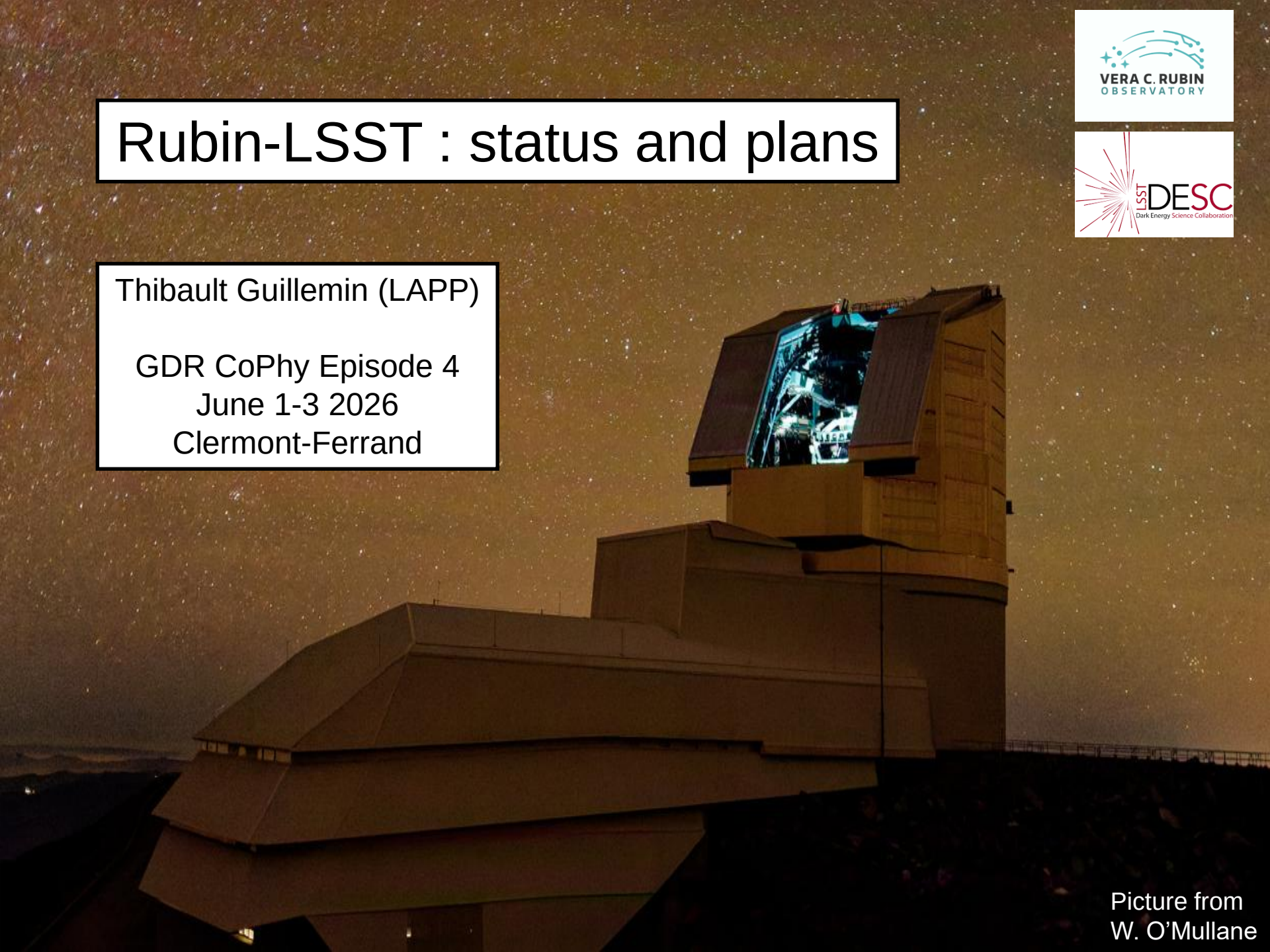
Rubin-LSST : status and plans

Thibault Guillemin (LAPP)

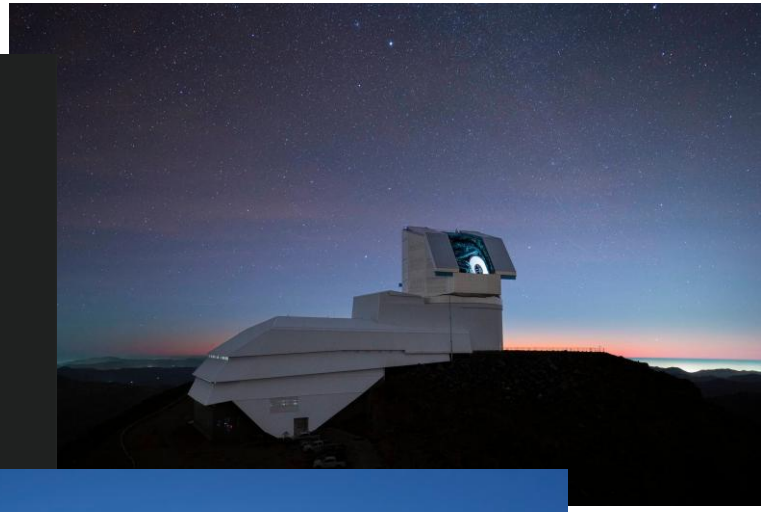
GDR CoPhy Episode 4
June 1-3 2026
Clermont-Ferrand



Picture from
W. O'Mullane

The Rubin Observatory

Located on **Cerro Pachón**, in the Coquimbo region of Chile
Altitude 2647 m



The LSST 10-year survey

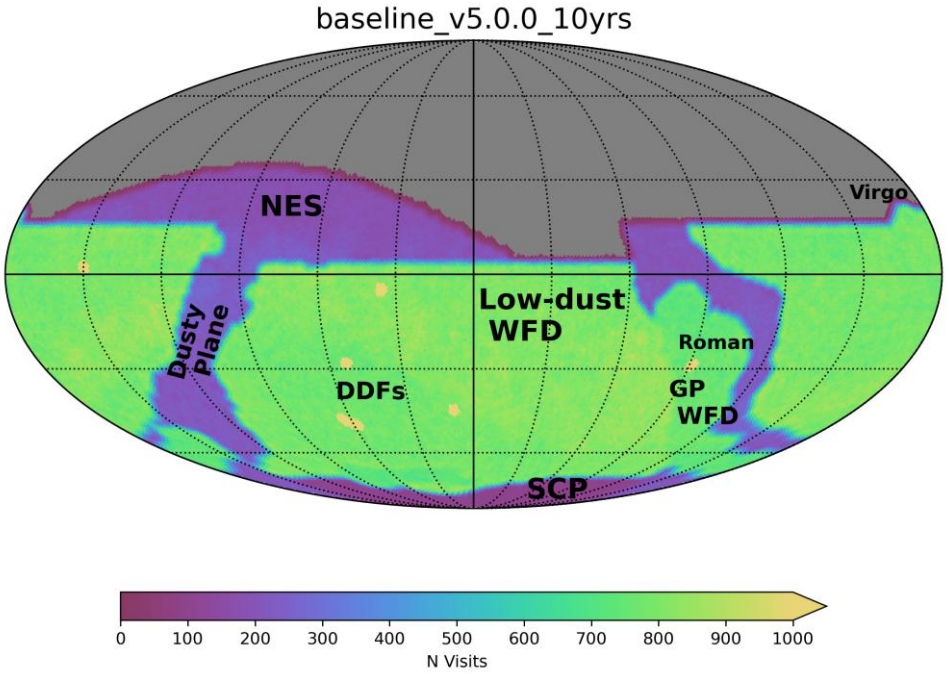
The **Wide Fast Deep** philosophy

- Full southern sky ~18.000 deg^2
scanned every 3 nights
30-s exposures ~10 deg^2

- 6 filter bands (ugrizy) 300-1100 nm

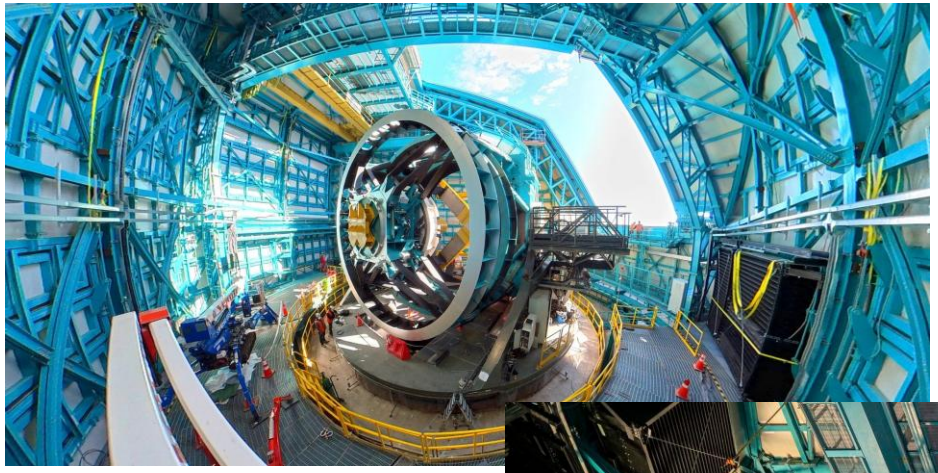
- 10-year magnitude depths (~800 visits)
25.6, 26.9, 26.4, 26.4, 25.6, 24.8

- Image quality : 0.7 arcsec



Additional programs (<20% of the survey time) :
Deep Drilling Fields, Target-of-Opportunity, Mini-Surveys

