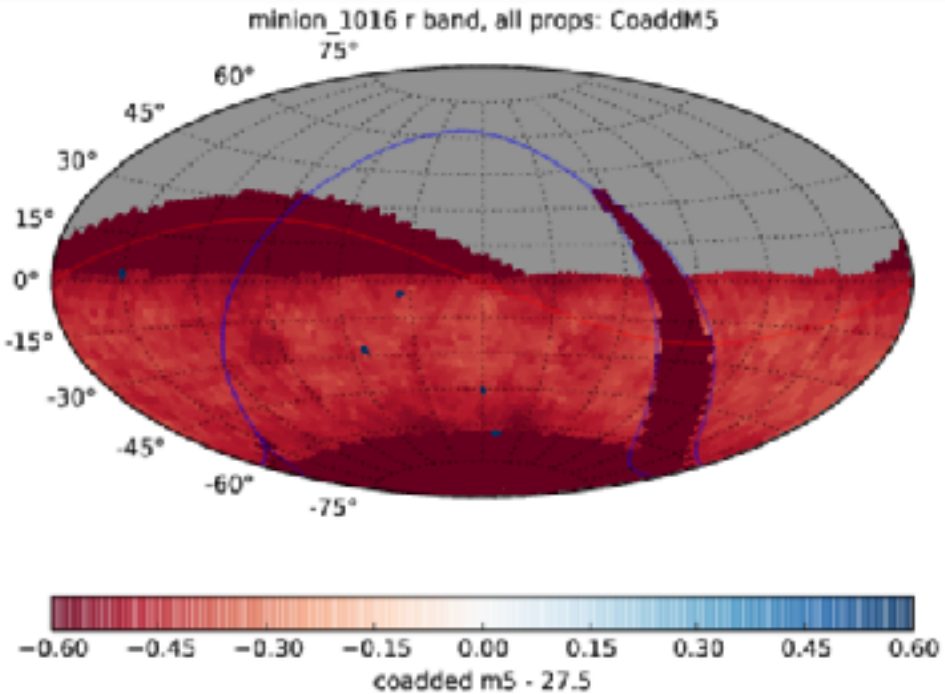
Latest Revision: 2018-06-28

http://ls.st/doc-28382

9th October 2018
14:45 – 15:15:
Submission process
F. Bianco

LSST: Many surveys in one

Wide Fast Deep - Minisurveys - DDF - ToO

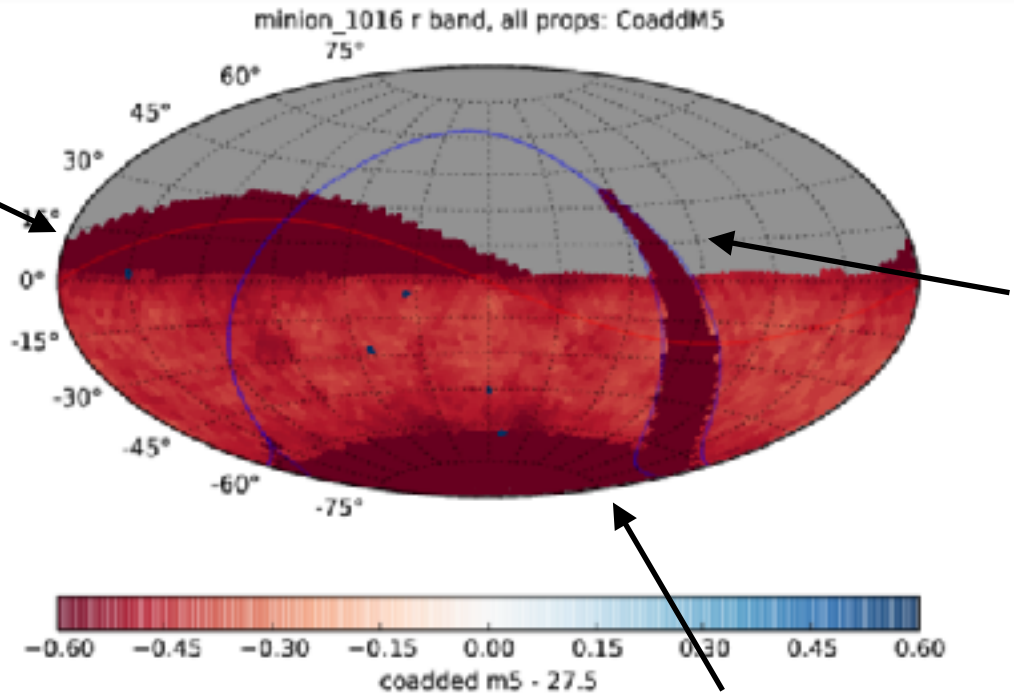


Wide-Fast-Deep (85.1%)

LSST: Many surveys in one

Wide Fast Deep - Minisurveys - DDF - ToO

North Ecliptic Survey
The NES is an extension to reach the Ecliptic at higher airmass than the WFD survey typically covers, no *u*



Galactic Plane (1.7%): covers the region where LSST is expected to be highly confused by the density of stellar sources; fewer total exposures/field and does **not collect in pairs**

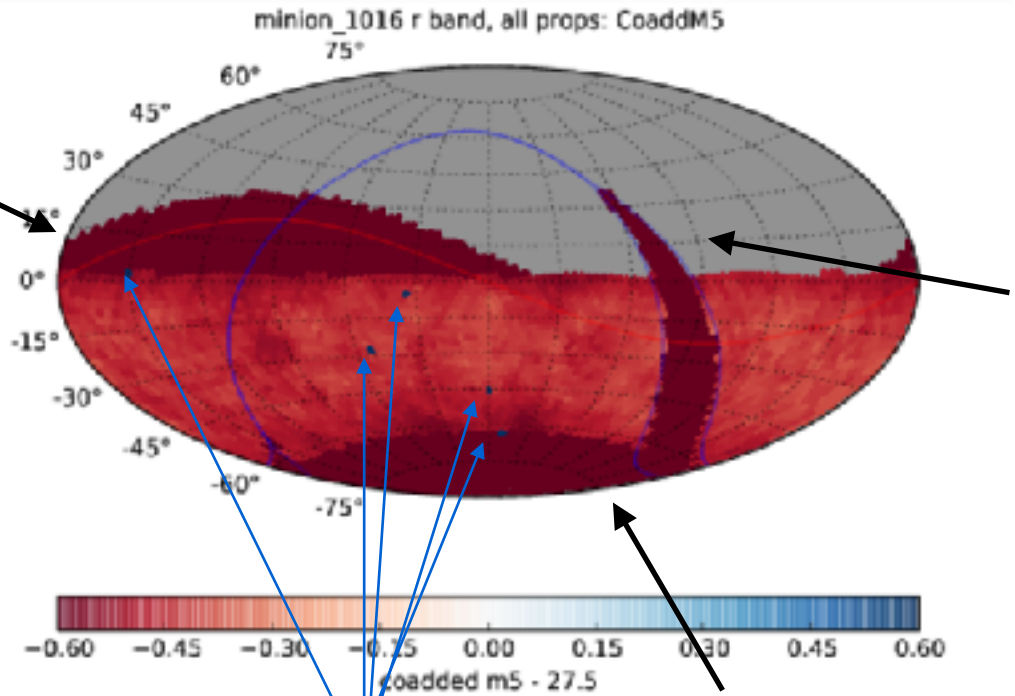
Wide-Fast-Deep (85.1%)

South Celestial Pole (2.2%): higher airmass decl>−65 degrees. includes *ugrizy*, but takes fewer exposures/field than the WFD and does **not collect in pairs.**

LSST: Many surveys in one

Wide Fast Deep - Minisurveys - DDF - ToO

North Ecliptic Survey
The NES is an extension to reach the Ecliptic at higher airmass than the WFD survey typically covers, no *u*



Galactic Plane (1.7%): covers the region where LSST is expected to be highly confused by the density of stellar sources; fewer total exposures/field and does **not collect in pairs**

Wide-Fast-Deep (85.1%)

Deep Drilling Fields DDF (4.5%)

South Celestial Pole (2.2%): higher airmass decl>−65 degrees. includes *ugrizy*, but takes fewer exposures/field than the WFD and does **not collect in pairs.**

LSST Science Requirements Document

http://ls.st/srd

If its written in the SRD document, it is basically written in stone

Science Goals

- **constraining dark energy and dark matter,**
- **taking an inventory of the Solar System,**
- **exploring the transient optical sky, and**
- **mapping the Milky Way**

LSST Science Requirements Document

http://ls.st/srd

If its written in the SRD document, it is basically written in stone

Technical constraints

- **A footprint for the 'main survey' of at least 18,000 deg^2** over which there must be **at least 825 30-second visits per 9.6 deg^2 field,** summed over all six filters, ugrizy (see SRD Tables 22 and 23), which places a ***minimum constraint on the time required to complete the main survey, typically requires 85–90% of the available time*** (10 years) even with scheduling improvements, it is unlikely that the goals of the main survey could be met with a time allocation significantly below 80%.

LSST Science Requirements Document

http://ls.st/srd

If its written in the SRD document, it is basically written in stone

Technical constraints

- **Parallax and proper motion 1σ accuracies of 3 mas and 1 mas/yr per coordinate at r = 24,** respectively, in the main survey (see SRD Table 26), which places a ***weak constraint on how visits are distributed throughout the lifetime of the survey and throughout a season.***

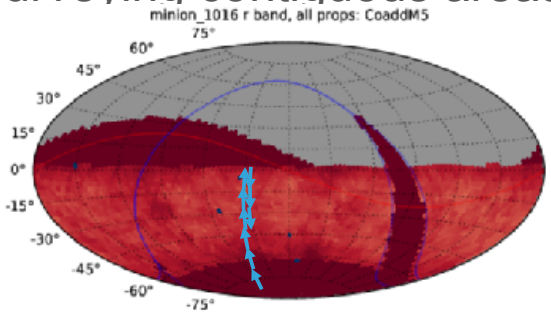
LSST Science Requirements Document

http://ls.st/srd

If its written in the SRD document, it is basically written in stone

Technical constraints

- **Rapid revisits (40 seconds to 30 minutes) must be acquired over an area of at least 2000 deg2 (see SRD table 25) for very fast transient discovery;** this requirement can usually be satisfied via field overlaps when surveying contiguous areas of sky



WP timeline

Call for white papers	June 30, 2018
2018 Project and Community Workshop	Aug 13-17, 2018
White papers submission deadline	**November 30, 2018**
Strategies selected for simulation (SAC)	April 2019
Survey strategies available	End of 2019
Survey Strategy Committee (SSC)	Early 2020
Advisory report from Project to SSC	Early 2020
SSC report on official initial LSST survey strategy	Early 2021
Baseline simulation of initial LSST survey strategy	Mid 2021
Start of LSST Operations	2022
Regular survey reviews by the SSC	2022-2032

WP timeline

members of the LSST Science Advisory Committee (SAC), with technical support from the Project, will undertake an initial review and decide which submitted white papers meet the criteria of scientific excellence and technical feasibility for further analysis.

Call for white papers	June 30, 2018
2018 Project and Community Workshop	Aug 13-17, 2018
White papers submission deadline	November 30, 2018
Strategies selected for simulation (SAC)	**April 2019**
Survey strategies available	End of 2019
Survey Strategy Committee (SSC)	Early 2020
Advisory report from Project to SSC	Early 2020
SSC report on official initial LSST survey strategy	Early 2021
Baseline simulation of initial LSST survey strategy	Mid 2021
Start of LSST Operations	2022
Regular survey reviews by the SSC	2022-2032

WP timeline

The input from the submitted white papers will be used to design multiple options in observing strategies, and the Project team will generate a series of simulations based on these survey strategies.

