Local Volume, Milky Way, Stars & Planets

L3 Requirements, Deep Drilling Fields, Minisurveys

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Session 7A Schedule

1. **Introduction** *(10 min)*
   I. Dékány, J. Jurcsik

2. **Prospecting for LMXB Periods with LSST** *(20 min)*
   M. Johnson

3. **Stellar Variability in Crowded Fields** *(20 min)*
   M. Dall'Ora

4. **Keynotes**
   Short speeches raising ideas and addressing issues
   (please give us prior notice before the session starts)

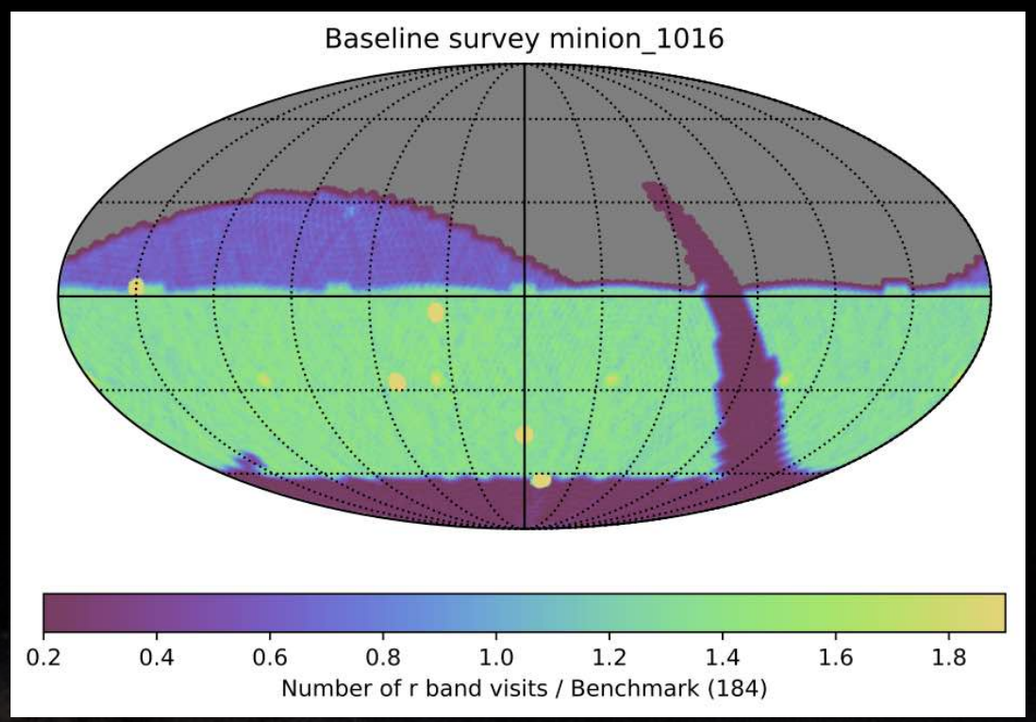
5. **Plenary discussion**
   brainstorming

LSST components

Wide-Fast-Deep (WFD, main survey)

Default strategy: "baseline universal cadence" (minion_1016)

ugrizy filter set
-65˚≤ δ ≤+5˚
30 sec / visit (split)
2 visits per night (within ~ an hour)
~ 85 % of time
~ uniform cadence over 10 years
subject to change