Telescope Mount Assembly

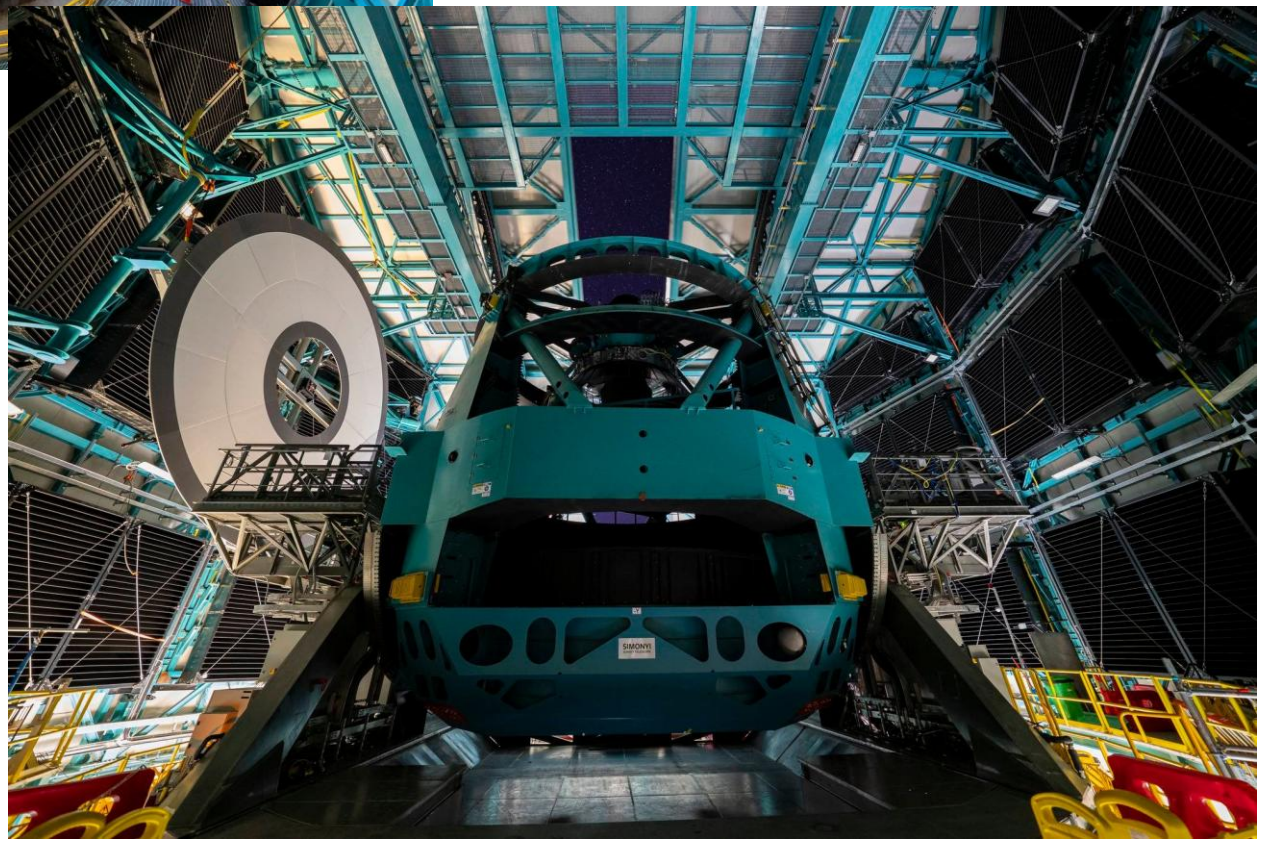


2022

Compact steel structure (~300 tons)

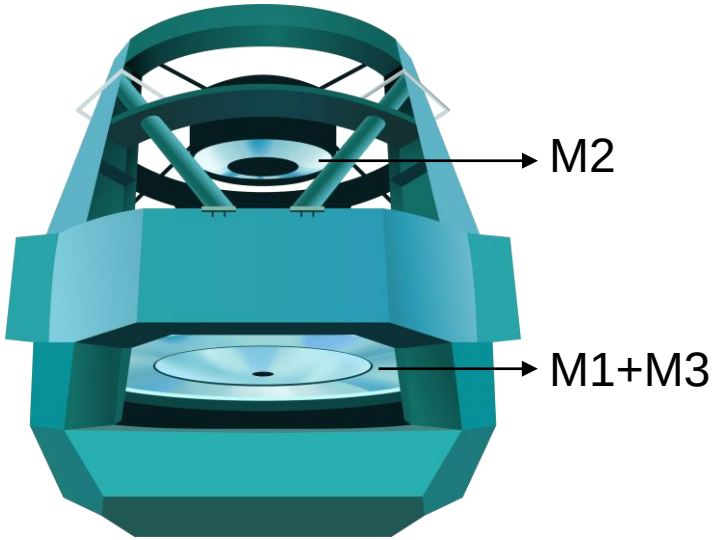
Velocity
~10 °/s (az.)
~5 °/s (el.)