Simulated survey outputs, generated via the LSST OpSim+MAF will become available by the end of 2019

Call for white papers	June 30, 2018
2018 Project and Community Workshop	Aug 13-17, 2018
White papers submission deadline	November 30, 2018
Strategies selected for simulation (SAC)	April 2019
Survey strategies available	**End of 2019**
Survey Strategy Committee (SSC)	Early 2020
Advisory report from Project to SSC	Early 2020
SSC report on official initial LSST survey strategy	Early 2021
Baseline simulation of initial LSST survey strategy	Mid 2021
Start of LSST Operations	2022
Regular survey reviews by the SSC	2022-2032

WP timeline

Call for white papers	June 30, 2018
2018 Project and Community Workshop	Aug 13-17, 2018
White papers submission deadline	November 30, 2018
Strategies selected for simulation (SAC)	April 2019
Survey strategies available	End of 2019
Survey Strategy Committee (SSC)	Early 2020
Advisory report from Project to SSC	Early 2020
SSC report on official initial LSST survey strategy	**Early 2021**
Baseline simulation of initial LSST survey strategy	Mid 2021
Start of LSST Operations	2022
Regular survey reviews by the SSC	2022-2032

WP rules and expectations

Quantitative, science-driven optimization input is requested for each of

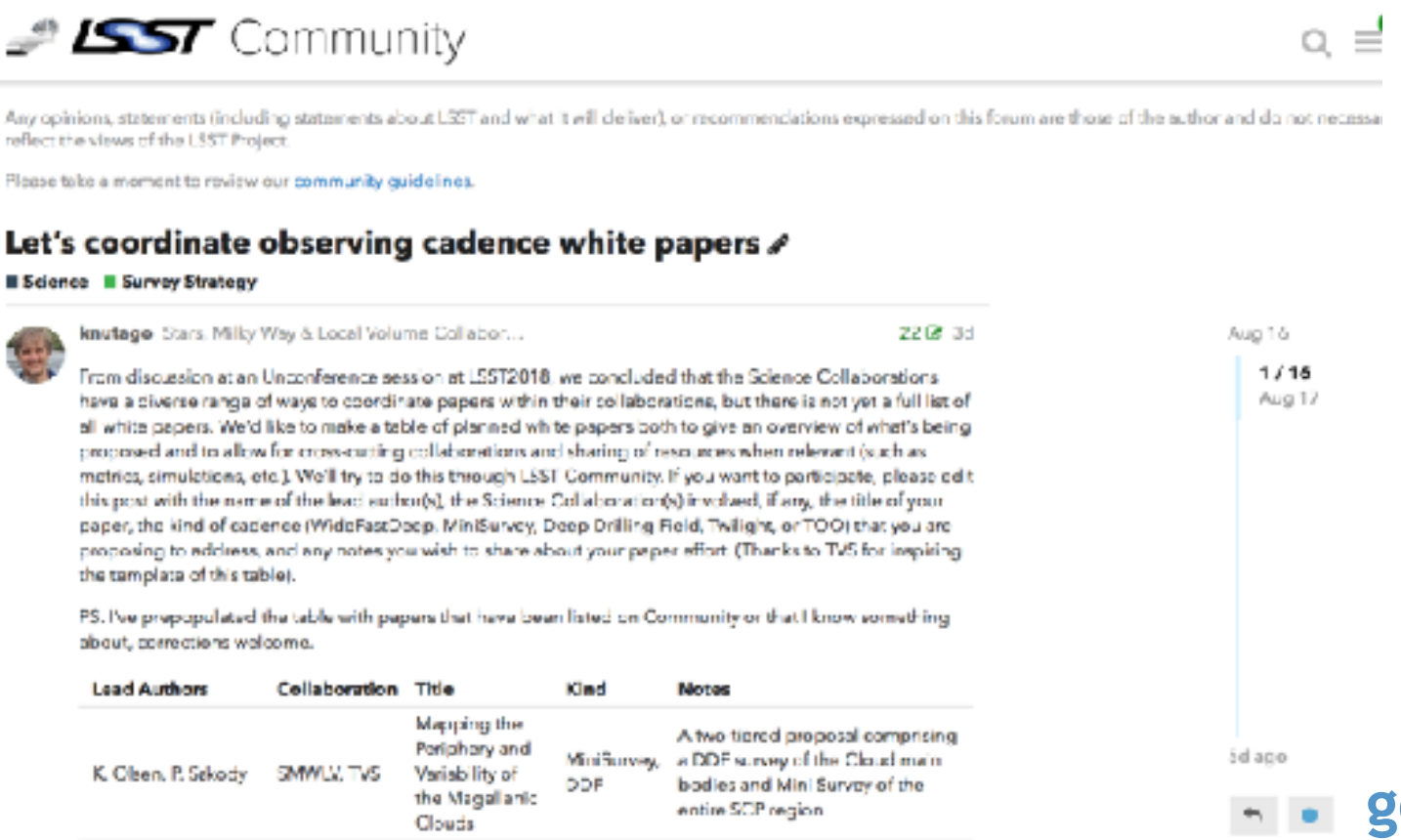
- **Wide Fast Deep WFD** (sky coverage, filter depth)
- **Deep Drilling Fields** (additional pointings, detailed strategy, depth)
- **MiniSurveys** (details of strategy for existing MS:
  - the candidate Galactic Plane (GP) minisurveys
  - the candidate Northern Ecliptic Spur (NES) minisurvey, and
  - the candidate South
  - Celestial Pole (SCP) minisurvey

  and **ideas for new MS**

strategy questions such as

- **optimal visit exposure time**
- **co-added per-bandpass imaging depth**
- **the sky coverage**
- **temporal coverage**
- **observing rules (including filters)**

planned White Papers



LSST Community

Any opinions, statements (including statements about LSST and what it will deliver), or recommendations expressed on this forum are those of the author and do not necessa
reflect the views of the LSST Project.

Please take a moment to review our community guidelines.

Let's coordinate observing cadence white papers

Science · Survey Strategy

knutago Stars, Milky Way & Local Volume Collabor... 22 3d

Aug 16

1 / 15
Aug 17

From discussion at an Unconference session at LSST2018, we concluded that the Science Collaborations have a diverse range of ways to coordinate papers within their collaborations, but there is not yet a full list of all white papers. We'd like to make a table of planned white papers both to give an overview of what's being proposed and to allow for cross-cutting collaborations and sharing of resources when relevant (such as metrics, simulations, etc.). We'll try to do this through LSST Community. If you want to participate, please edit this post with the name of the lead author(s), the Science Collaboration(s) involved, if any, the title of your paper, the kind of cadence (WideFastDeep, MiniSurvey, Deep Drilling Field, Twilight, or TOO) that you are proposing to address, and any notes you wish to share about your paper effort. (Thanks to TVS for inspiring the template of this table).

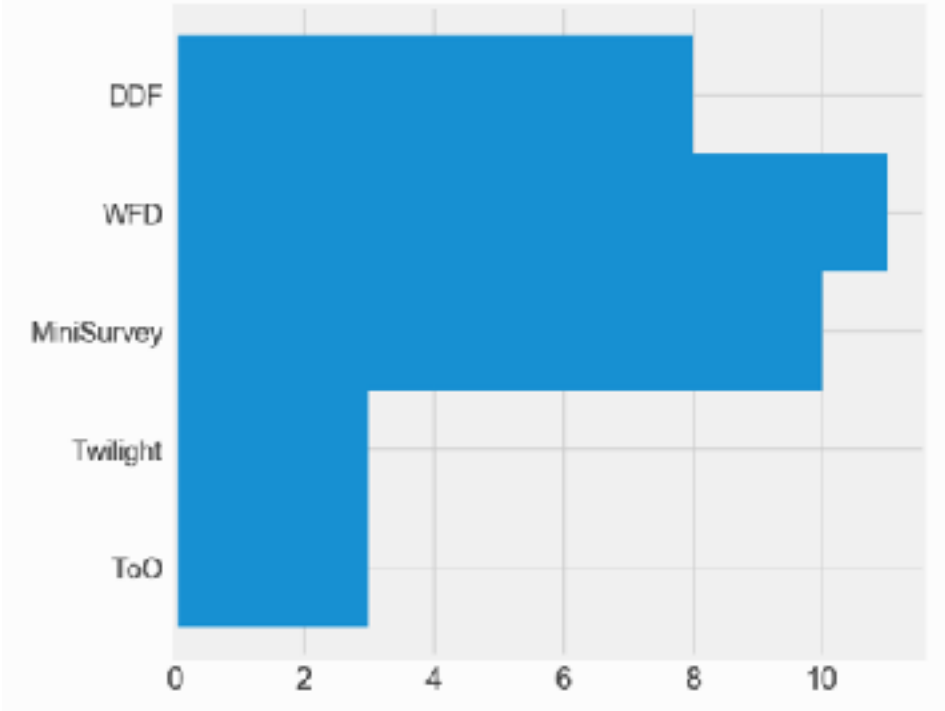
PS. I've prepopulated the table with papers that have been listed on Community or that I know something about, corrections welcome.

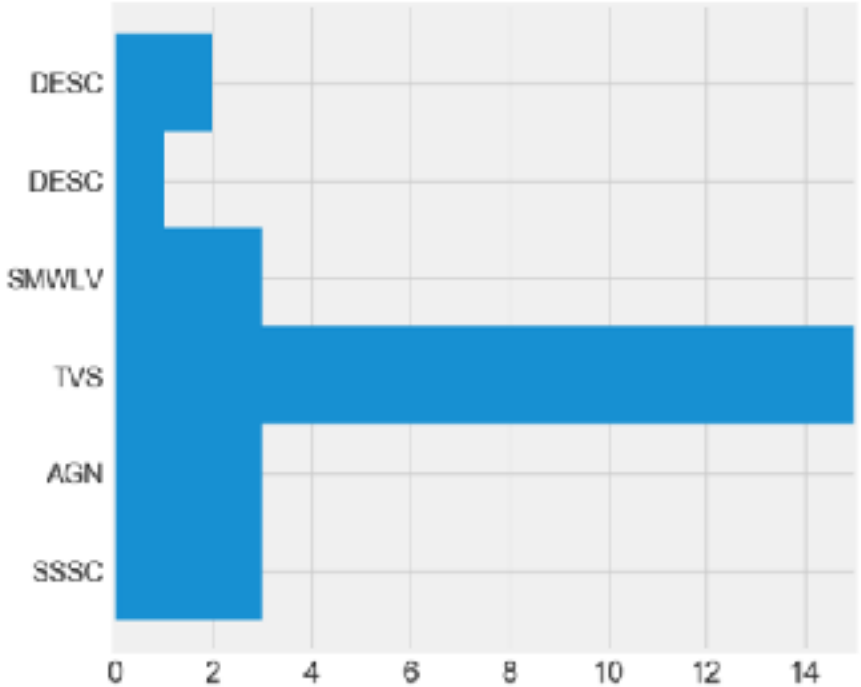
Lead Authors	Collaboration	Title	Kind	Notes
K. Olsen, P. Sekody	SMWLV, TVS	Mapping the Periphery and Variability of the Magallanic Clouds	MiniSurvey, DDF	A two tiered proposal comprising a DDF survey of the Cloud main bodies and Mini Survey of the entire SCP region