credit: LSST living paper

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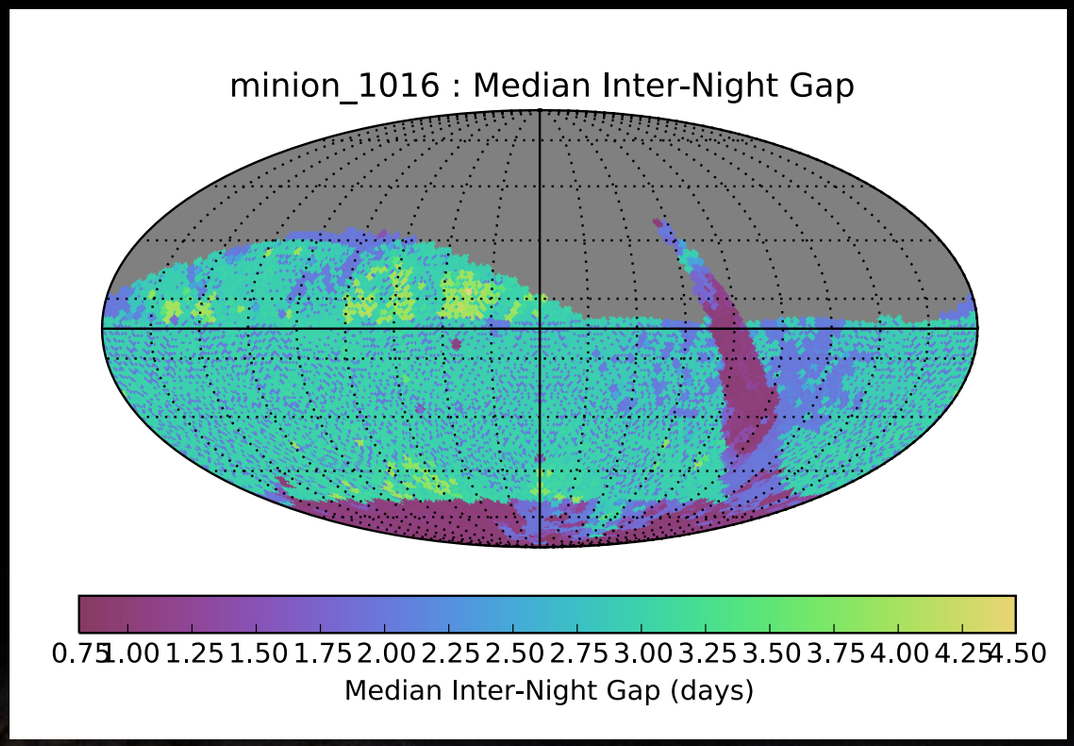


credit: LSST strategies white paper

LSST components

Complementary surveys

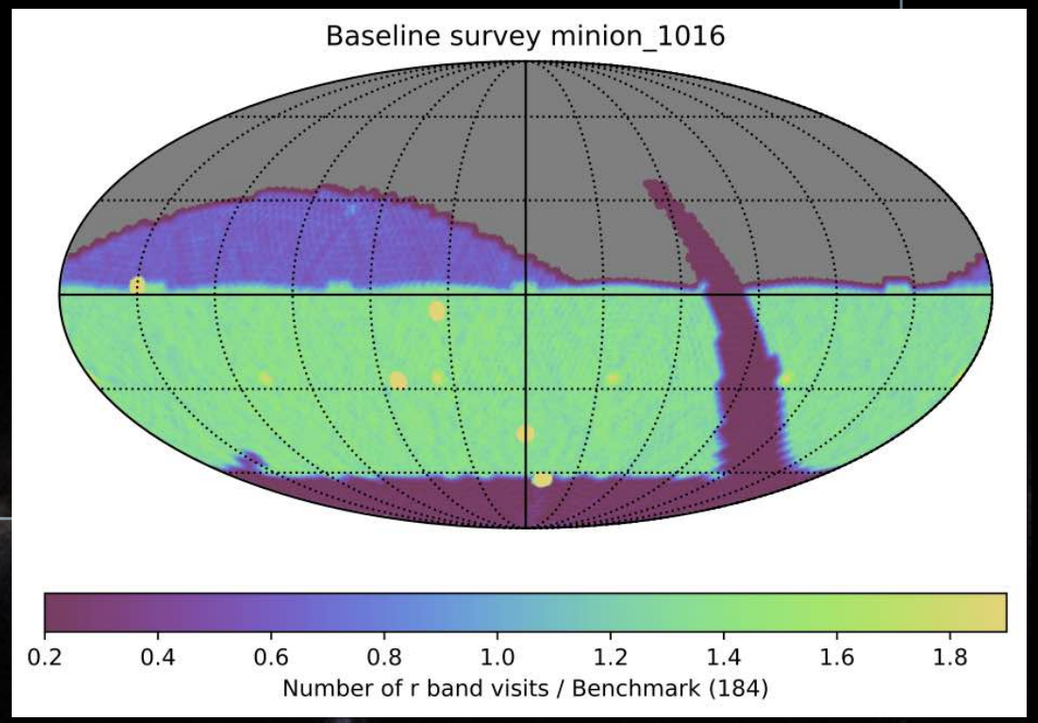
Default strategy: 3 minisurveys + Deep Drilling Fields