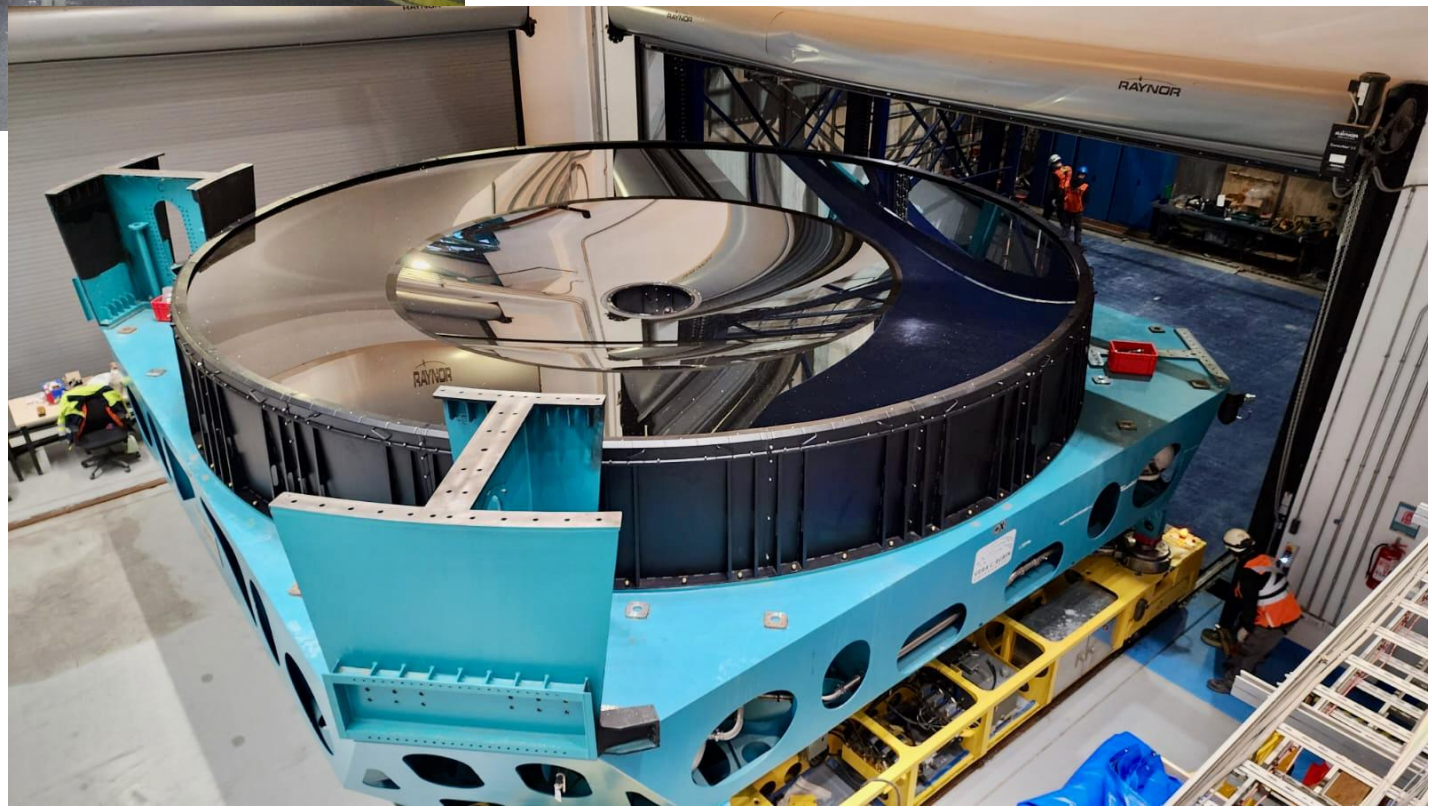
Settling time ~1 s



2025

Mirrors

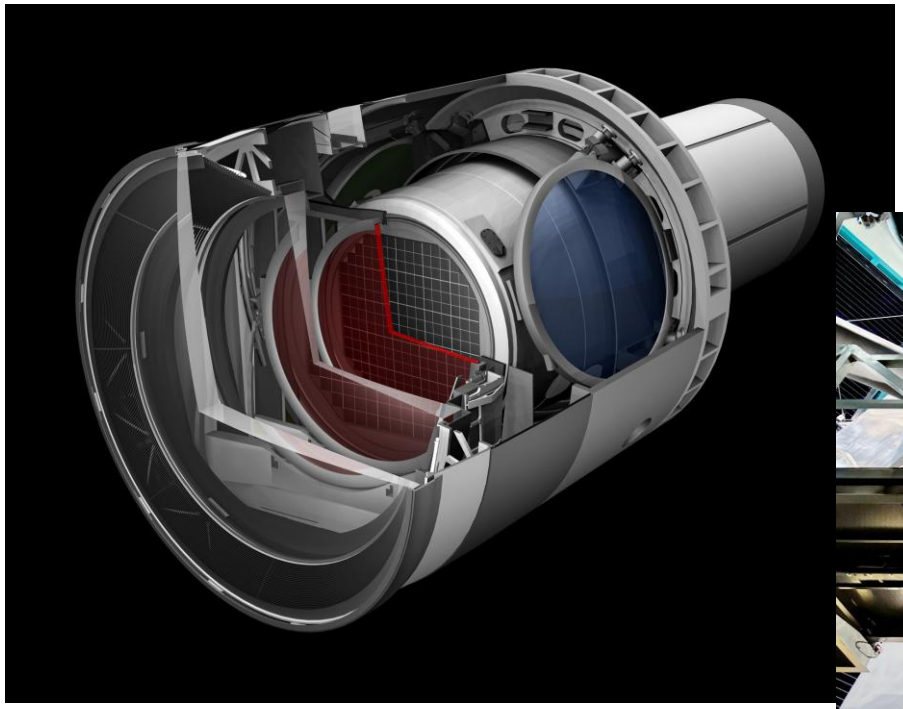




M1 diameter :
8.4 m

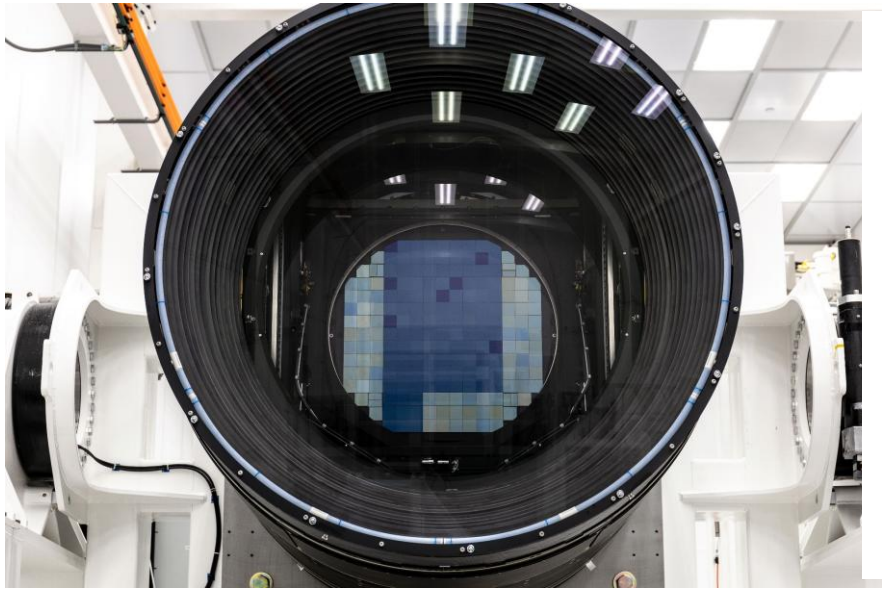
Silver

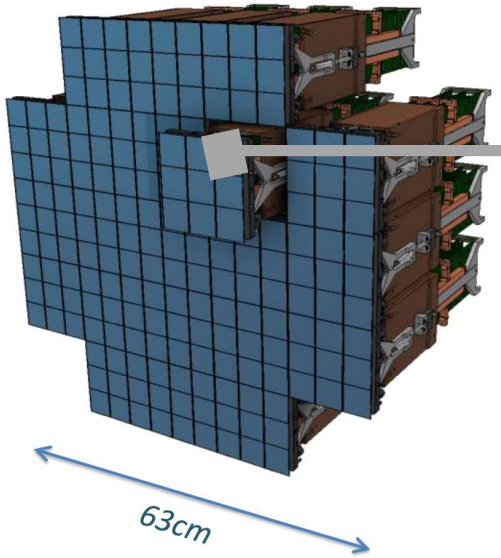
LSSTCam

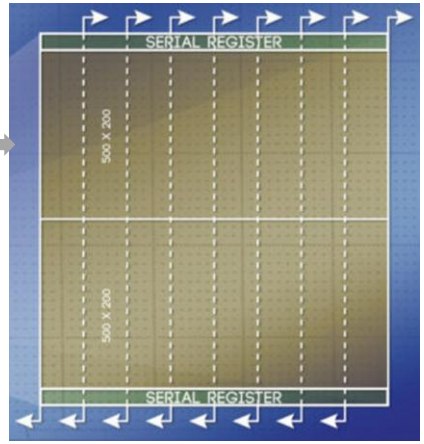


Diameter 1.6 m
Length 3.7 m
Weight 3 tons

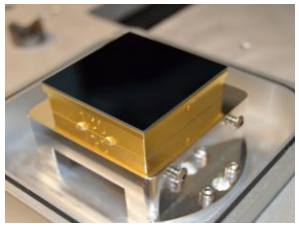
LSSTCam focal plane







CCD ITL



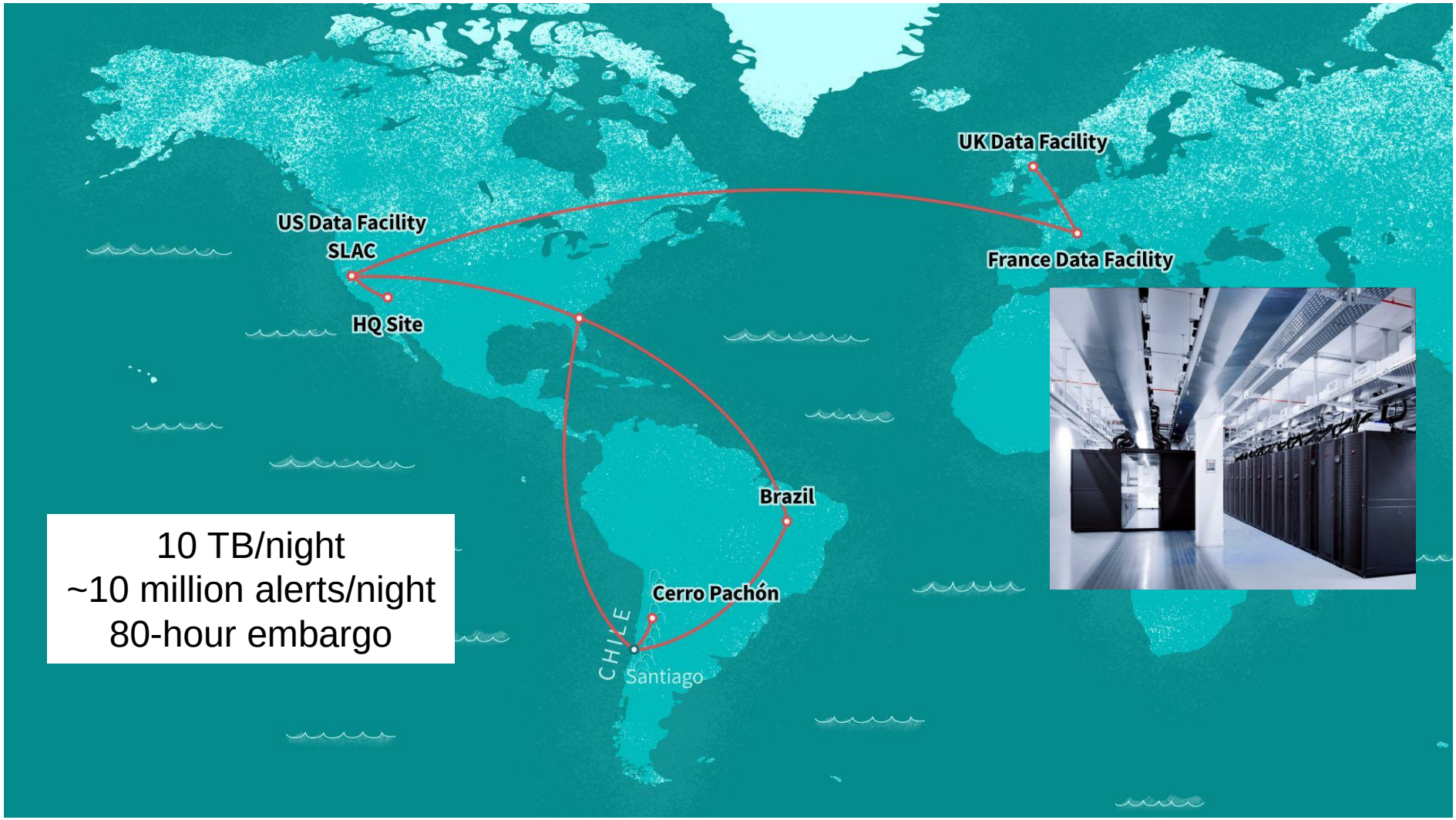
21 rafts / 1 raft = 9 CCDs / 1 CCD = 16 amp.
189 CCDs / 3024 channels
3.2 Gpixels to calibrate

Pixel : 10 μm
0.2 arcsec/pixel

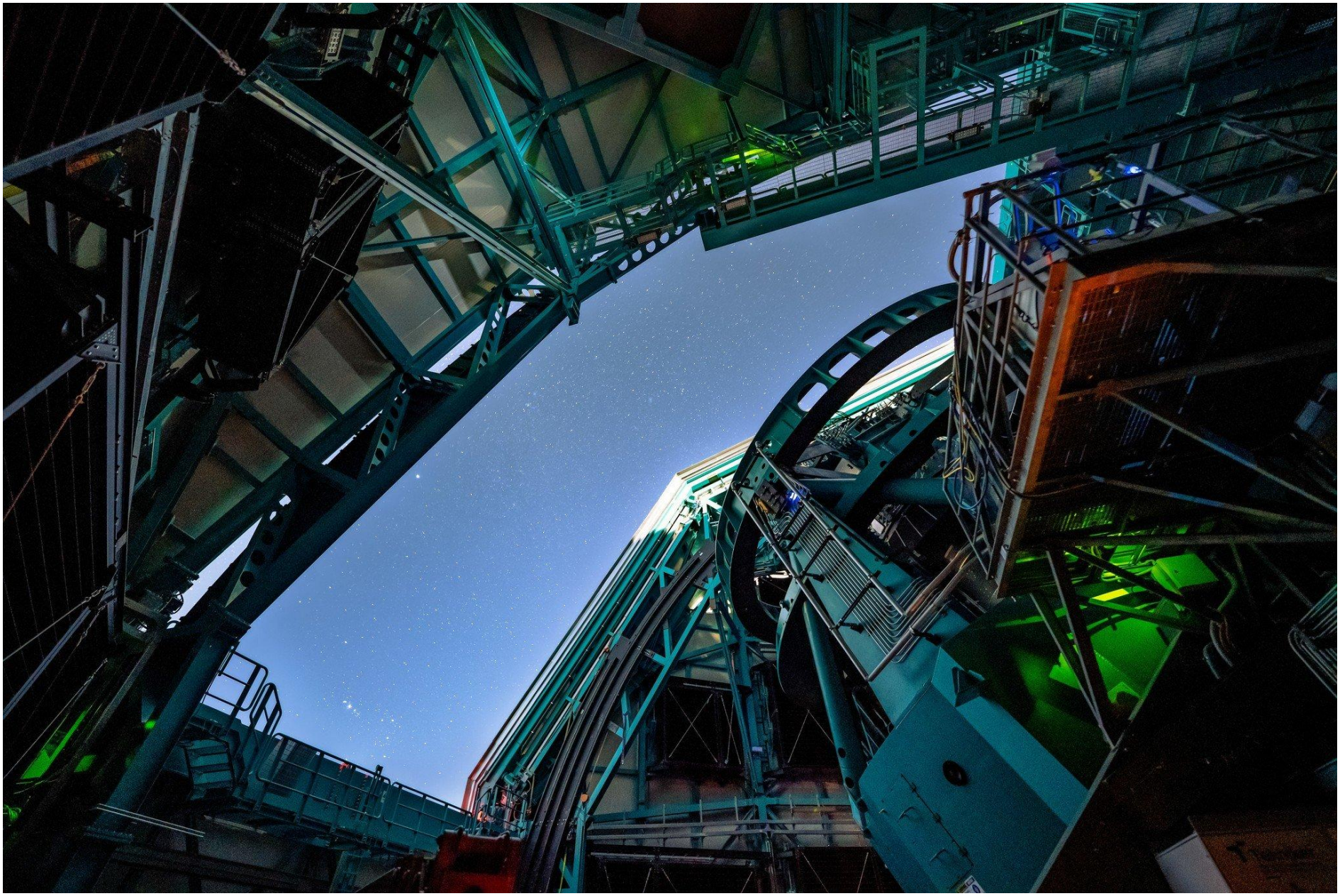
Readout time ~2-3 s

Very complex refrigeration system
Cold system : -40 °C for electronics
Cryostat : -100 °C for CCDs

Data transfer and processing



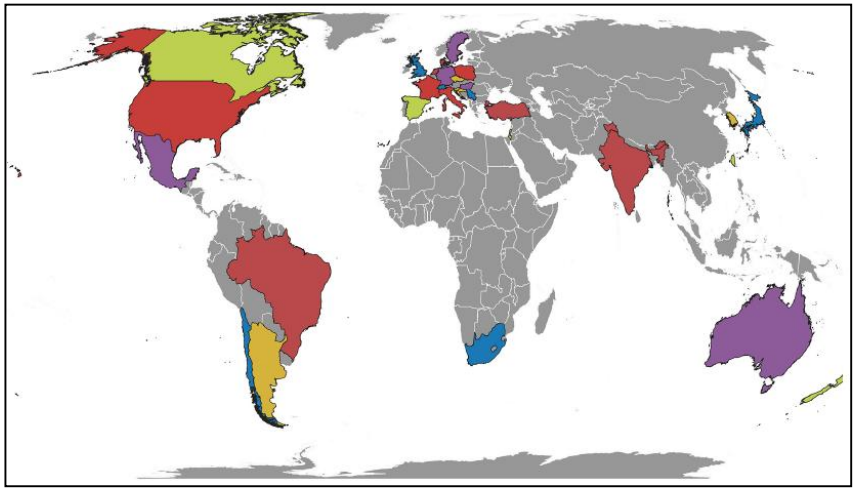
Telescope in operation since 1 year !