3d ago

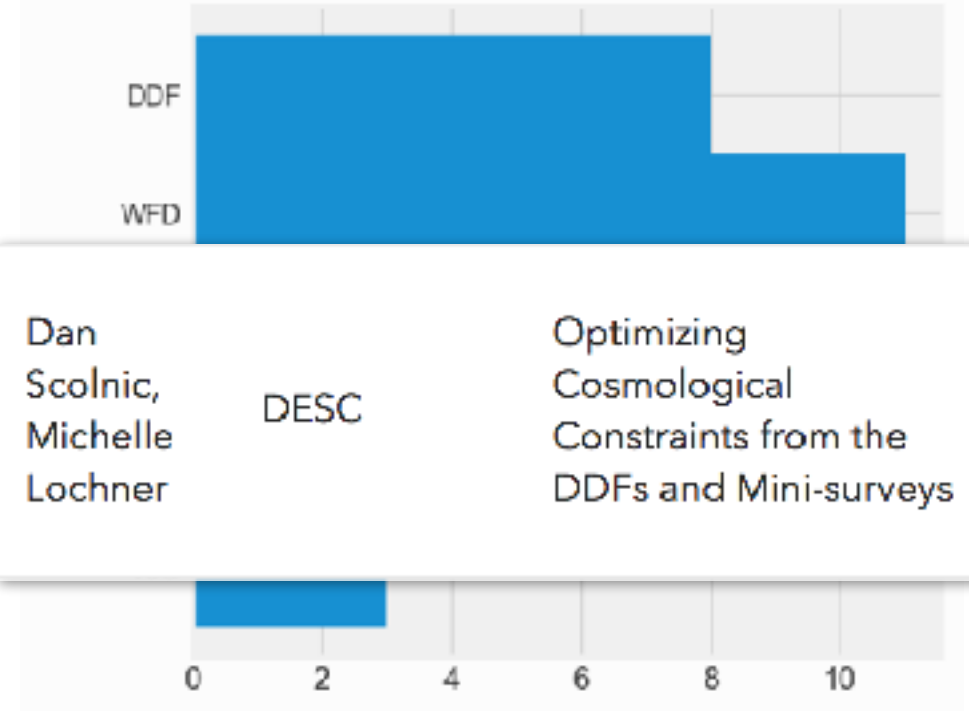
goo.gl/Mx8eCs

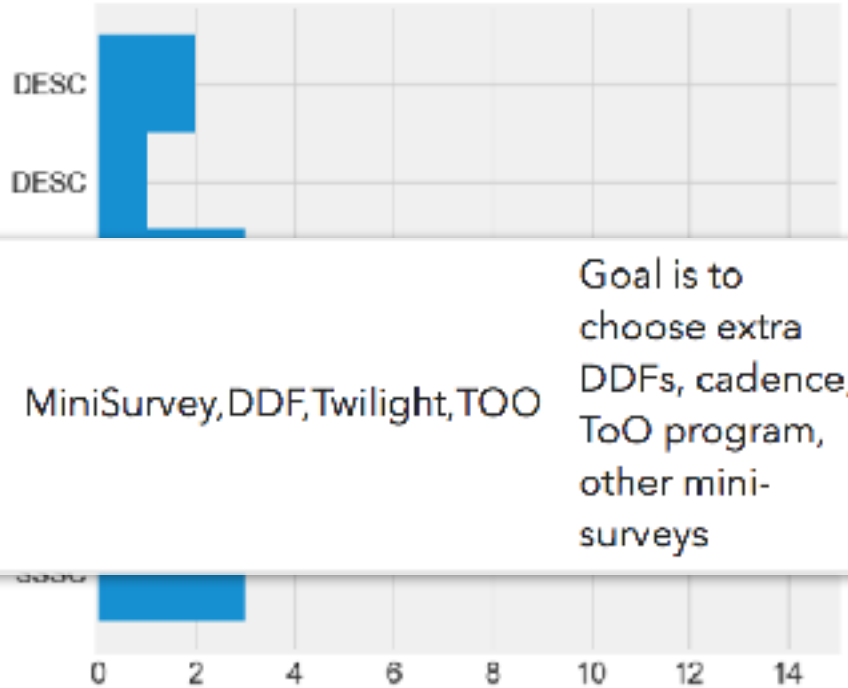
planned White Papers





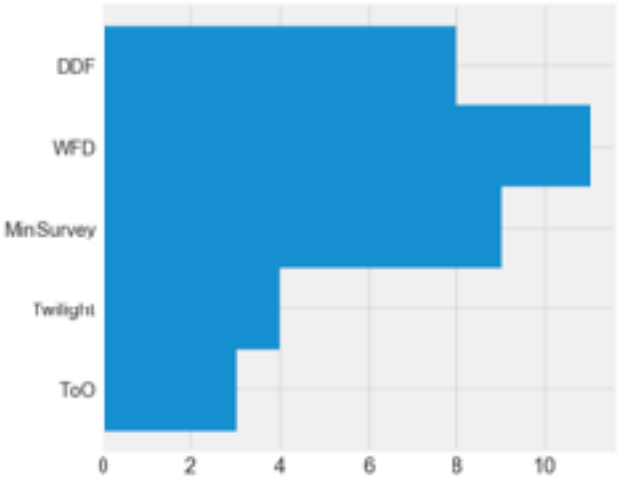
planned White Papers

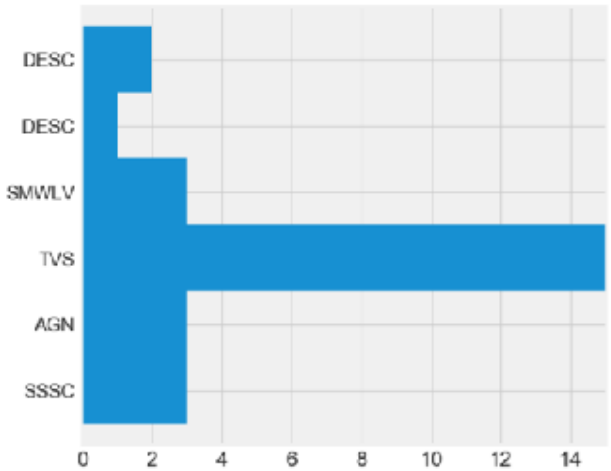


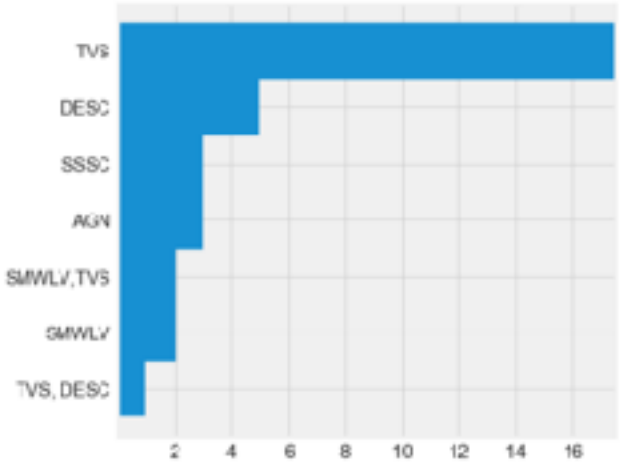


Dan Scolnic, Michelle Lochner	DESC	Optimizing Cosmological Constraints from the DDFs and Mini-surveys	MiniSurvey, DDF, Twilight, TOO	Goal is to choose extra DDFs, cadence, ToO program, other mini-surveys

planned White Papers





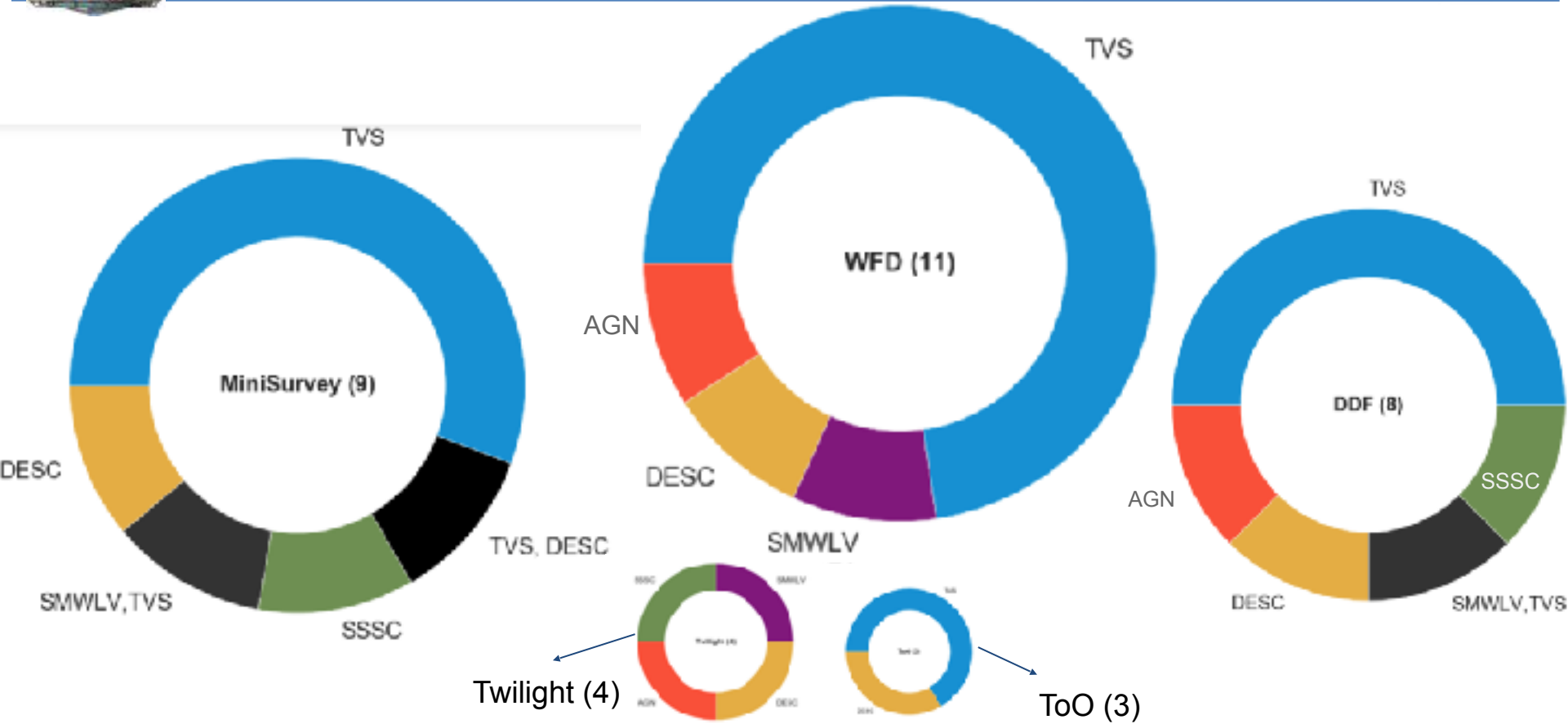


number of papers survey kind and per SC

planned White Papers

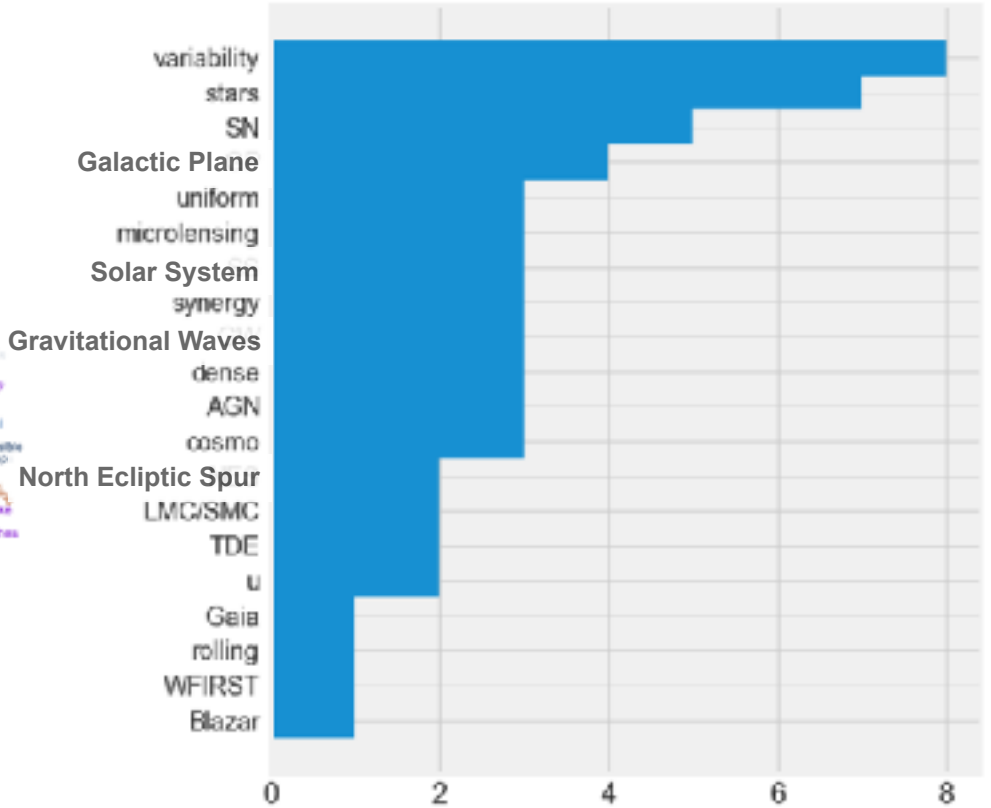
	WFD	MiniSurvey	DDF	Twilight	ToO
AGN	Y		Y	Y	
DESC	Y	Y	Y	Y	Y
SMWLV	Y	Y	Y	Y	
SSSC		Y	Y	Y	
TVS	Y	Y	Y		Y
SLSC	?	?	?	?	?
Galaxies	?	?	?	?	?
ISSC					