North Ecliptic Spur minisurvey
crescent of the North ecliptic plane, *griz* filters, relaxed airmass constraint

Galactic Plane minisurvey
~ 30 visits per filter, without *ugrizy* or *rizy* filters

South Celestial Pole (SCP) minisurvey
δ<60˚, *ugrizy* filter, no visit pairs, fewer visits

Deep Drilling Fields
single pointings, large number of visits
4 DDFs allocated
more to be defined



credit: LSST strategies white paper

Deep Drilling Fields

4 fields selected by the science council

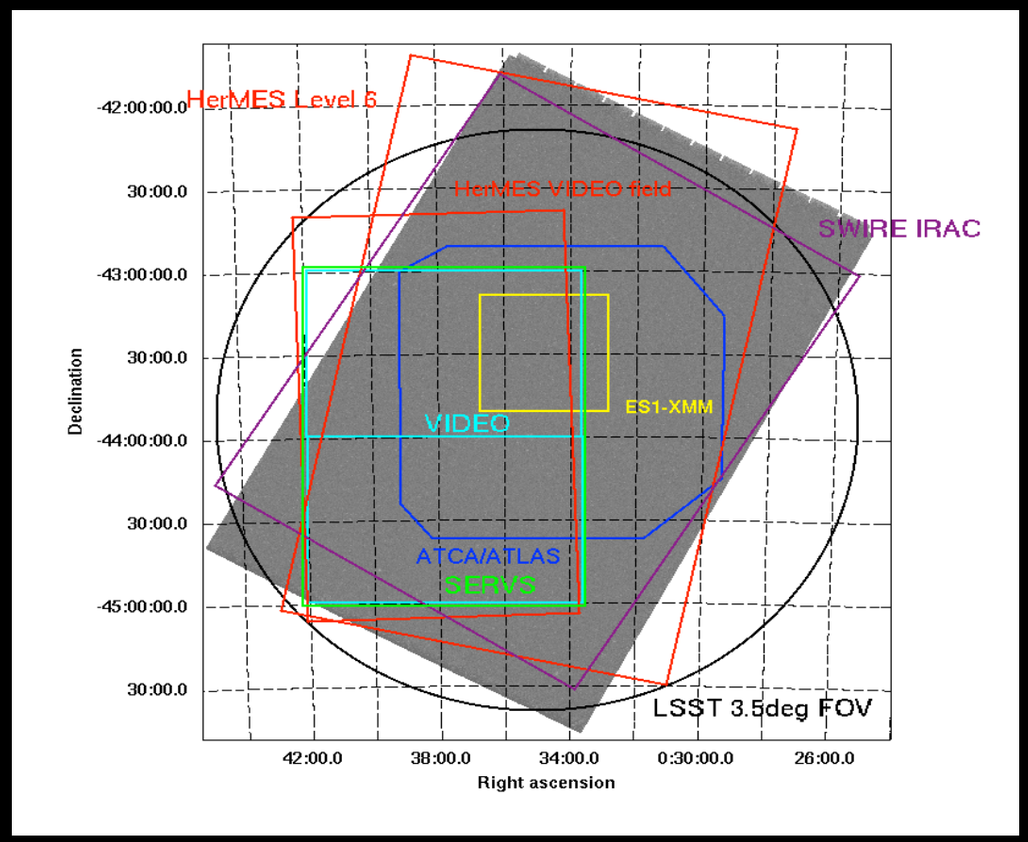
Elais-S1
XMM-LSS
Extended Chandra Deep Field South
COSMOS