Overall organization

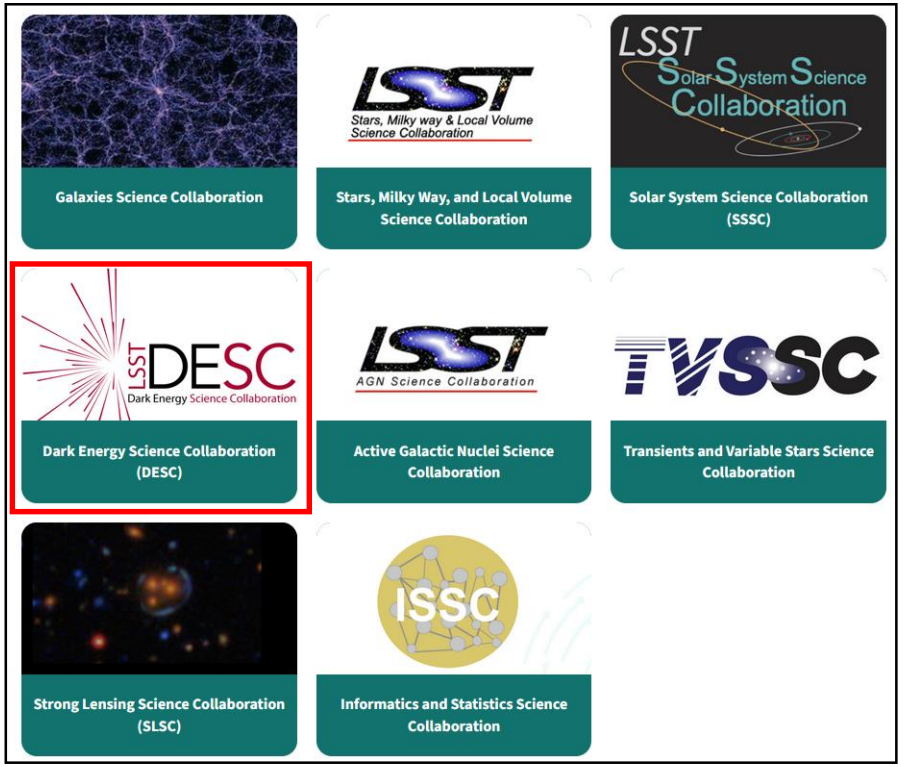
Rubin project

US + Chile (host)
+ France
➔ Special case : only non-US major contributor to the construction (camera)
➔ Major role in operations : camera and computing (40% of the Data Release Processing)
+ In-kind contributions (to get Rubin data rights)



From 10.5281/zenodo.10393317

Science collaborations

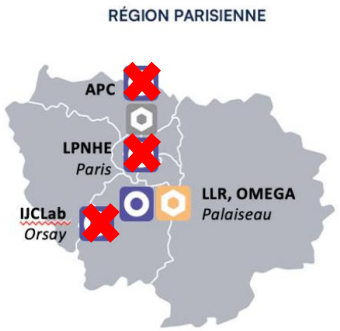


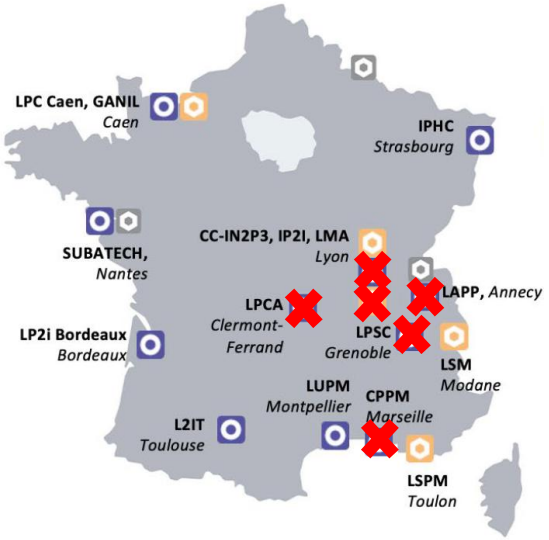
DESC : ~1450 members

LSST-France

~80 researchers at CNRS N&P
~40 IR/IE/T at CNRS N&P

+ now ~20 researchers
at CNRS T&U



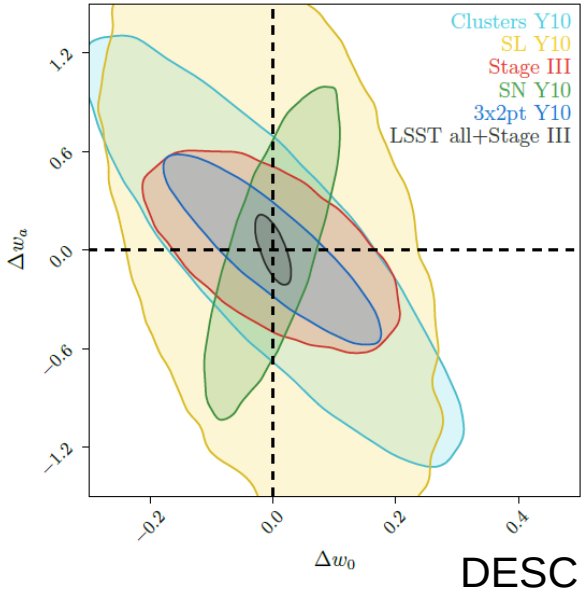


CAMERA | COMMISIONING PHOTOMETRY | COMPUTING | FINK | SCIENCE

Preparing stage-IV cosmology

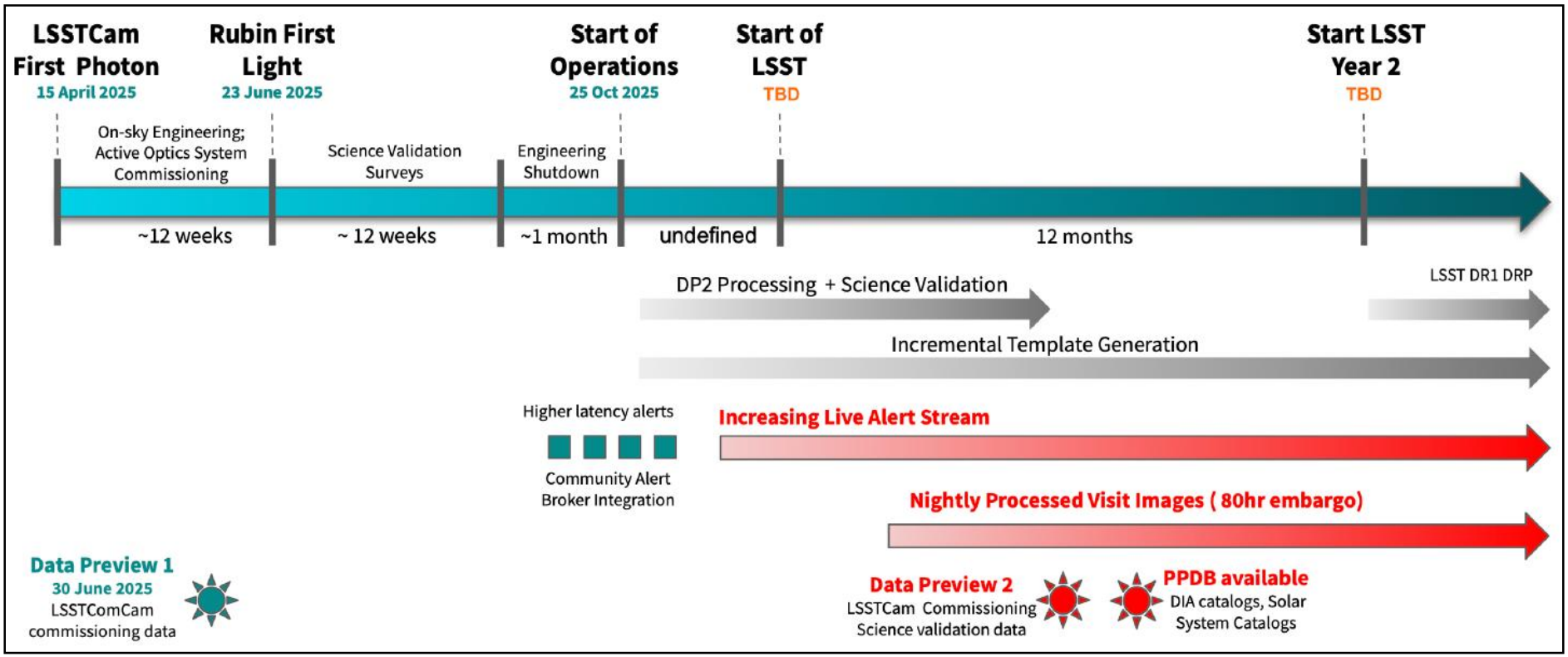
Dark energy probes

- ❑ Supernovae
- ❑ 3×2-pt
- ❑ Galaxy clusters



DESC SRD 2018

Overall planning

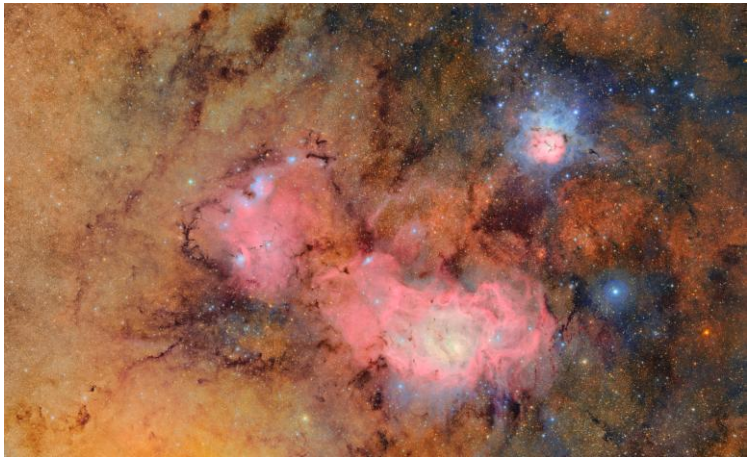


- 2024 : LSSTComCam short campaign
- 2025 : LSSTCam first photon
- 2026 : Start of LSST ?