planned papers: survey kind by SC

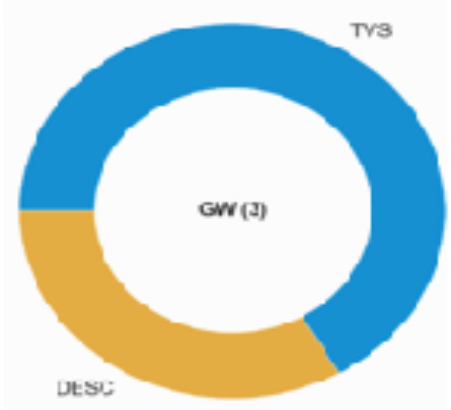


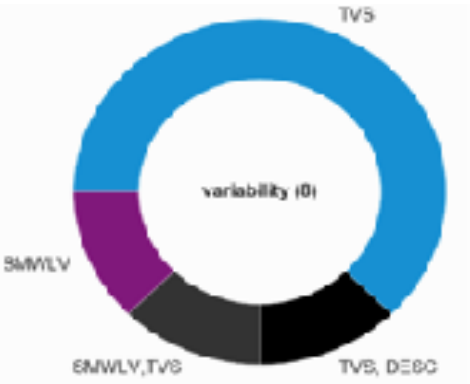
planned papers: popular topics

planned papers: popular topics

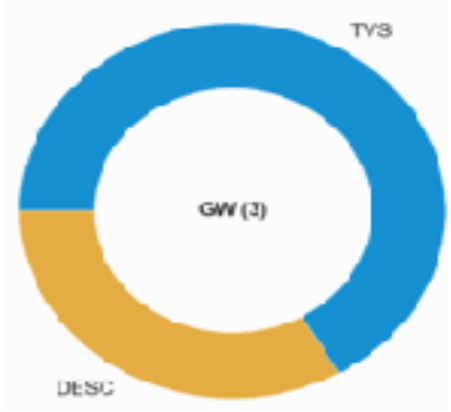


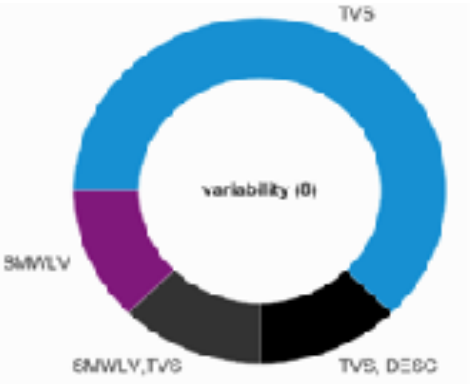
planned papers: popular topics



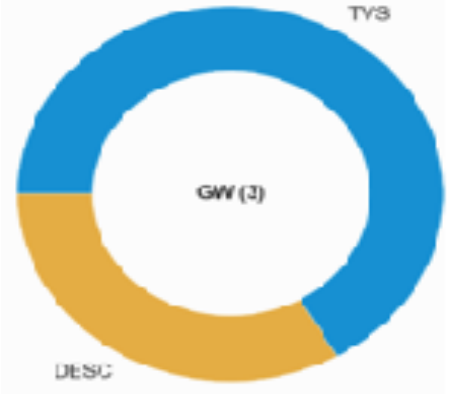


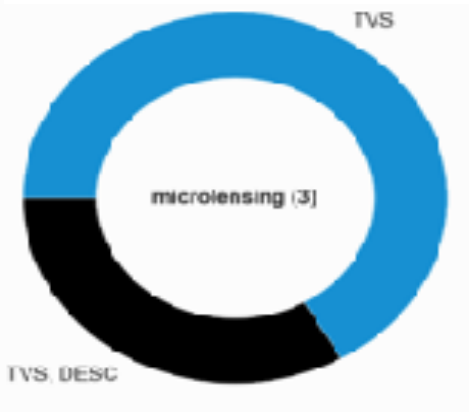
planned papers: popular topics

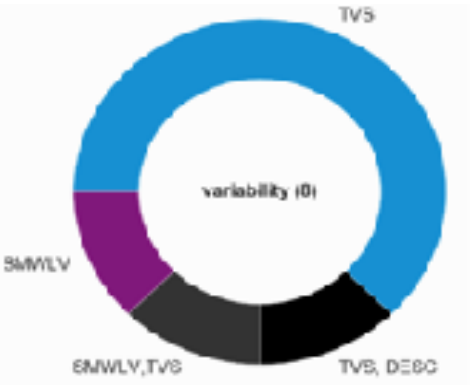




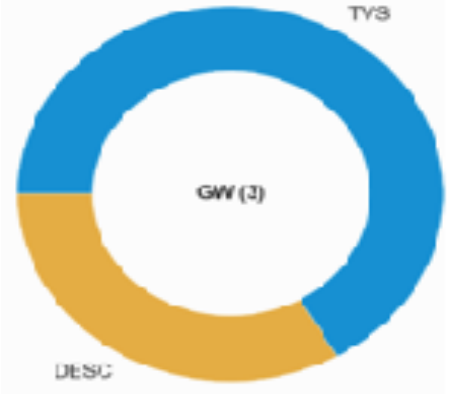
planned papers: popular topics

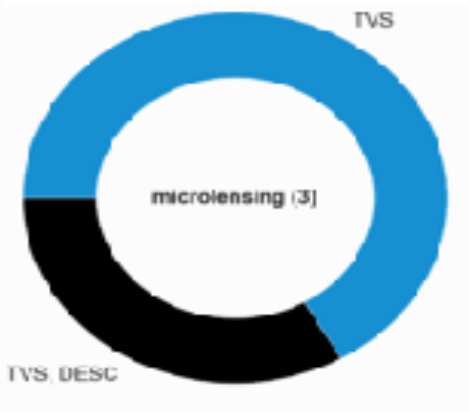


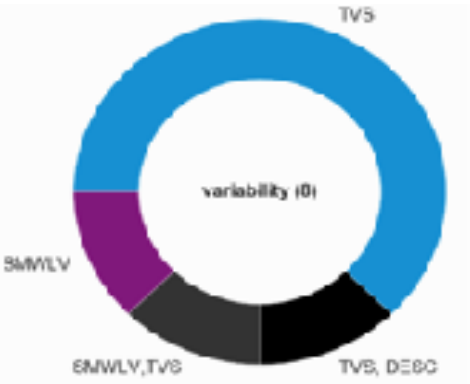


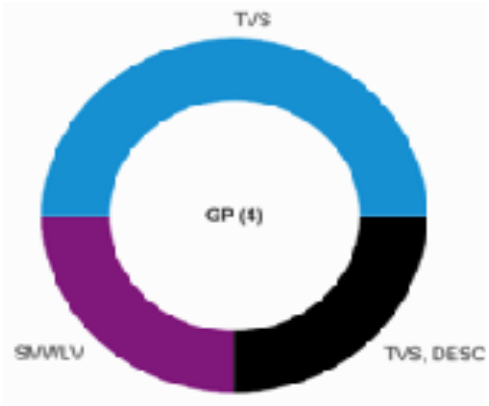


planned papers: popular topics

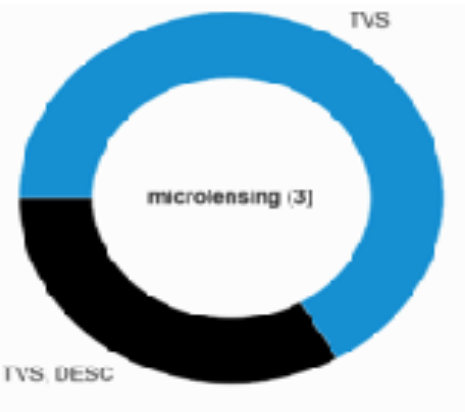




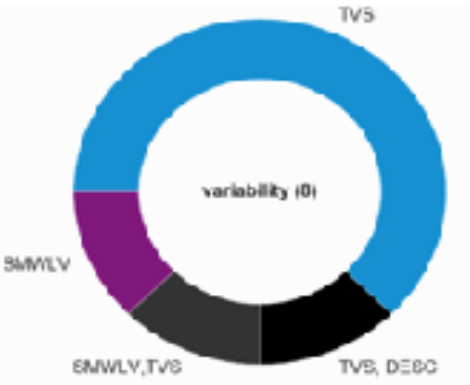


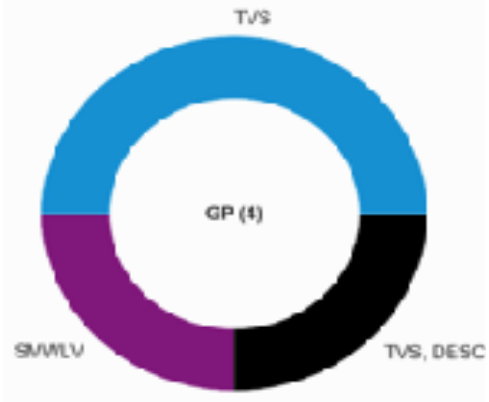


planned papers: popular topics

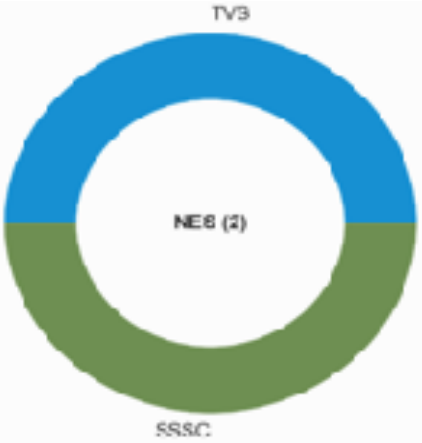


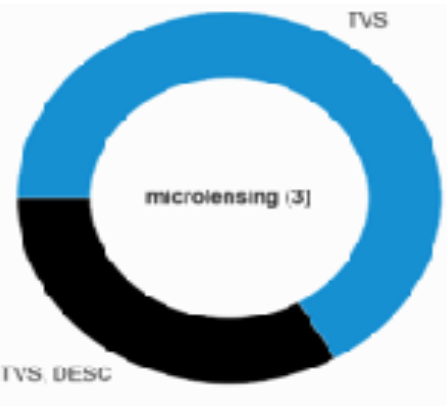
AGN

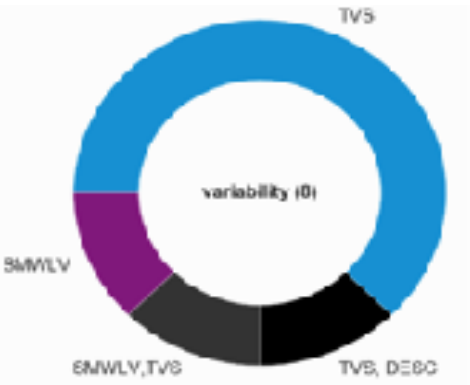


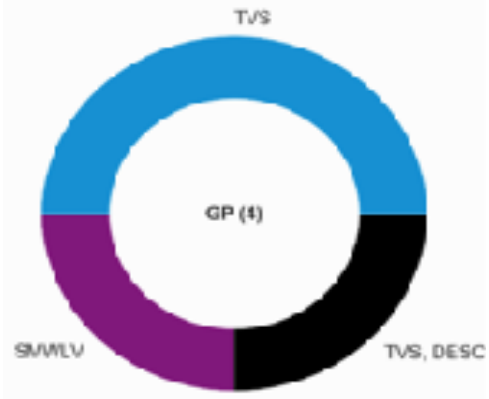


planned papers: popular topics

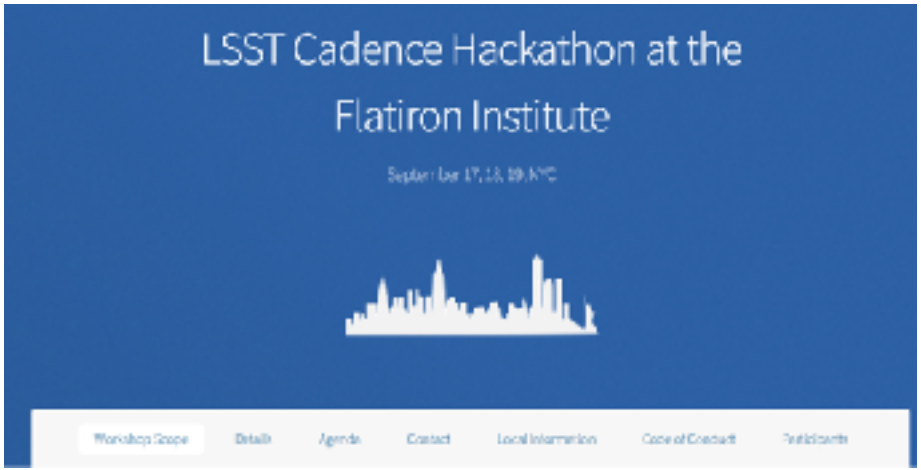




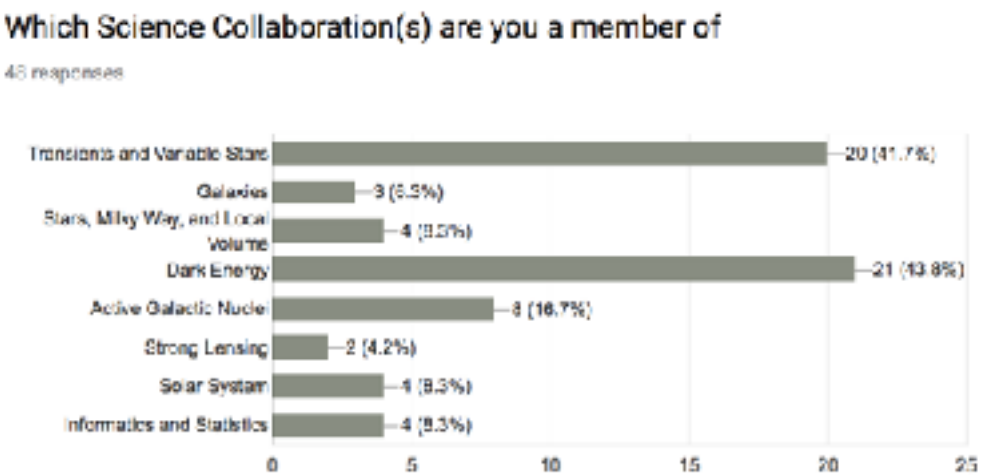




planned White Papers



ls.st/ias



WP plan after Flatiron https://goo.gl/hkzzvw

planned papers showcase

WP showsown

ONE SLIDE PER PAPER

federica bianco
@fed

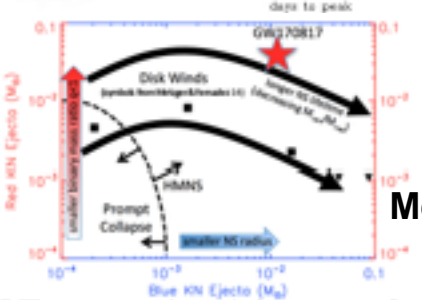
TVS

Fast transients detection and characterization with LSST WFD

WFD

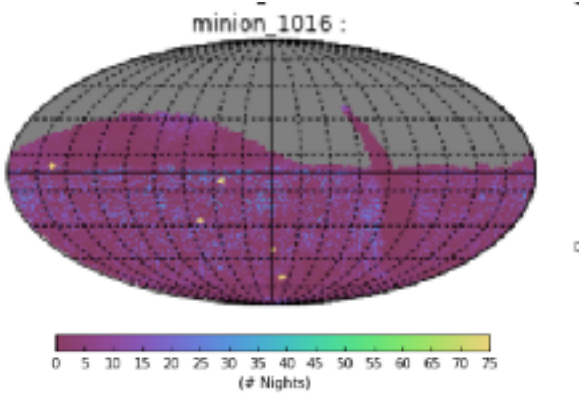
3 visit, the first two in 2 filters, filter (A), revisit with another filter (B) within 30 minutes , and revisit the field with a larget time gap (~3h) with either filter A or B

Bianco+ 2011



Metzger+ 2017

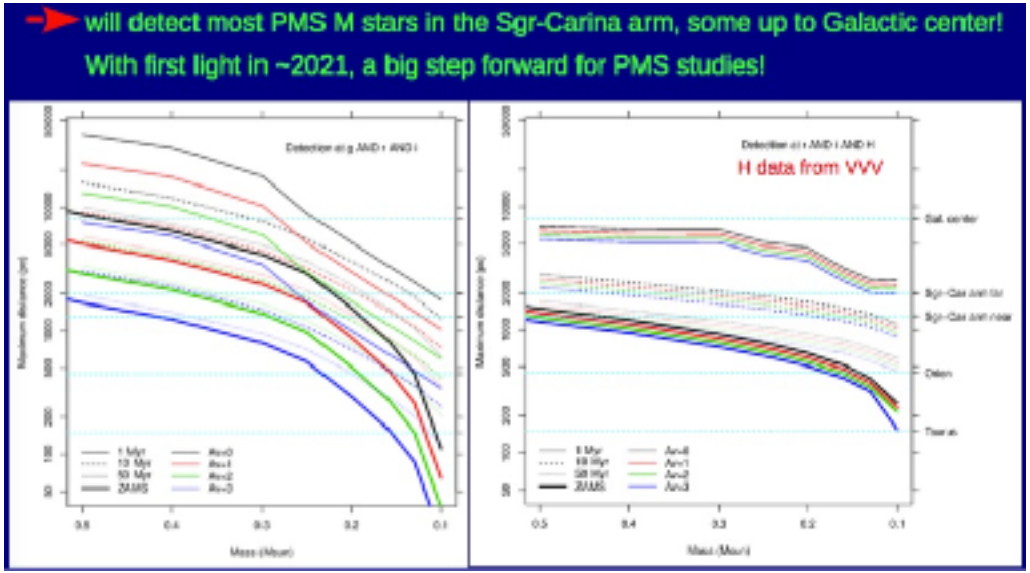
Calculates the number of fields that have 3 observations in 2 bands within a night



https://github.com/LSST-nonproject/sims_mat_contrib/blob/master/science/Transients/Transient_w_color.ipynb

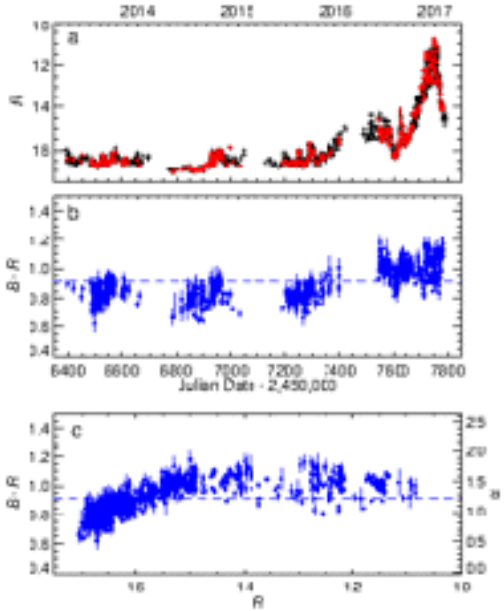
TVS: Young stars with variability

Sara Bonito	TVS	Young stars with variability	WFD	It will be fixed later, but as observed in classical T Tari stars as TW Hya variability ranging from 30 min to several hours are expected due to the accretion process that we aim at investigating in u, r, and z filters.



Study young stars in clusters and their variability due to accretion at time scales ranging from minutes to hours

TVS:The Blazar scientific case for LSST



Brightness and color behaviour of the blazar CTA 102 (Raiteri et al. 2017, Nature, 552, 374)

Barbara Balmaverde
@balmaverde

TVS

The Blazar scientific case for LSST

WFD, MiniSurvey, DDF, ToO

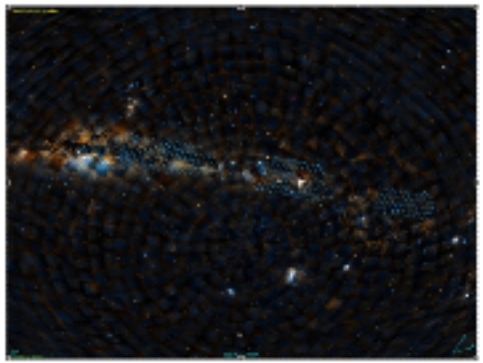