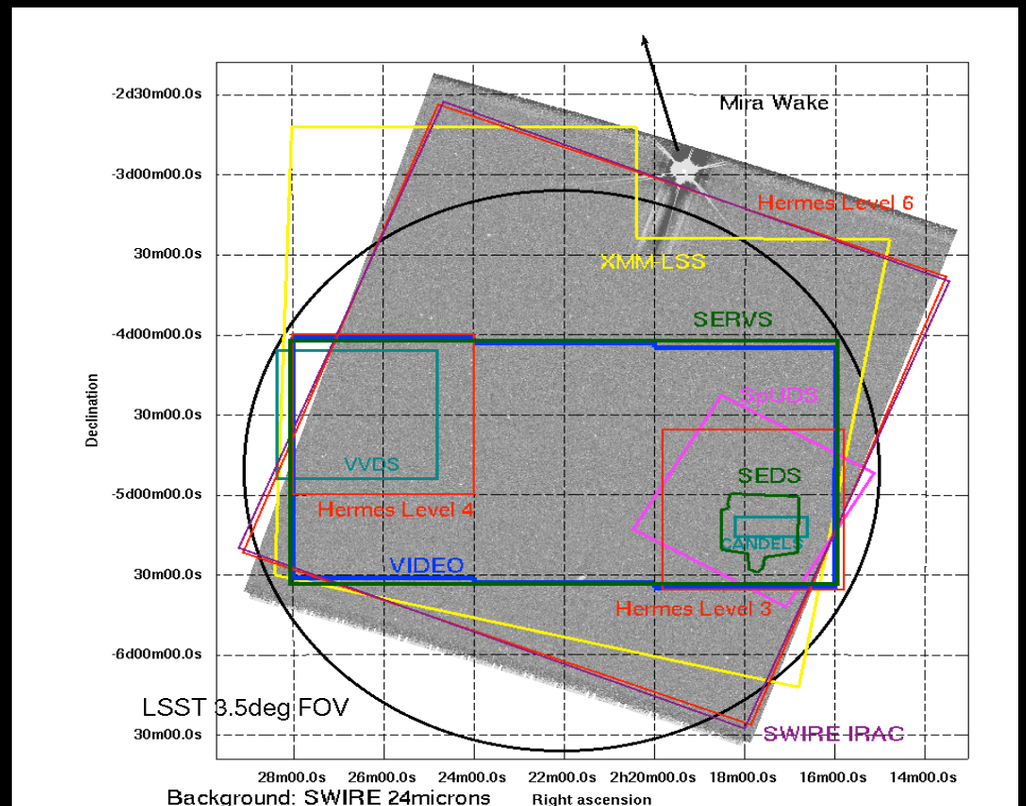
All 4 are “blank fields”, i.e., distant extragalactic fields
They have excellent multi-wavelength coverage

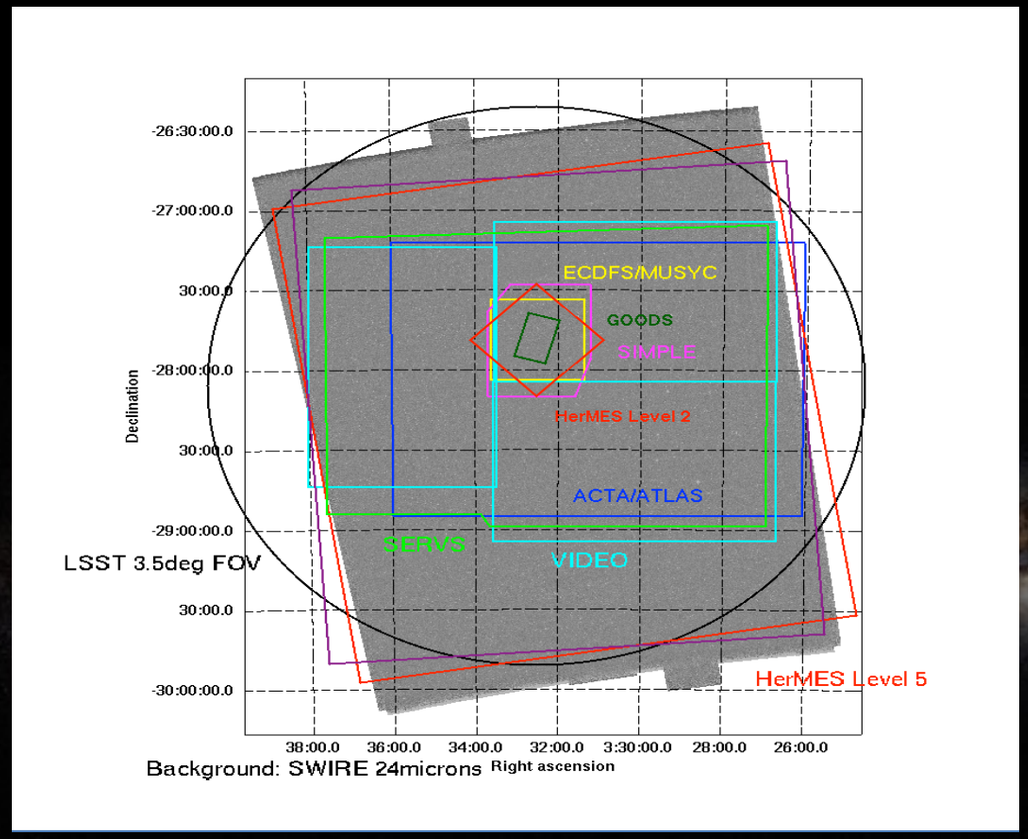
MORE FIELDS NEEDED.