Rubin First Look

Communiqué de presse national 23/06/2025

L'Observatoire Vera C. Rubin dévoile les premières images du ciel prises avec la plus grande caméra du monde

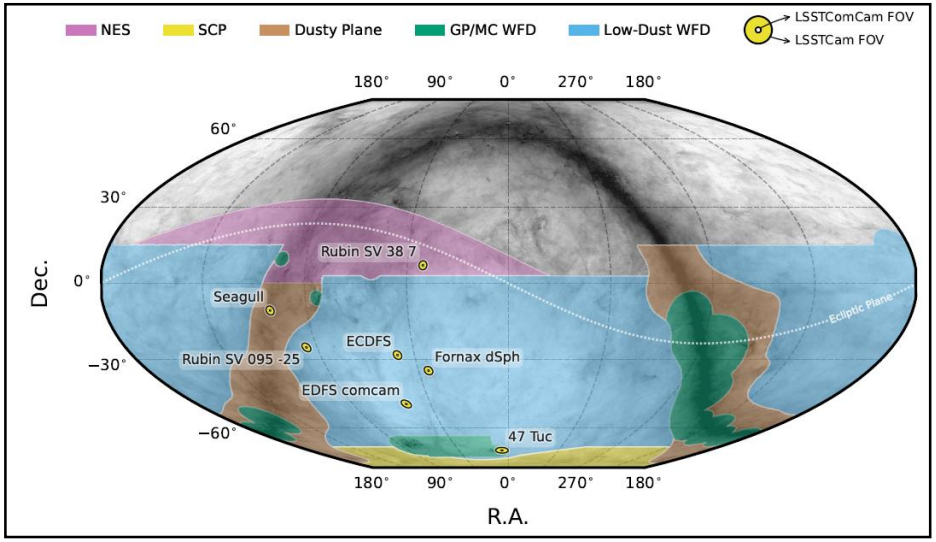


https://rubinobservatory.org/gallery/collections/first-look-gallery

An interlude : Data Preview 1

The Vera C. Rubin Observatory Data Preview 1
Paper just published https://arxiv.org/abs/2603.23786

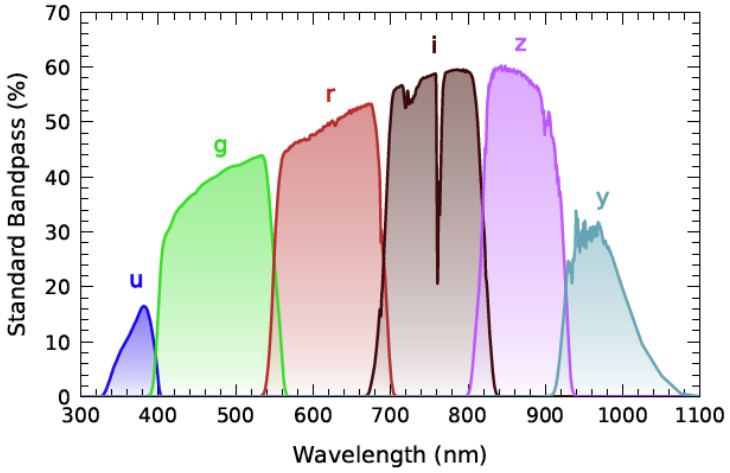
(369 authors)

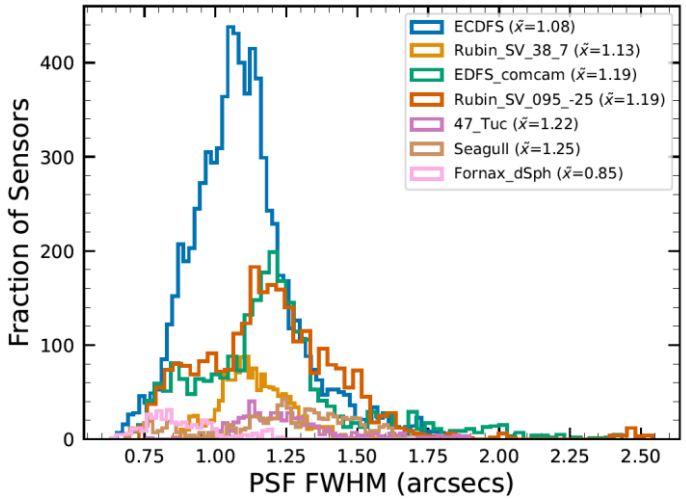


7 fields

47_Tuc	47 Tucanae Globular Cluster
ECDFS	Extended Chandra Deep Field South
EDFS_comcam	Rubin SV Euclid Deep Field South
Fornax_dSph	Fornax Dwarf Spheroidal Galaxy
Rubin_SV_095_-25	Rubin SV Low Galactic Latitude Field
Rubin_SV_38_7	Rubin SV Low Ecliptic Latitude Field
Seagull	Seagull Nebula

r-band mag depth in range 24.2-26.0





Small-field complete processing exercise

Science with Data Preview 1

Abell 360 for commissioning

Check photometry and photoz using red sequence galaxies

Use the cD/BCG to check sky background (over-)subtraction

Check for spurious/missing detections around bright stars

Check PSF modeling in the field

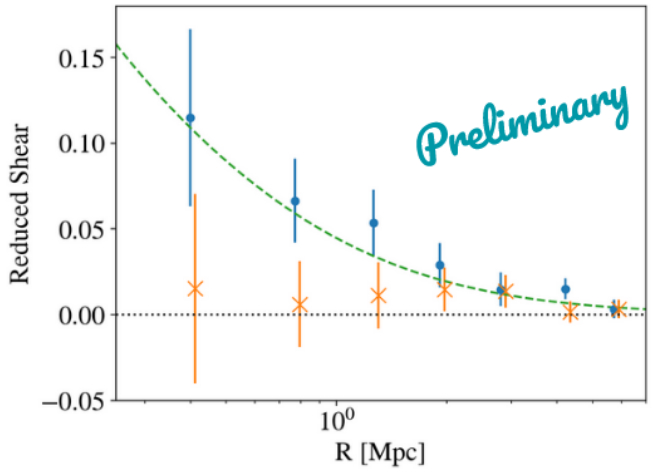
Check deblending

Measure tangential shear signal; check null cross shear signal

A360 shear profiles

Significant detection of tangential shear signal!

Cross-shear consistent with zero!

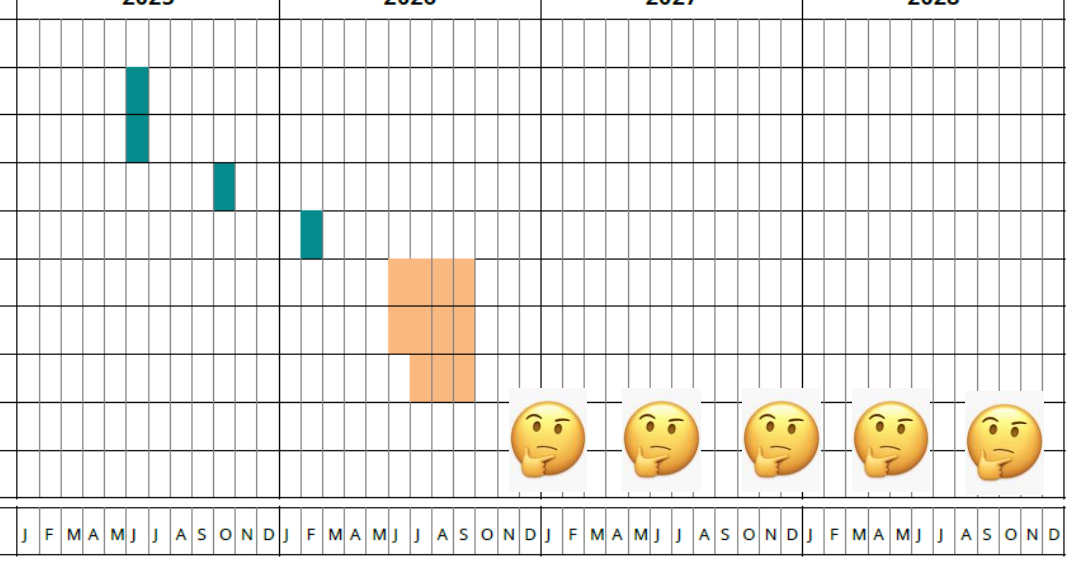


Slides from C. Combet's talk at LSST-Europe 2025
Paper in preparation

Data release schedule

Rubin Operations Survey and Data Release Timeline

Event	Date or Date Range
Data Preview 0.1/2/3 (DP0)	2023-06-30
Rubin First Light (RFL)	2025-06-23
Data Preview 1 (DP1)	2025-06-30
Start of Operations (OPS)	2025-10-25
Rubin First Alerts (RFA)	2026-02-24
PPDB Release (PPDB)	Jun – Sep 2026
Nightly PVIs & Direct-Image Catalogs (NPC)	Jun – Sep 2026
Data Preview 2 (DP2)	Jul – Sep 2026
Start of LSST (SVY)	TBD
Data Release 1 (DR1)	TBD



Until recently :

DR1 = LSST Y1 dataset ➔ Planned for **early 2028**

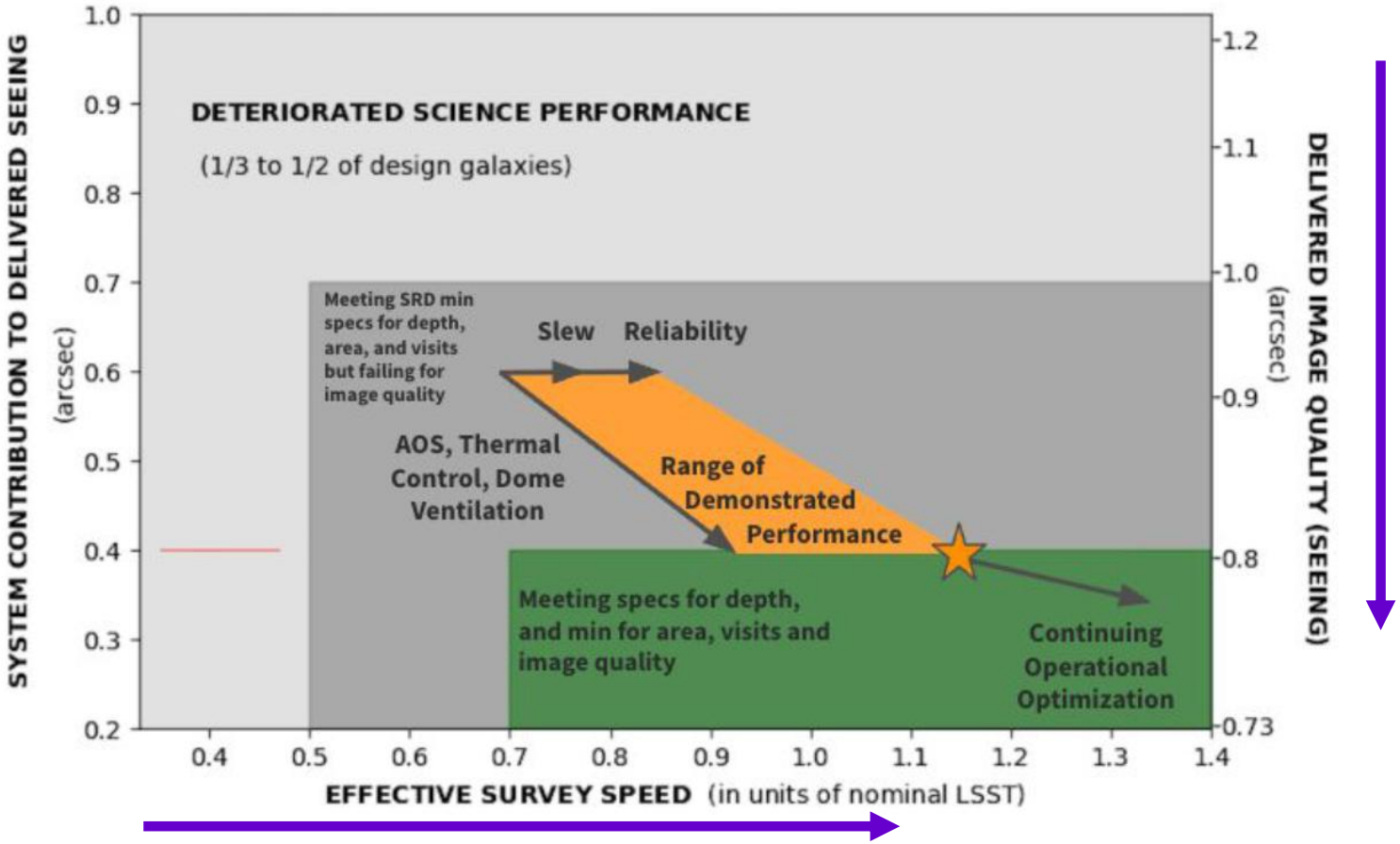
****Assuming a start of the survey at the end of 2025****

Why has the survey not started ?