Showing peculiar and unpredictable behavior, 1) a reference filter to be used every night avoiding color conversion between different filters by acquiring one visit per night in the r-band and the other visit in one of the other filters according to the scheduled sequence, or by acquiring the two 15 sec exposures of a visit in different filters. 2) keeping the main Wide-Fast-Deep cadence as uniform as possible would likely facilitate the detection of periodic behaviours in the light curve analysis. MS: support the proposed mini survey in the North Ecliptic Spur, since this is a portion of the sky that it is covered by two radio surveys, the NRAO VLA Sky Survey (NVSS) and most notably the VLA FIRST Survey at 20 cm.

TVS:RR Lyrae stars in the inner bulge: where the eagles dare

Massimo Dall'Ora @dallora	TVS	RR Lyrae stars in the inner bulge: where the eagles dare	MiniSurvey

The pulsation periods of RR Lyrae stars range typically from 0.3 to 0.8 days, and therefore a continuous monitoring (let's say, one or two data points per hour) during three or four consecutive nights would be the more effective technique to pick them and to provide robust pulsational parameters. This single run could be repeated over time, to improve the detection and derive more robust parameters and, even more importantly, to highlight the possible light curve modulations (the Blazhko effect).

- Datasets adequate to test crowded field photometry:
  - DECam bulge images in the OGLE IV footprint
  - Time series from OGLE IV (need permission for publication) / KMTNet



2013A-0719, bands ugriz, 4156 images (PI: Saha)
2014A-0429: bands griz, 1328 images (PI: Finkbeiner)
2016A-0327: bands grizY, 2319 images (PI: Finkbeiner)
2016B-0279: bands grizY, 6150 images (PI: Finkbeiner)
2016A-0951: bands griz, 90 images of 3 fields w overlap (PI: Penny)
2017A-0936: bands grizY, 190 images (PI: A. Calamida)

TVS:The Gaia-LSST Synergy and Constraining Theory using LSST observations

Gisella Clementini - Ilaria Musella @ilaria.musella	TVS	The Gaia-LSST Synergy and Constraining Theory using LSST observations	MiniSurvey	Cadence should be optimised to allow the coverage of both short period (P< 1 d) variable stars such as RR Lyrae and delta Scuti and longer period variables (P from a few days up to about 100 d) such as Cepheids and LBVs.

TVS:ToO observations of GW events with LSST

Raffaella Margutti
@raffaellamargutti

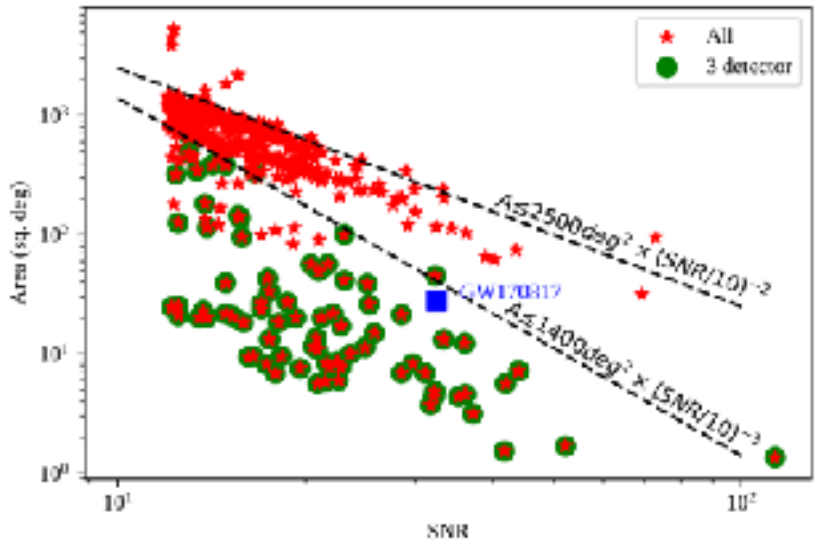
TVS

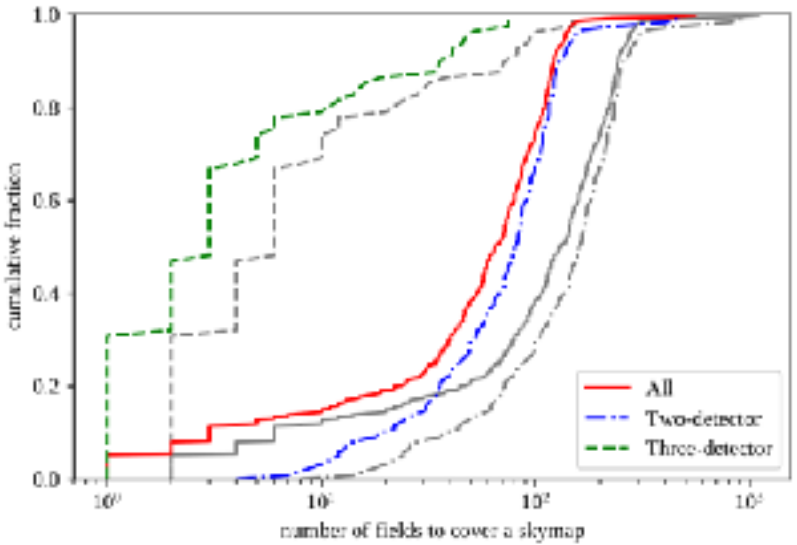
ToO observations of GW events with LSST

ToO

Target of Opportunity We are still working to identify the best observing strategy, which will necessarily be a strong function of the properties of the GW event (i.e. size of the localization region, distance of the event etc).