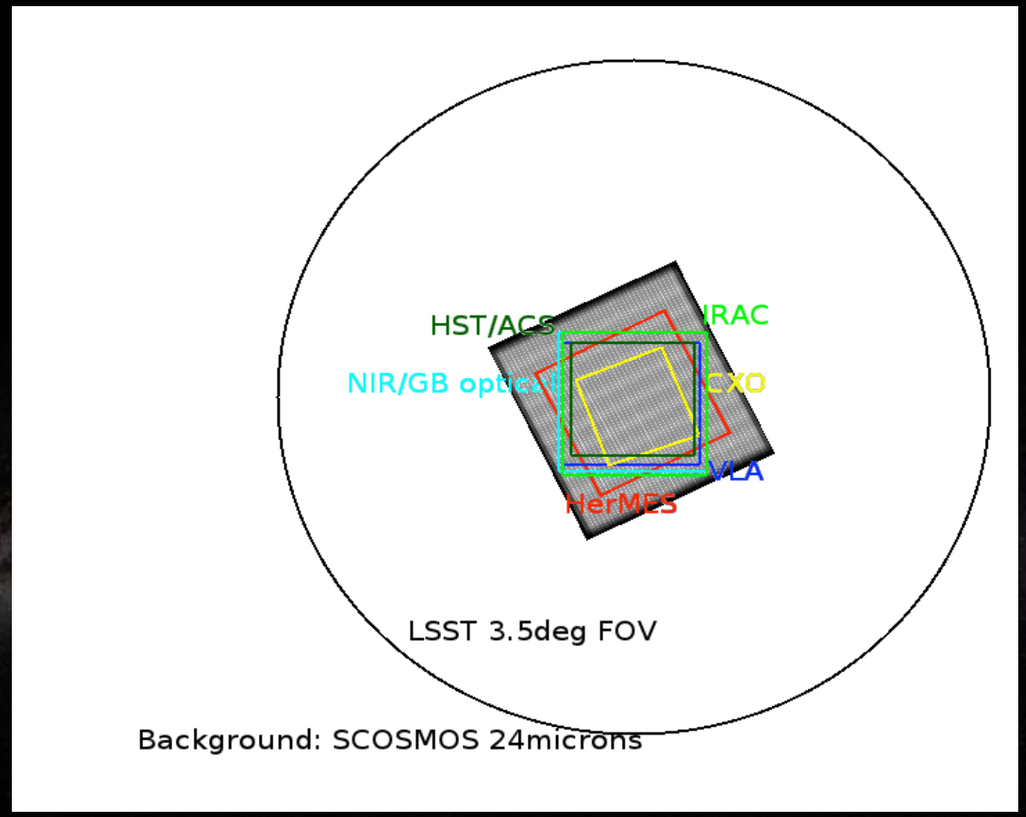
	ELAIS S1	XMM-LSS	Extended Chandra Deep Field-South	COSMOS
RA 2000	00 37 48	02 22 50	03 32 30	10 00 24
DEC 2000	-44 00 00	-04 45 00	-28 06 00	+02 10 55
Galactic l	311.30	171.20	224.07	236.83
Galactic b	-72.90	-58.77	-54.47	42.09
Ecliptic l	345.97	31.04	40.29	150.70
Ecliptic b	-43.18	-17.90	-45.47	-9.39