Official statement (early May) :

“We expect to start the LSST in the next months.”

Schematic of the path towards science requirements



Huge work on efficiency, reliability and image quality

Ongoing work

Finalization of the dome construction

Installation of 12 louvers

From J. Neveu

Installation of light wind screens

From A. Alexov

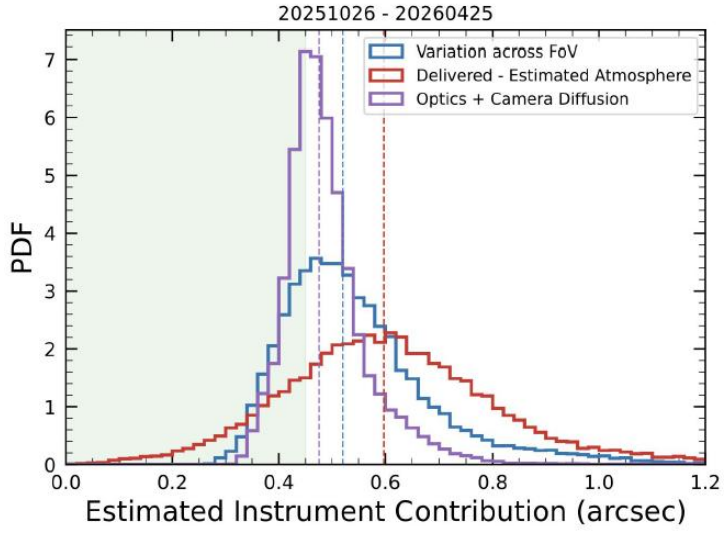
+ Work on M1M3 thermal control

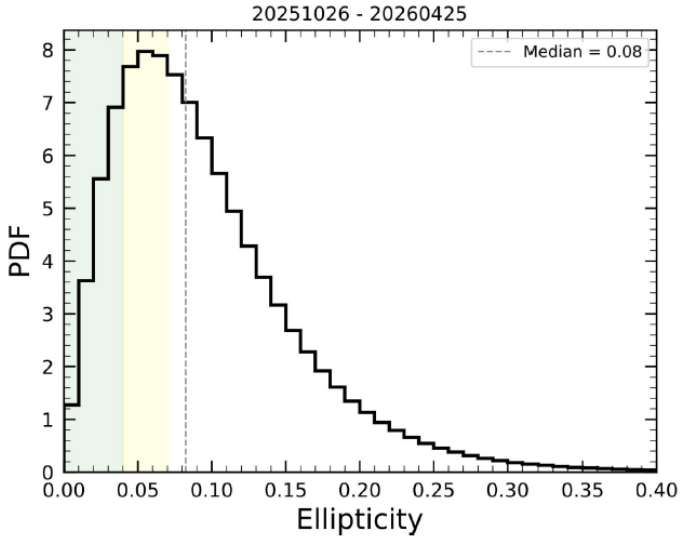
Goal : improve dome seeing

Ongoing work

From Rubin All Hands meeting, 14/05/26

Monitoring image quality metrics and PSF ellipticity





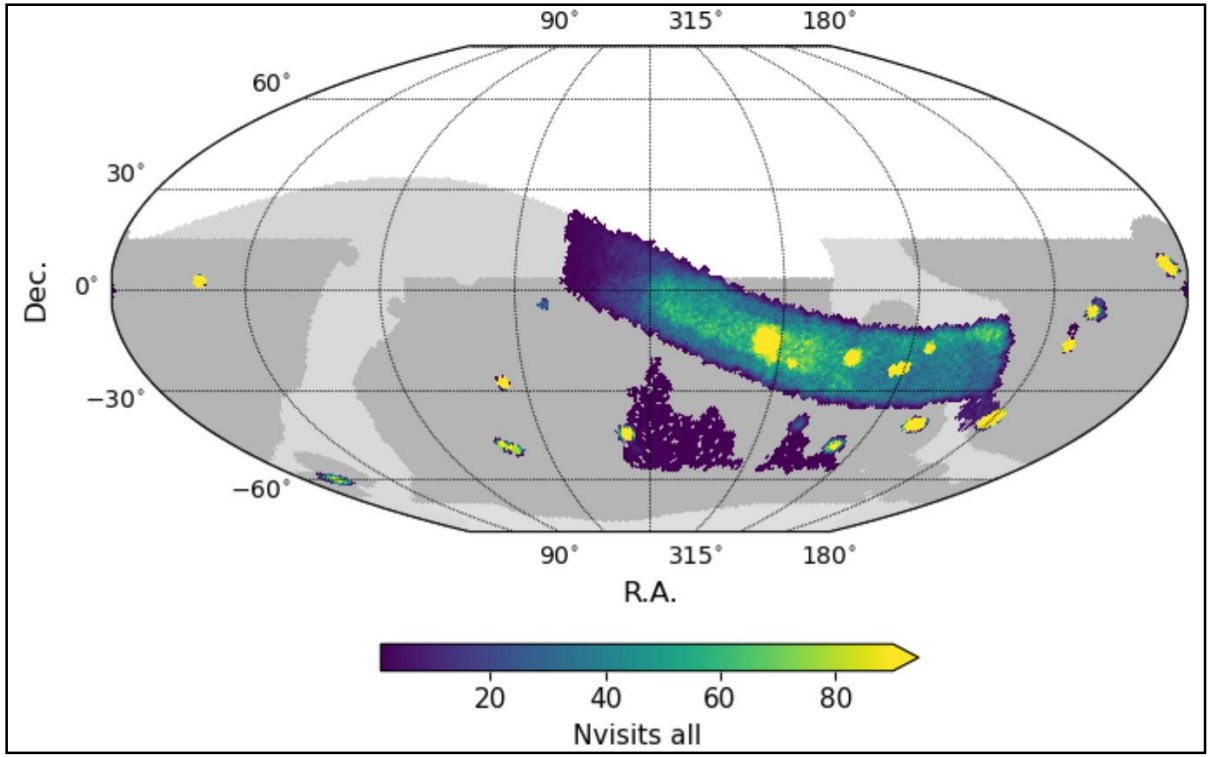
Continuous work :
active optics system, mirror bending modes, in-dome environment control, wavefront sensors, etc.

Image quality and PSF ellipticity are getting closer and closer to requirements

The good news : Data Preview 2 is coming !

Official statement : “Release planned in July-September”

21,647 science visits in 6 bands



Wide Survey ~750 deg^2
Pipelines, templates, science validation

Deep Survey
Coadds at ~LSST 10-year depth

More details : https://rtn-011.lsst.io/

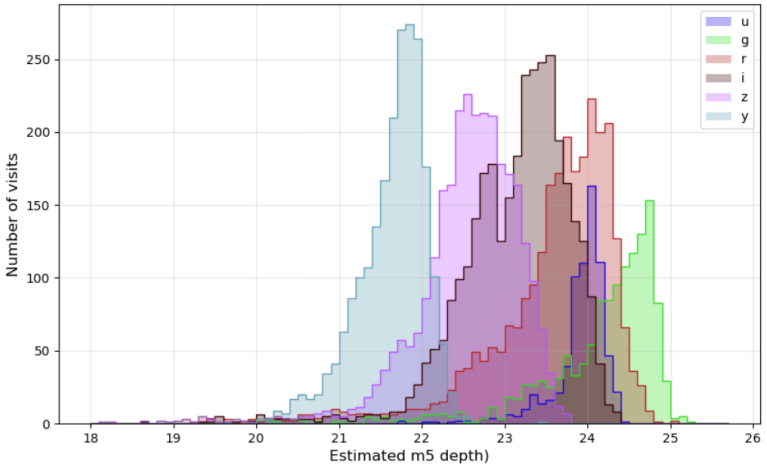
The good news : Data Preview 2 is coming !

DP2 processing ~3 months

Reminder : DP2 release = release to LSST data right holders (proprietary period of 2 years)

Data Product
Raw Images
DRP Processed Visit Images and Source Catalogs
DRP Coadded Images and Object Catalogs
DRP Cell-based Coadded Images and ShearObject Catalog
DRP ForcedSource Catalogs
DRP Difference Images and DIA Catalogs
DRP SSP Catalogs

Photo-z catalog later



Wide Survey

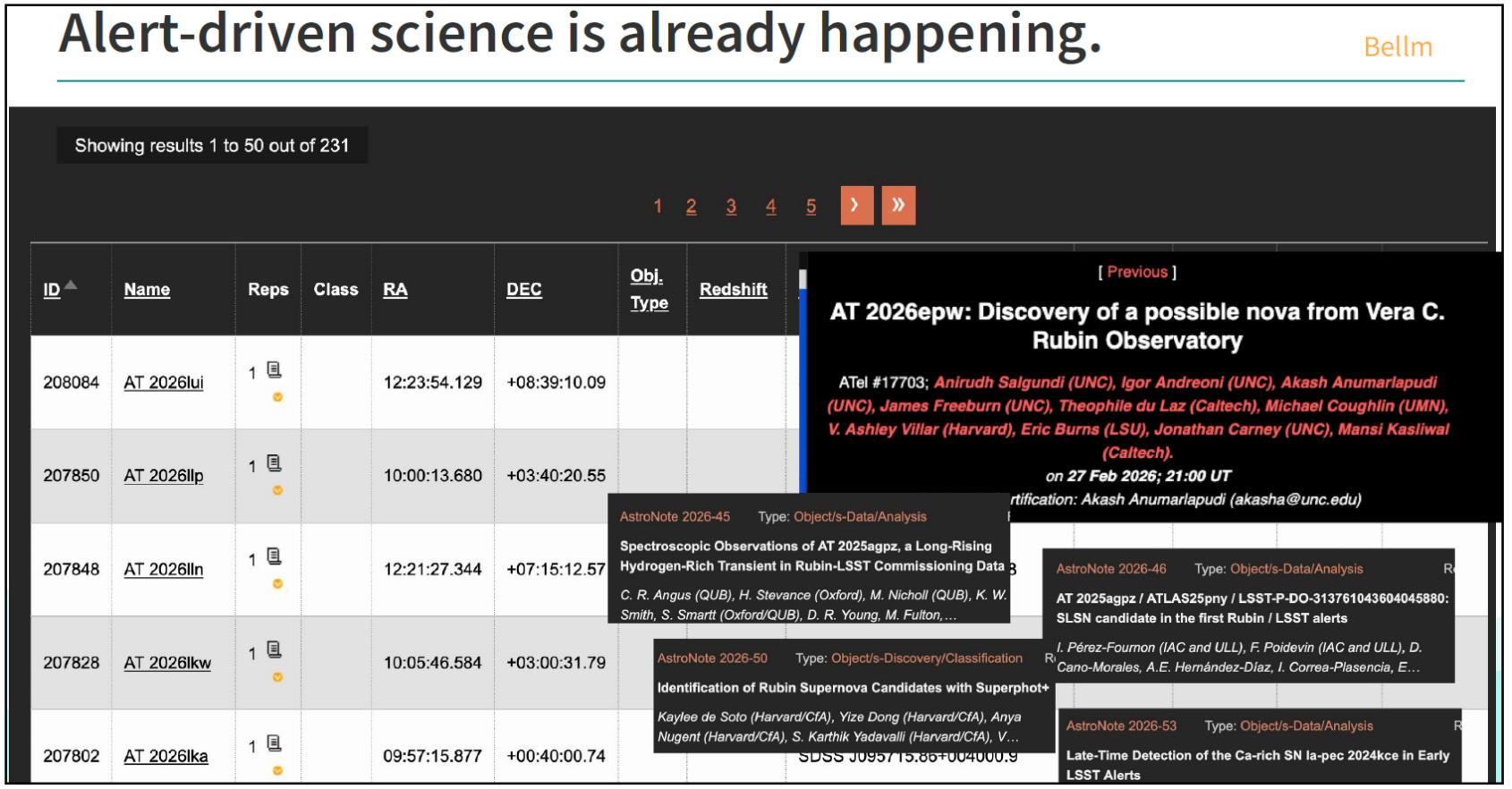
Field	Band						Total
	u	*g*	*r*	*i*	*z*	*y*	N visits
750 deg^2	2	4	12	16	11	9	56
	24.4	25.2	25.2	24.8	24.0	23.0	
Median FWHM (arcsec)	1.18	1.26	1.26	1.24	1.17	1.25	

What about alerts ?