(Om Sharan Salafia)





TVS:SN rates and demography with LSST

Mari Teresa Botticella @mtbotticella	TVS	SN rates and demography with LSST	DDF	We want to observe the deep drilling fields in one band with a cadence of 2-4 days to obtain detailed light curves for each transient and other two bands observations once a week to monitor the transient colour evolution.

TVS:The Diverse Science Return from Extending the Wide-Fast-Deep Survey to the Galactic Plane

Rachel Street @rstreet	TVS	The Diverse Science Return from Extending the Wide-Fast-Deep Survey to the Galactic Plane	WFD	Our proposal would extend the Wide-Fast-Deep survey strategy to include the Galactic Plane, but using a restricted range of filters (griz) rather than the full set to minimize the impact on the rest of the Main Survey.

Science

Improve constraints on free-floating planetary mass function
Identify bound planets
Measure FFP distance, kinematics
Constraints on microlensing parallax
Transiting planet discovery
Variability in ultra-cool dwarfs
Cataclysmic variable orbital periods

Observing Strategy

Every ~15-30min during simultaneous windows
Limited to <few hours per night
Jan-March and Sept-Oct
Starting 2024 until end of WFIRST survey
Primarily z or i, some observations in g, r

TVS:Observing the Galactic Plane as a MiniSurvey

Michael Lund **@lundmb**	TVS	Observing the Galactic Plane as a MiniSurvey	MiniSurvey	~1000 observations (same as WFD, roughly), but likely with a different filter distribution (likely mostly g, r, i) and revisit strategy (more likely to benefit from slightly more uniformly sampled observations instead of pairs of observations one hour apart)

TVS LSST-WFIRST Coordinated Bulge Survey

Rachel Street @rstreet	TVS	Unique Science from a Coordinated LSST-WFIRST Survey of the Galactic Bulge	DDF	We propose to monitor a single Deep Drilling Field centered on the WFIRST Bulge survey at high cadence (hourly or better) while the field is visible simultaneously from Earth and space, with extended monitoring at lower cadence to take place during the gaps between WFIRST's Bulge survey periods.

Science

Determine essential microlensing parameters
Measure microlensing annual parallax
Exclude false-positive FFP detections
Variability in ultra-cool dwarfs
Cataclysmic variable outbursts

Observing Strategy

Include Galactic Plane in Wide-Fast-Deep but using a restricted set of filters {z, i also r, g}
Ensure coverage of DDF every ~days between WFIRST survey seasons

Metrics

Spatial overlap between WFIRST/LSST DDF
Temporal overlap for during simultaneous viewing windows
Regular monitoring during inter-season windows

TVS: Microlensing Black Hole Survey of the Milky Way Bulge and Magellanic Clouds

W. Dawson & PALS collab. @wadawson	TVS, DESC	Microlensing Black Hole Survey of the Milky Way Bulge and Magellanic Clouds	MiniSurvey

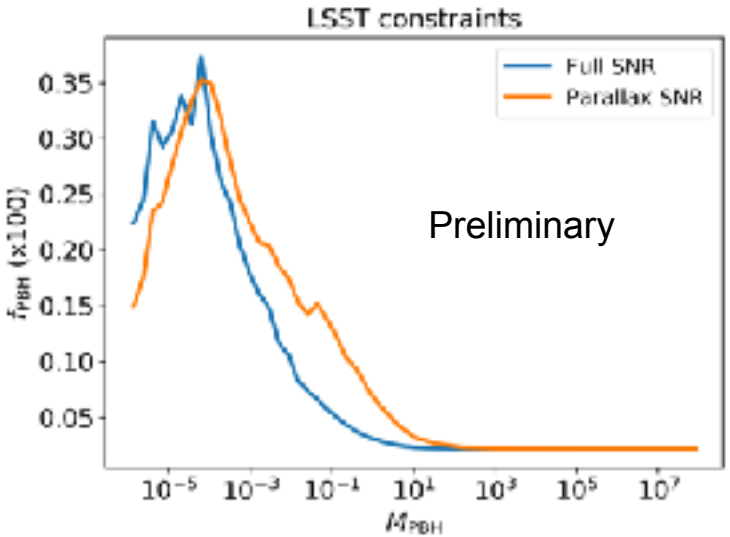
A time variable survey of the Bulge in Clouds designed to detect the multi-year parallax microlensing signal of black holes in the Milky Way disk and halo. Can couple with shorter timescale surveys.

Nathan Golovich (@nrgolovich)

Science:
Dark matter constraints
Free floating and binary microlensing of black holes
Parallax microlensing modeling

Metrics:
spatial overlap with ongoing microlensing survey fields
mass constraints of macho dark matter

Observing strategy:
Repeated observations of bulge and magellanic clouds
two filters, probably r and i



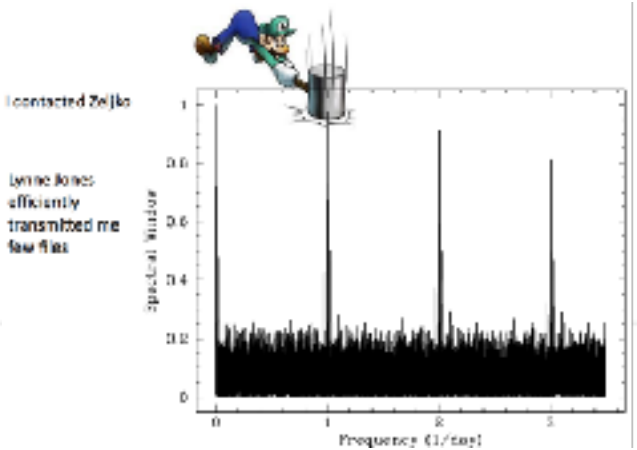
TVS:A cadence for reduced aliasing in LSST

Keaton J. Bell
@keatonb

TVS

A cadence for reduced aliasing in LSST

WFD



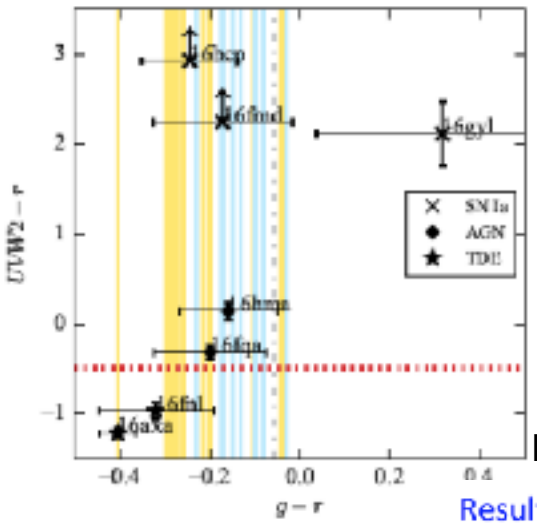
We propose an additional consideration for the scheduler that weights fields according to when observations will contribute least to aliasing. The current aliases for each field can be calculated at the start of each night from the history of observations. We can then compute the times throughout the night when additional observations would worsen or alleviate these aliases. The scheduler should give preference to observation epochs that lessen the effect of aliasing, while still meeting other cadence requirements.

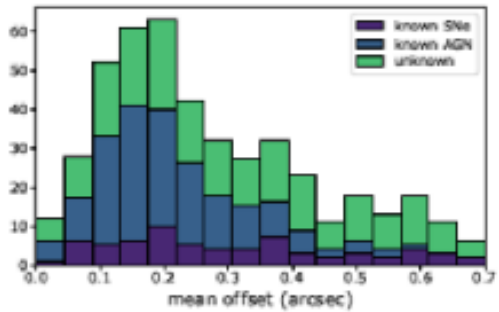
Laurent Eyer University of Geneva, Switzerland LSST@Europe3, Lyon, France

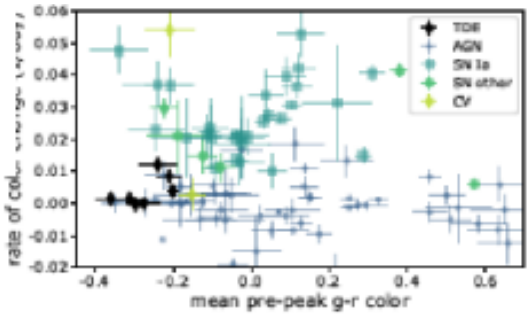
TVS:The importance of u-band for identifying tidal disruption events in the LSST transient stream

Suvi Gezari	TVS	The importance of u-band for identifying tidal disruption events in the LSST transient stream	WFD	We would like to explore the possibility of having a cadence in the u band that matches the g and r bands…at least for a subregion of the sky.

- Offset, color, and color evolution can be used to photometrically select TDEs from the LSST transient alert stream.
- The UV is the cleanest discriminator between TDEs and SNe.
- Goal of WP: What u-band cadence is required for the WideFastDeep survey to efficiently filter out nuclear SNe.







Results from ZTF: van Velzen, Gezari+ (2018)

Results from iPTF: Hung, Gezari+ (2018)

TVS:TDEs with LSST

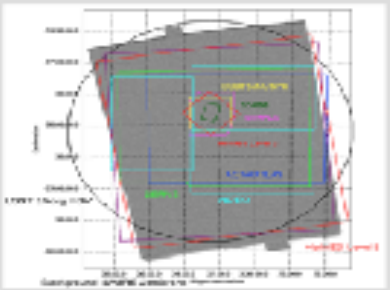
Katja Bricman **@bricmank**	TVS	TDEs with LSST	WFD	test how the cadences released with the white paper call affect observations of TDEs. optimisation TBD

AGN: AGN science in LSST DDFs

W.N. Brandt AGN AGN Science in the LSST DDFs DDF

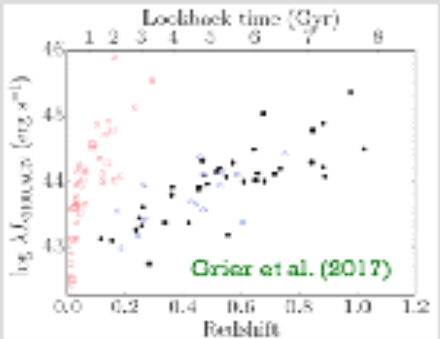
Goal is to state the needed total DDF exposures and needed DDF cadences for strong AGN studies. Drivers include SDSS-V/4MOST reverberation mapping, photometric reverberation mapping, and SMBH transient phenomena

W.N. Brandt et al.



Incoming data from XMM-Newton, Spitzer, MeerKAT, VISTA, HSC, DEVILS, etc.

Goal is to state the DDF footprints, total DDF exposures, and DDF cadences needed for strong AGN studies.