credit: LSST strategies white paper



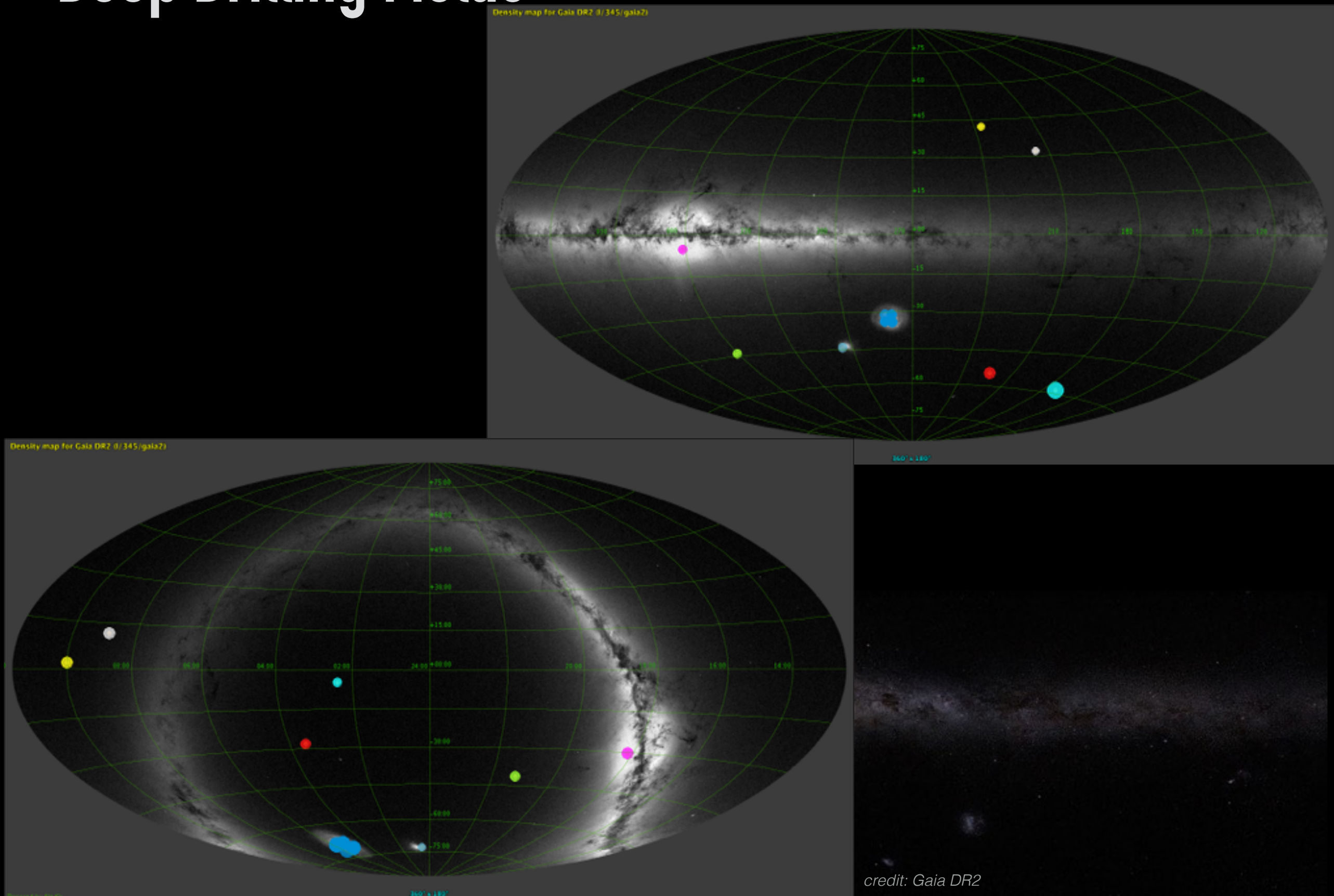






credit: Neil Brandt's presentation

Deep Drilling Fields



credit: Gaia DR2

Deep Drilling Fields

COSMOS
field

Ext. Chandra
Deep Field South

XMM-LSS

ELAIS-S1

credit: Gaia DR2

Deep Drilling Fields

M67
old open cluster

Bulge
DDF / minisurvey

LMC
quad-DDF

SMC + 47 Tuc

credit: Gaia DR2

alternative LSST

Wide-Fast-Deep (WFD, main survey)

Alternative strategies:

only WFD (minion_1012, minion_1013)
area increased by 40% / increase time domain coverage

baseline WFD, short exp. time (kraken_1052)
-33% exp. time —> +30% visits, -10% total open shutter time

baseline WFD, 2x exp. time (kraken_1053)
halves # visits, +15% survey efficiency

WFD extended to Galactic Plane (astro_lsst_01_1004)
same cadence as in baseline WFD within its coord. limits
slightly fewer visits per field, -5% depth

Rolling cadences
enhanced sampling rate “on some of the sky all of the time and all of the sky some of the time”
could begin with delay (after 2nd year)
constrain: uniform depth needed during survey, proper motion, etc.
would be greatly beneficial for short transients, and variable stars

Data Products

LSST Data Management System

Prompt Products

serving research on transient phenomena

Data Release Products

11 releases planned, 2 in 1st year, then annually

planned to be science-ready

will consist of images (raw, reduced, coadded), catalogs (objects & sources), reprocessed prompt products, metadata, software

User generated data products (a.k.a. ‘Level 3’)

output of specialized processing of obs. data (*e.g.,* DDFs)
additional, custom data products

end-users can create their data products, store them at the LSST Data Facility, and benefit from services provided by the LSST Science Platform

priorities and requirement needed from the community

Community involvement

"[…] at this writing, there is a vigorous discussion of cadence plans in the LSST community, exploring variants and alternatives that enhance various specific science programs, while maintaining the science requirements described in the SRD."