NSF–DOE Vera C. Rubin Observatory Launches Real-Time Discovery Machine for Monitoring the Night Sky

800.000 science alerts the night of 24 February

DDFs first (templates)

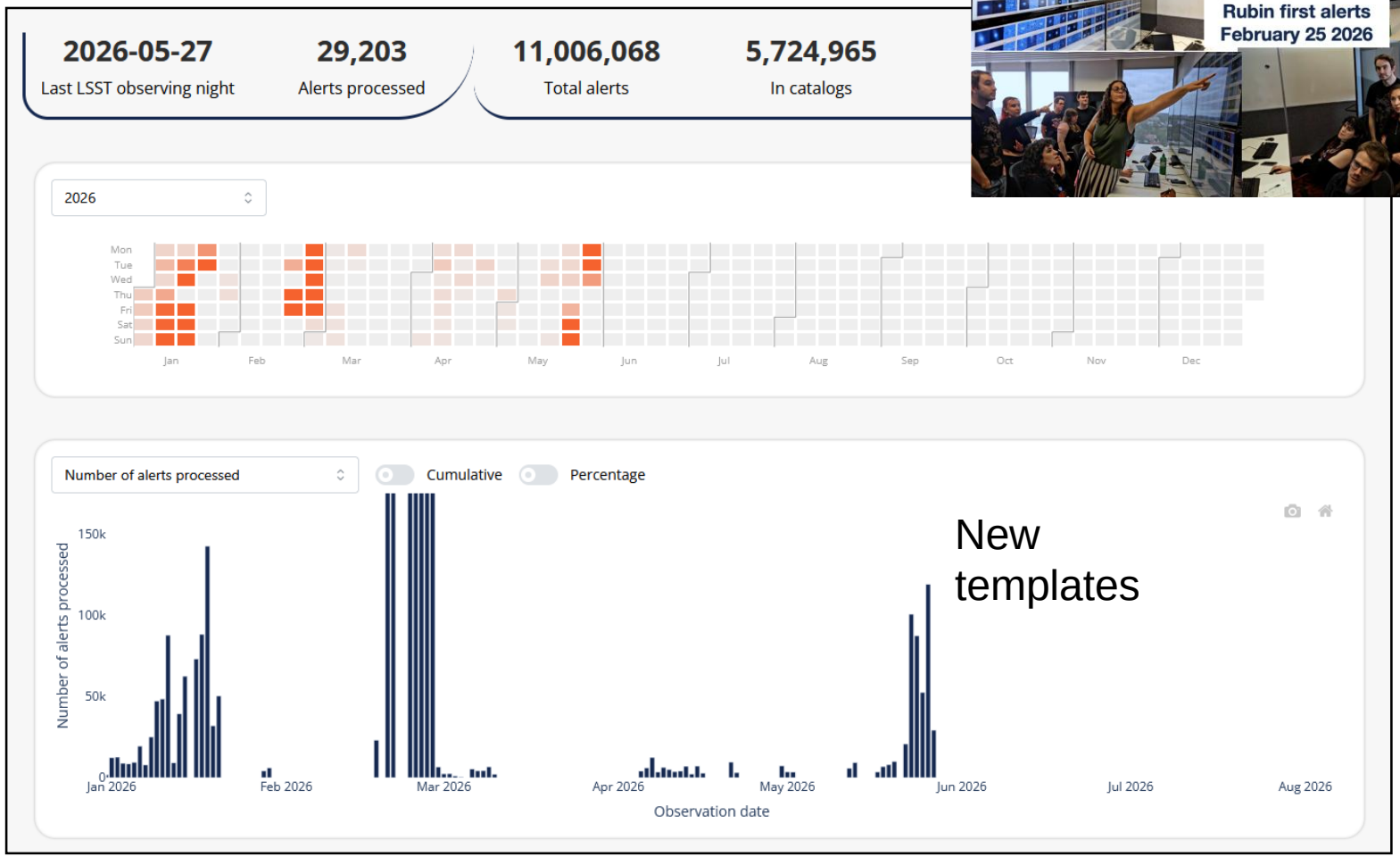


From Rubin All Hands meeting, 14/05/26

Alert broker : FINK

From J. Peloton

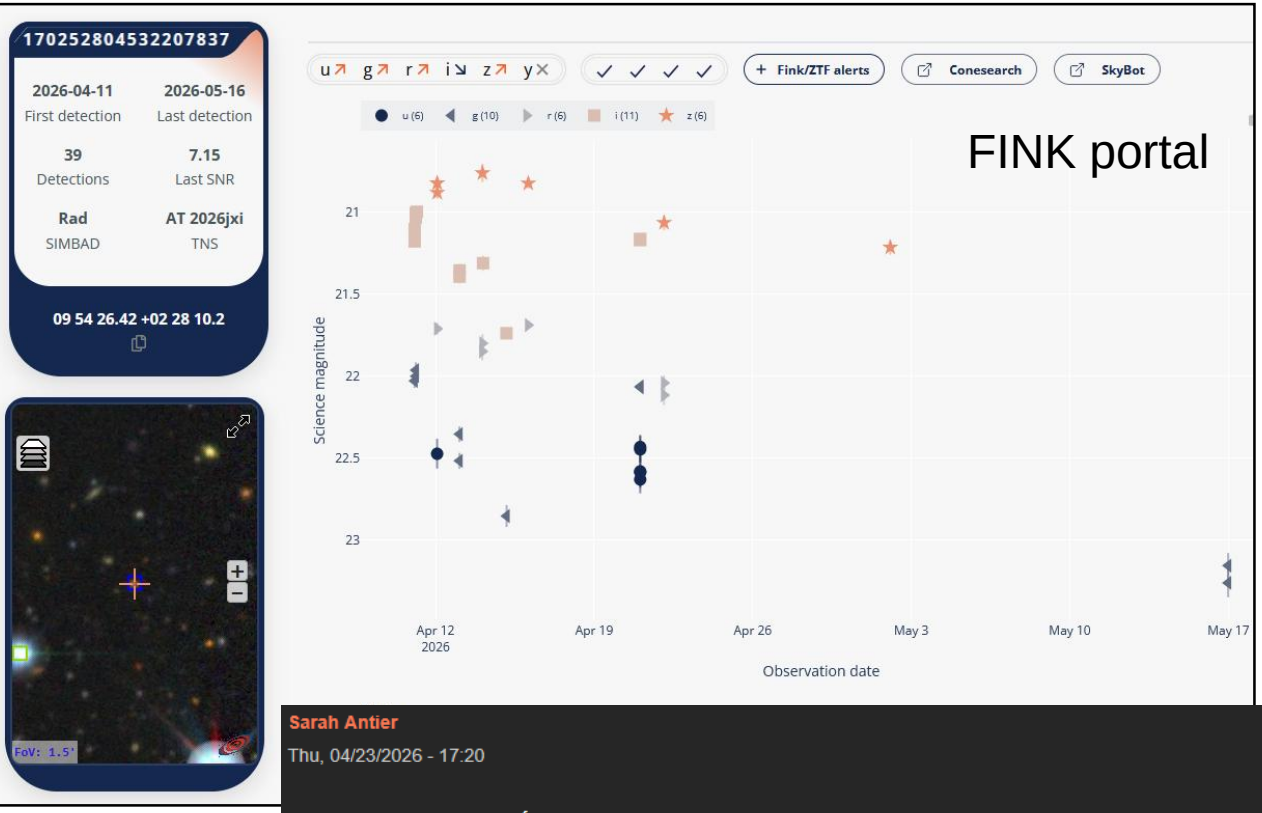
Fink science portal :
https://lsst.fink-portal.org/



Tests ★ → **Real alerts**

Alert follow-ups

Thanks to S. Antier for the information



COLIBRI telescope

Sarah Antier
Thu, 04/23/2026 - 17:20

AT 2026jxi: COLIBRÍ follow-up report

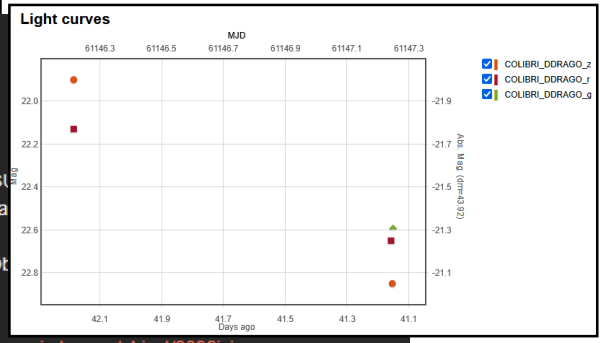
D. Akl (NYUAD), P. Hello (IJCLAB), A. Jacquesson (IJCLAB), R. Hanna (IJCLAB), N. Jasmin (Uliege), L. Chen (TSU
(IJCLAB), S. Antier (IJCLAB), M. Pillas (IAP), M. Coughlin (UMN), A. LeCalloch (UMN), T. DuLaz (Caltech) on beha

We observed the field of the 2026jxi event with the DDRAGO wide-field imager on the COLIBRÍ telescope at the Ob
de San Pedro Mártir, in two consecutives nights on 2026-04-16 and 2026-04-17 in g,r,z filters.

We detected the source with the following magnitudes after subtraction from the template flux reported in https://www.wis-tns.org/object/2026jxi

The data were coadded with analysed in STDWeb/STDPipe (Karpov 2025). Comparing our observations (and after performing image subtraction) against Legacy Survey DR10.

However, we observed a re-brightening in the g-band after 6 days post discovery compared to measurements taken by Vera Rubin Taken. This was re-confirmed by further LSST measurement 2 days after. Currently, taken into account the properties of the source in the template, and the light curve of the transient, we cannot determine the class of this transient : a type of AGN ? a type of supernova ?