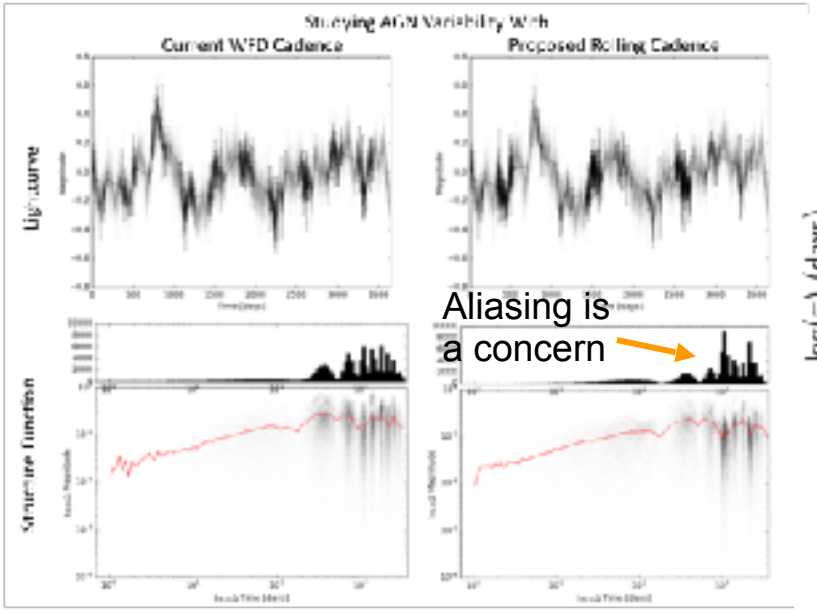
Also 4-MOST RM

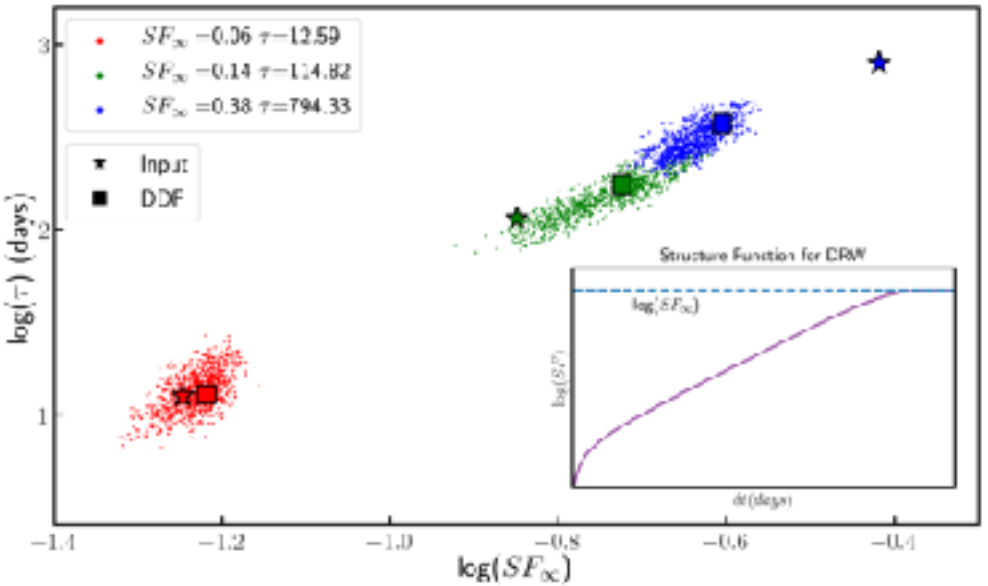
Science Goals	Primary Selection	Density (deg^{-2})	N_{epochs}	N_{years}
Reverberation mapping, BH masses	Optical 6000$_A$ / < 23	30-50	~300	10+
BH accretion and outflow, time-domain physics, changing-look quasars	Optical 6000$_A$ / < 19	10	23,000	5-10
eRASS:8 Follow-up: AGN, X-ray binaries, galaxy clusters	$f_X > 2.5 \times 10^{-14}$ erg cm^{-2} s^{-1} / < 21.5	20-50	400,000	1-3

Also photometric RM and transient SMBH phenomena.

AGN-Optimized Rolling Cadence

G.T. Richards	AGN	LSST Rolling Cadence Optimized for AGN Science	WFD	Goal is to explore what rolling cadence choices would work well/acceptably for variable AGN science in WFD





AGN:twilight survey at high air mass

G.T. Richards	AGN	Twilight Survey at Large Airmass	Twilight	Goal is to investigate the benefits to photo-z of a twilight survey in the g-band at large airmass, levering the effect of differential chromatic refraction. See https://arxiv.org/abs/0904.3909 3

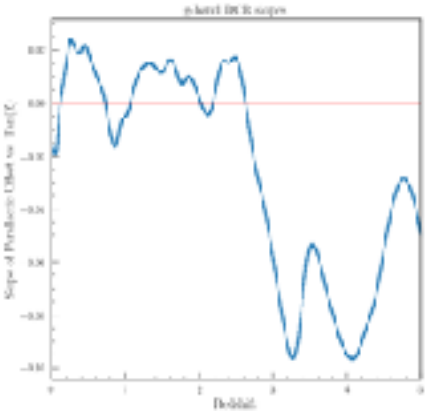


Photo-z's of AGNs (and many other sources with) can be improved by adding **more high airmass observations.** A twilight survey is a low impact way to accomplish that.

Related to a desire for the **longest** possible **observing season**.

DESC: Optimizing Cosmological Constraints from WFD

Dan Scolnic, Michelle Lochner	DESC	Optimizing Cosmological Constraints from the DDFs and Mini-surveys	MiniSurvey,DDF,Twilight,TOO	Goal is to choose extra DDFs, cadence, ToO program, other mini-surveys
Michelle Lochner, Dan Scolnic	DESC	Optimizing Cosmological Constraints from WFD	WFD	Goal is to optimize WFD overall observing strategy including cadence, exposure times, filter changes

DESC Response led by Michelle Lochner and Dan Scolnic.

Studying multiple components of WFD strategy including cadence, depth, exposure time, filter changes, dithers

Currently finding consensus amongst multiple science cases. Every group nearing completion of studying ~16 different OpSim strategies.

Progress documented here: https://github.com/LSSTDESC/ObsStrat/

Fig. by P. Gris, N. Regnault

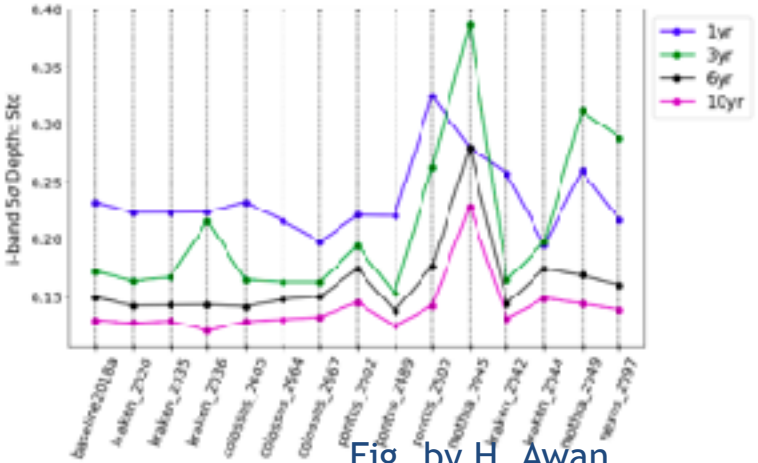
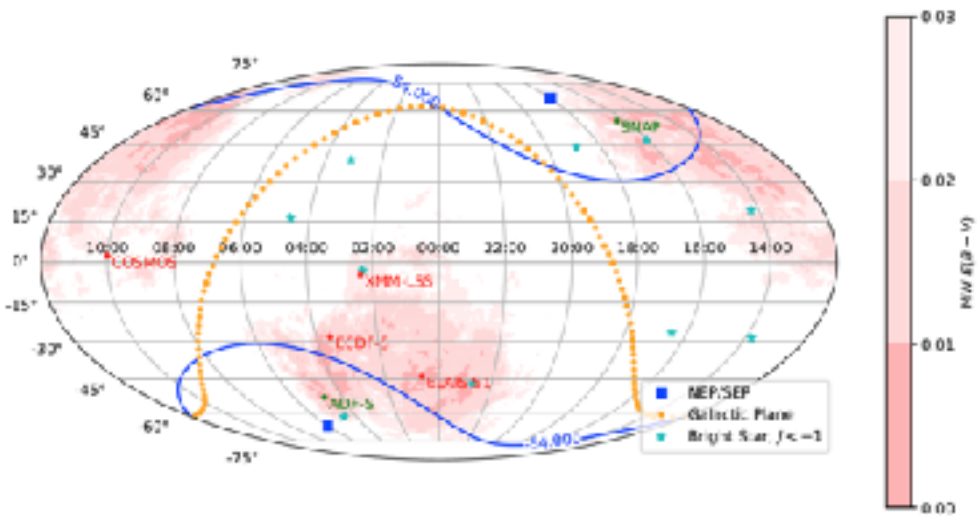


Fig. by H. Awan

DESC Response led by Dan Scolnic and Michelle Lochner.

Studying location, depth, cadence of DDF. Also studying best course for ToO program.

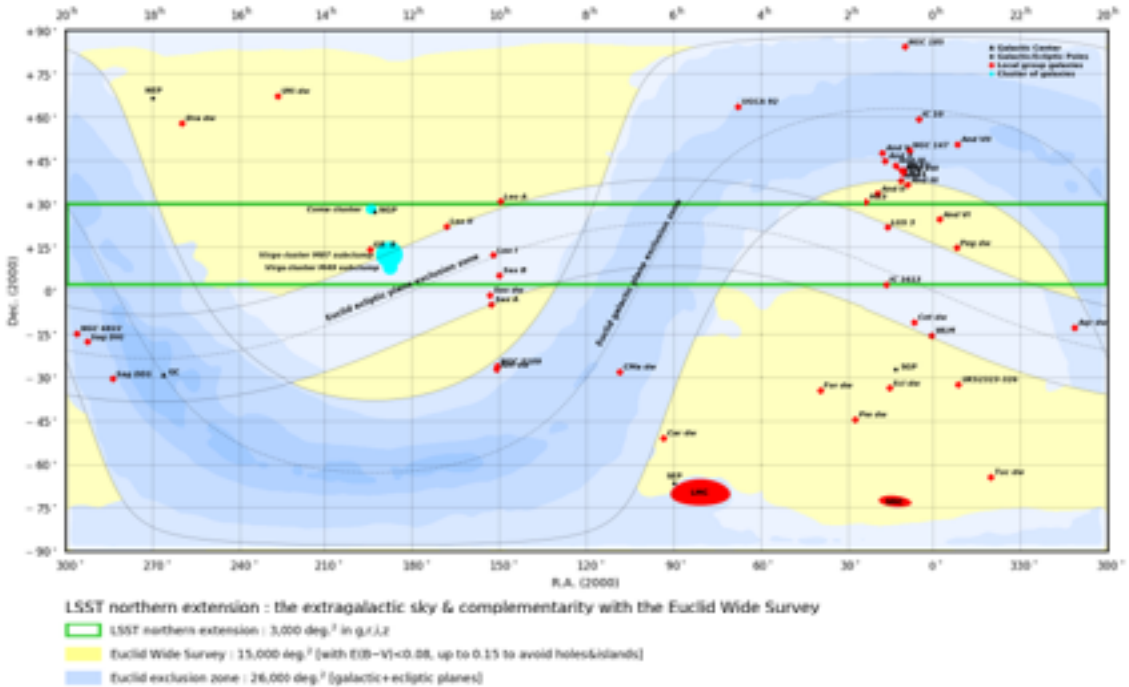


DESC has a number of tools for transient simulations for WFD and DDF - see P. Gris for SNIa focus, R. Hlozek and D. Scolnic for general SN transients.