(LSST 'living paper')

"These four fields are only the first chosen for deep-drilling observations. The project plans a community call for white papers suggesting additional deep drilling fields and other specialized observing cadences."

(LSST 'living paper')

	Cadence Optimization	Calls to Community
2017	Start work on tools to run MAF & Opsim at scale	
	Rolling cadence experiments; DDF experiments/examples	Publish Observing Strategy white paper (OSWP) Call for DDF white papers (Dec)
2018	Rolling cadence experiments evaluated with OSWP metrics; Mini-survey experiments/examples	DDF white papers due (Apr)
	DDF WP -> simulated surveys; mini-survey experiments	Call for mini-survey (special programs) white papers (Oct)
2019	Updated baseline with DDF + rolling cadence (June)	Mini-survey white papers due (Feb) Request for white paper and metrics update (Mar)
	Mini-survey WP -> simulated surveys;	White paper with metrics due (Aug)
2020	Finalize MAF and Opsim tools; deliver documentation and a series of simulated surveys to SAC; form SSC	
	Ask SAC and Survey Strategy Committee to recommend the initial observing strategy	
2021	Announce initial survey strategy and publish a baseline simulation that reproduces that strategy	

(LSST Observing strategy white paper)

Strategy refinement

- The LSST Project engages the community
  White Paper Calls, Workshops

- The community gives input
  - science cases for DDFs and mini-surveys
  - assessment of survey parameter requirements
    (fields, filter set, cadence, obs. conditions)
  - definition of single real number evaluation metrics (‘merit functions’)
  - strategy evaluation and parameter optimization using *OpSim*
  - development of detailed proposals (‘white papers’)

- The Project considers input from community through the SAC and makes decisions
  - cadence decisions
  - DDF and mini-survey definitions
  - refinement of survey parameters

Survey optimization with community input
up to commissioning