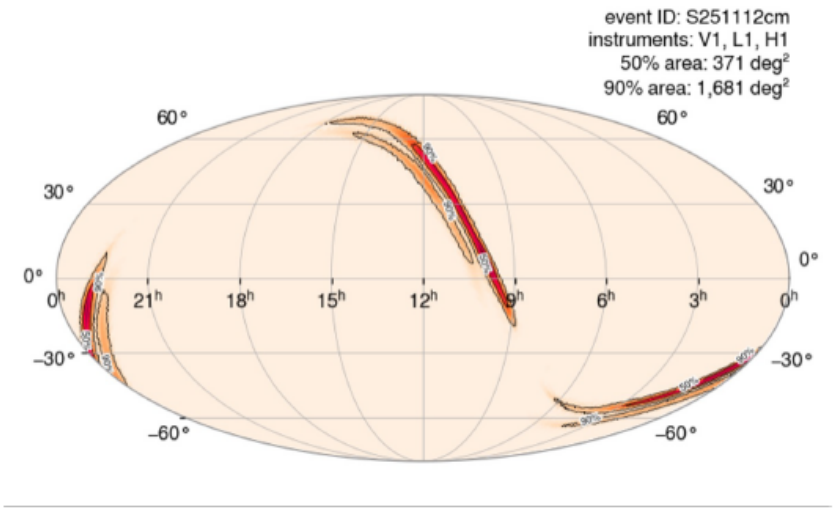


ToO : gravitational waves

Two LVK GW candidates selected for ToO :
1) S250725j (July 25 2025)
2) S251112cm (November 12 2025)

S251112cm discovery

- On 2025-11-12 LVK detected a sub-solar mass merger candidate, **S251112cm**
- **HasSSM > 99%** and **Mchirp** between **[0.1, 0.87] Msun**
- False Alarm Rate: 1 per 4 yrs
- Localized to **1681 sq. deg** at a distance of **93 +/- 27 Mpc**
- Many teams followed up the event, including GO-TO, BlackGEM, ZTF (GCN 42677; SA+2025) and DECam

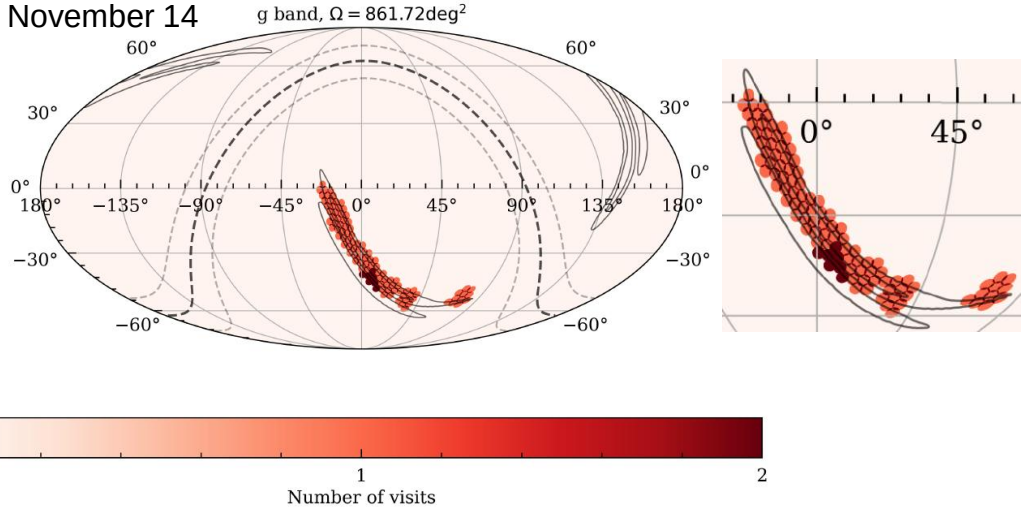


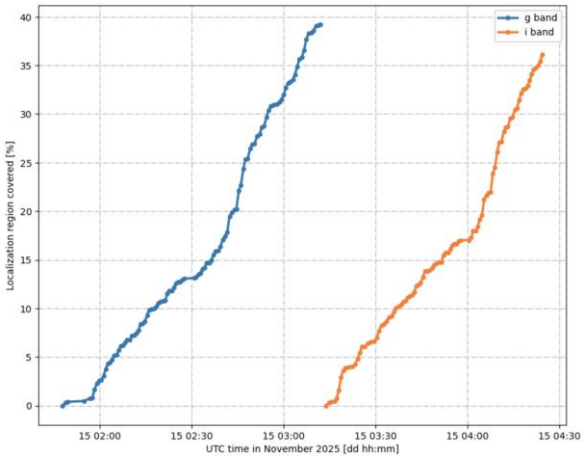
Slide from S. Anand's talk at RAPID 2026

ToO : gravitational waves

Thanks to S. MacBride and the Rubin ToO team

November 14

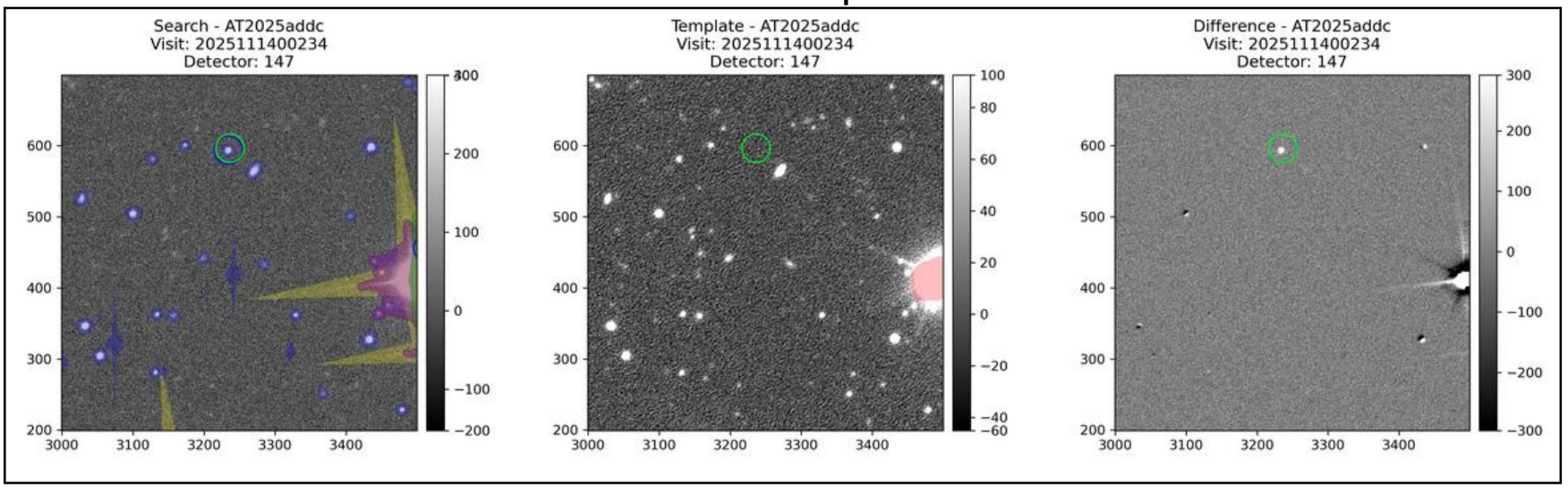




~850 deg² in 2 bands in 3 hours
Depths : g 24.5 and i 23.5

Wide Fast Deep in action !

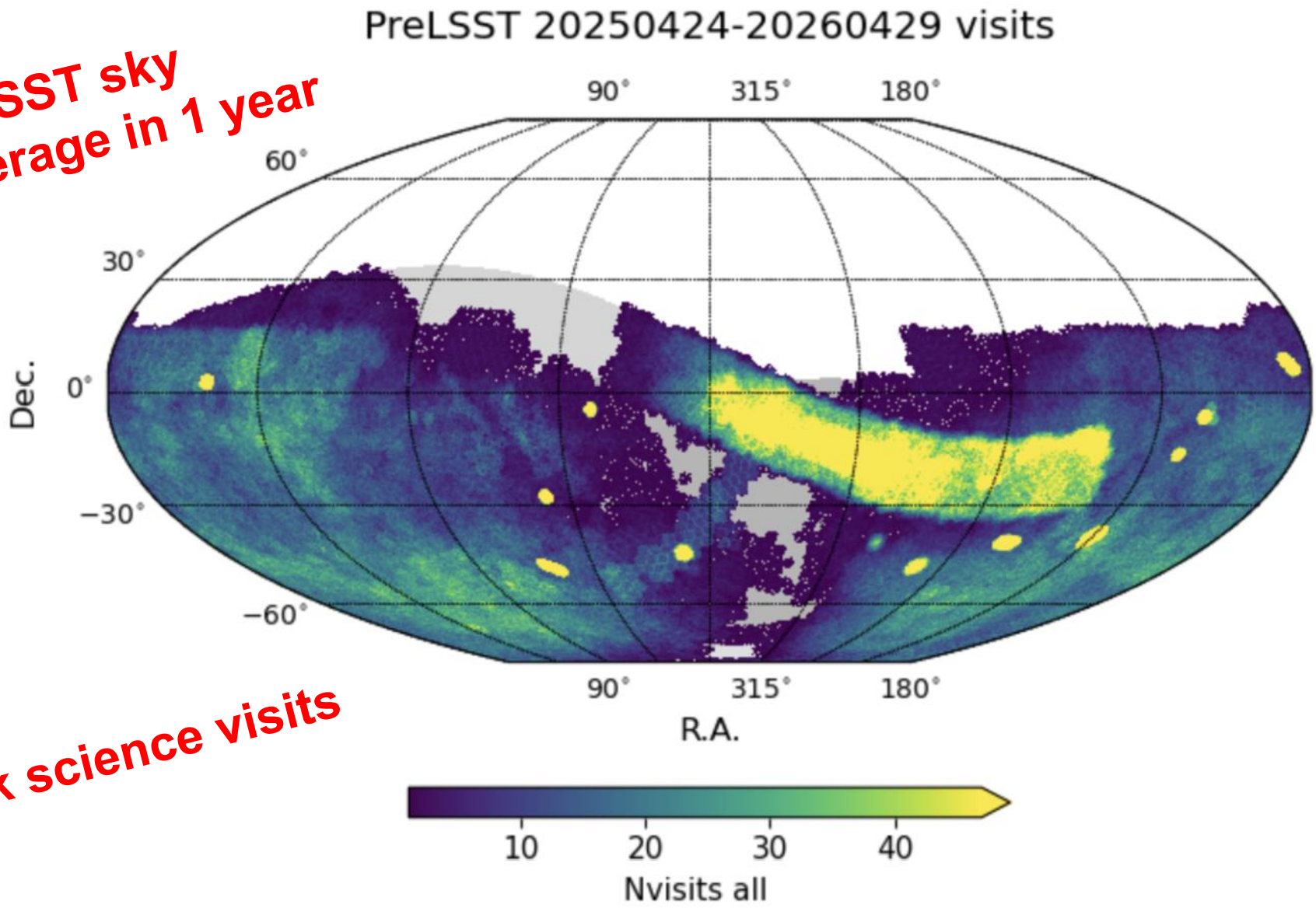
Search for EM counterpart candidates



Conclusion

From Rubin All Hands meeting, 14/05/26

PreLSST sky coverage in 1 year



>50k science visits

The end