R. Hlozek has full survey simulated for each strategy on NERSC!

DESC:+30 dec extension

Likely whitepaper for shallow extension of LSST DEC footprint to +30 in mini-survey for overlap with northern surveys. Led by Euclid, DESI, Peter Capak, D. Scolnic -- TAG survey coordination

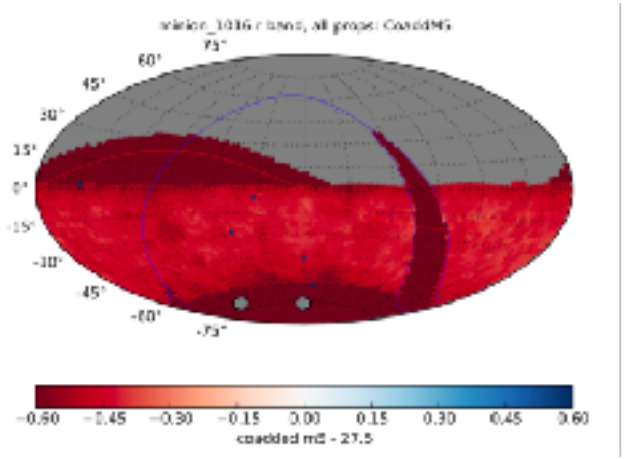


SMWLV: Mapping the Periphery and Variability of the MCs

K. Olsen, P. Szkody	SMWLV, TVS	Mapping the Periphery and Variability of the Magellanic Clouds	MiniSurvey, DDF	A two-tiered proposal comprising a DDF survey of the Cloud main bodies and Mini Survey of the entire SCP region

Select field(s)	Coadds	Single epochs
	Legacy survey of the Magellanic Clouds	Variable star populations (Szkody) Microlensing (Dawson) Transiting extragalactic planets (Lund) New short-timescale transients Interstellar scintillation (Moniez) Light echoes
Many-fields	Structure and tidal debris Dwarf satellites	Proper motions RR Lyrae as tracers of 3D structure

- A Wide-Fast-Deep-like survey around the South Celestial Pole
- A Deep Drilling survey covering the main bodies of the Magellanic Clouds, up to 250 deg^2



SMWLV: extending WFD to Galactic Plane

J. Strader	SMWLV	Extending WFD to the Galactic Plane	WFD

This white paper will argue for no-compromise WFD coverage of the Plane, including static, variable, and transient science from a variety of areas

Contact strader@pa.msu.edu (or @caprastro on twitter) if you want to contribute

SMWLV: twilight survey for MW

John Gizis @jgizis	SMWLV	Twilight Survey for Milky Way	MiniSurvey	Details TBD, but big picture is a twilight survey aimed at extending LSST photometric system to brighter stars. Will probably concentrate on 3 filters.

SSSC: Observing the North Ecliptic Spur

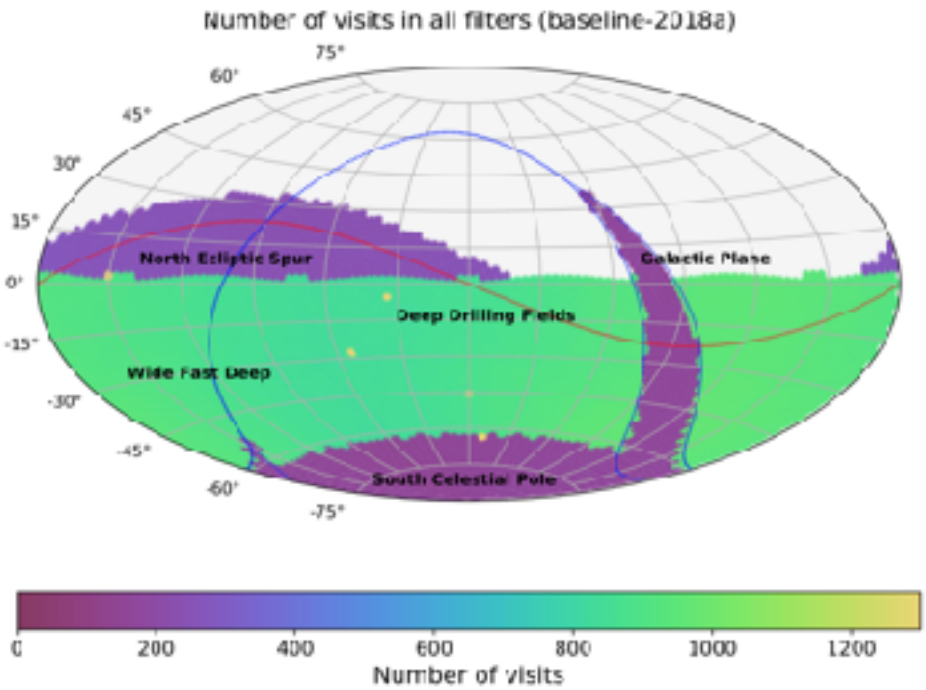


Image Credit: Cadence Optimization White Paper Call (LSST Project)

White Paper Lead: Meg Schwamb (mschwamb.astro@gmail.com)

Aim: Cover NorthernEcliptic up to +10 degrees ecliptic latitude.

Inner Oort Cloud origin+ Planet 9/Planet Beyond Neptune constraints/direct detection

Probining Kuiper belt Resonances and Neptune's migration history

Priorities split between discovery observations for distant Solar System objects vs monitoring observations for main belt comets + griz obs (r filter minimum)

SSSC: Solar System Deep Drilling Field

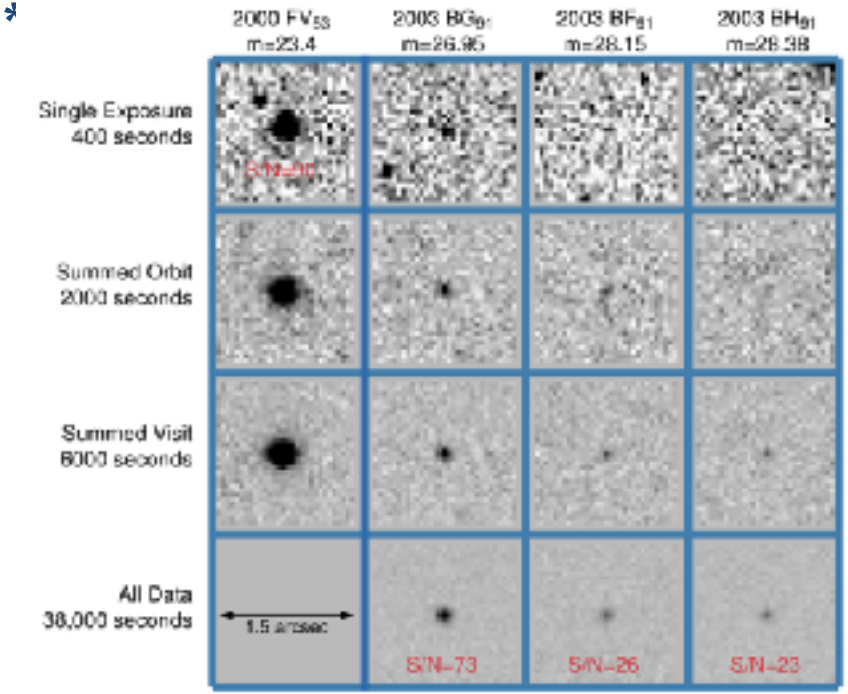


Image Credit: Bernstein et al. (2004)

White Paper Lead: David Trilling (David.Trilling@nau.edu)

Aim: Observe same fields (near the ecliptic) in one filter/maybe 2 (for many hours).

Stack-and-shift images to find small Kuiper belt objects (KBOs) to probe the size distribution

Obtain high precision high cadence light curves for a sample of asteroids and brighter KBOs

SSSC: Near-Sun twilight NEO survey

White Paper Lead: Rob Seaman (seaman@lpl.arizona.edu)

Twilight is the only time that near-sun elongations can be surveyed. LSST will invest most time near N/S meridian. Earth Trojans & Interior-to-Earth-Orbits are only found near-sun; Potentially Hazardous Asteroids (potential Earth impactors) enhanced at near-sun sweet spots.

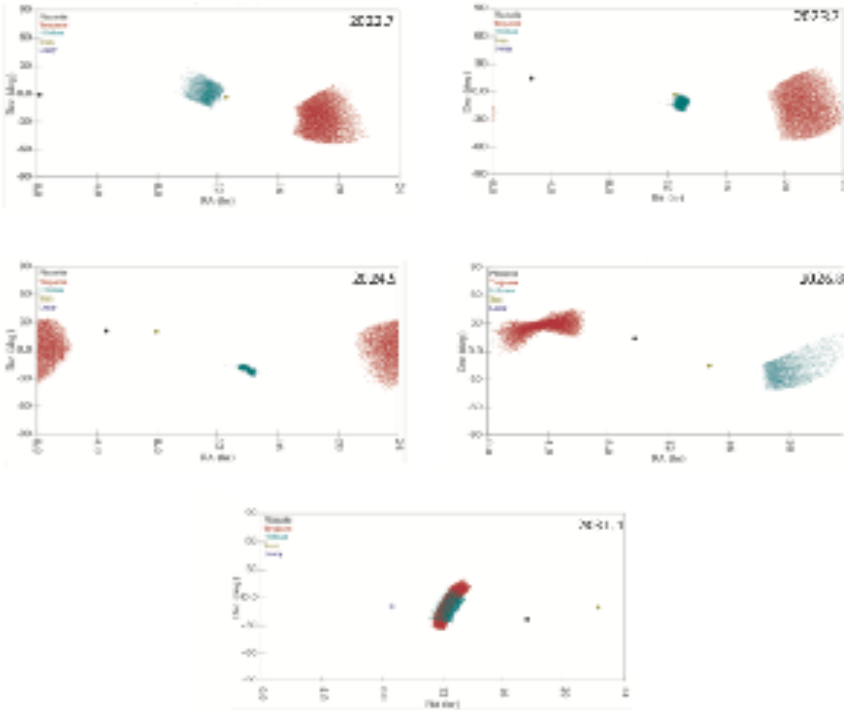
- New sky, ~1°/dy, appears to the east in morning twilight, **LSST first-look survey**
- Slice of old sky disappears nightly to the west in evening twilight, **LSST last-look survey**
  - observing near-sun maximizes seasonal window for objects of all types, not just SSSC science
- Group, including members of SSSC, proposing *DECam Asteroid Taxonomy Ecliptic Survey* (DATES)
  - w/ pathfinder twilight survey implementing similar near-sun picket pattern tiling Earth L4/L5 *1*
  - NEO cadence (4 images in 20-30 min or less , interleaved fields): **high-confidence tracklets**, thus **rapid follow-up**
  - Background objects, TVS and otherwise, as with Catalina Real Time Survey (CRTS)

Questions: Best twilight strategy to address multiple science goals? **Need not be same as WFD strategy.**

1 Mon. Not. R. Astron. Soc. 420, L28–L32 (2012)

SSSC: Other Likely White Paper Efforts Not Started

Prioritizing Lucy L5 Jupiter Trojan/Hilda Target Regions



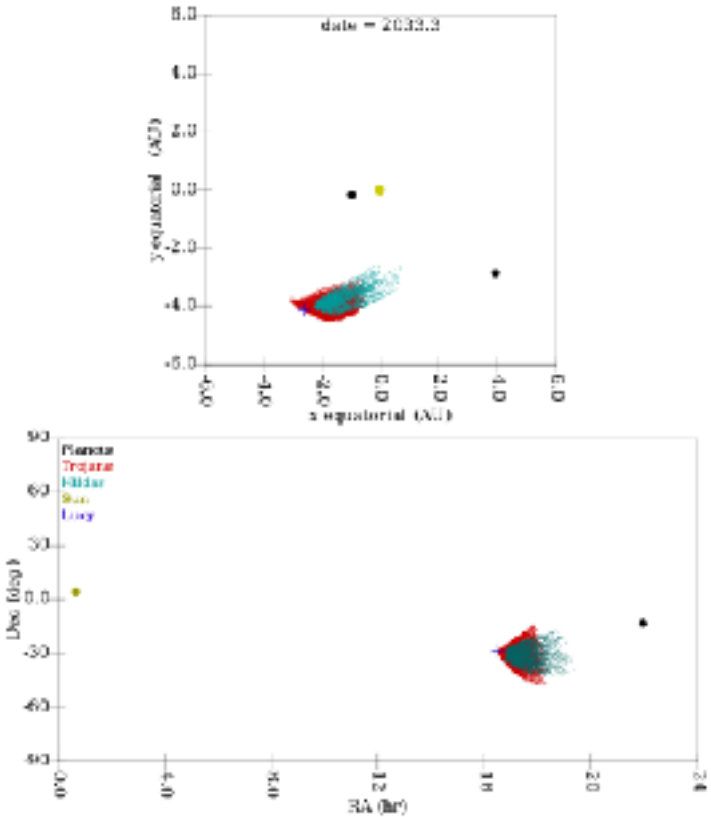


Image Credit: Schwamb et al. (2018) RNAAS (http://iopscience.iop.org/article/10.3847/2515-5172/aade00/meta)

SSSC: Other Likely White Paper Efforts Not Started

What filter should Solar System discovery observations be taken in the Wide Fast Deep Survey - likely not u,z,y since low SNR - should be a single filter for more consistent detection efficiencies? r -band?

SSSC: Other Likely White Paper Efforts Not Started

A single snap per observation for the Wide Fast Deep Survey and Northern Ecliptic Spur proposed mini-survey is satisfactory for most Solar System populations - small impact for very fast moving Near Earth Asteroids