



SAC Meeting Discussion

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- Plans for early science
- Science verification activities
- The distinction/relation between the end of Construction and the start of the **10-year survey**













Early Science is defined as any science enabled by Rubin for its community through and including the first data release, Data Release 1 (DR1)



<u>RTN-011: Plans for Early Science</u> (V4.0) is the guiding document

- Plans for the Rubin Early Science Program;
- Early science data products & data access environment;
- Timeline for implementation;
- Science considerations and relationship with SCOC;
- Can and should be cited in research proposals,
- Regularly updated to provide the most up to date information in support research proposal
- Discussion on the <u>Rubin Community Forum</u>
- Short URL: <u>ls.st/esp</u>



Cite RTN-011 as follows:

Leanne P. Guy, Keith Bechtol, Eric Bellm, Bob Blum, Melissa L. Graham, Željko Ivezić, Robert Lupton, Phil Marshall, Colin T. Slater, & Michael Strauss. (2023). Rubin Observatory Plans for an Early Science Program (4.0). Zenodo. <u>10.5281/zenodo.5683848</u>



Early Science Scenarios

Scenario A:

Rubin Observatory is ready to execute the 10-year LSST at the completion of the construction project.

Scenario B:

Prior to commencing the LSST, spend up to 2 months collecting more on-sky data to extend & complement commissioning datasets. This ensures full preparation to start the LSST, and provides an exquisite dataset prior to DR1.

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- Expect Operations phase begins in **mid 2025** (see R. Blum plenary).
- Start of Operations phase != Start of 10yr LSST
- LSST will begin sometime following the start of the Operations phase see Scenarios A/B on previous slide.
- In both scenarios it is assumed that the Rubin Construction project delivers an integrated system that can capture, transfer and process science-grade data at the time full/survey operations begins.
- Both scenarios will include alert generation of some type, with the major distinction being the relative availability of templates in time, sky position, and filter.
- As we approach full/survey operations and the commissioning program emerges and is executed, a single scenario will be adopted and executed.

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Early Science Timeline Overview



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- A series of three **Data Previews (DP), DP0, DP1 and DP2**, based on either simulated LSST-like data (DP0) or data taken during the Rubin Observatory commissioning period with the LSST Science Camera (LSSTCam) (DP1 & 2).
- A world-public stream of Alerts from transient, variable, and moving sources that will be scaled up continuously during commissioning and year 1+.
- **Template generation,** both prior to the start of regular survey operations using LSSTCam commissioning data, and incrementally during the first year of regular survey operations to maximize the number of templates available for Alert Production during year 1.
- LSST Data Release 1 (DR1), which will be based on the Data Release Processing (DRP) of the first six months of LSST data

+ Due to the need for Data-Release-derived templates, Alert Production cannot run at full scale nor full fidelity during commissioning and year one.

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Data Preview/Release Schedule & Contents

Rubin Early Data Release Scenario	Jun 2021	Jun 2022	Jun 2023 - Sep 2023	Dec 2024 - Apr 2025	Aug 2025 - Mar 2026	Feb 2026 - Nov 2026
	DP0.1	DP0.2	DP0.3	DP1	DP2	DR1
Data Product	DC2 Simulated Sky Survey	Reprocessed DC2 Survey	Solar System PPDB Simulation	First Light LSSTCam Data	LSSTCam Science Validation Data	LSST First 6 Months Data
Raw images					\checkmark	\checkmark
DRP Processed Visit Images and Visit Catalogs						\checkmark
DRP Coadded Images						\checkmark
DRP Object and ForcedSource Catalogs			C _			\checkmark
DRP Difference Images and DIASources		0				\checkmark
DRP ForcedSource Catalogs including DIA outputs						
PP Processed Visit Images						\checkmark
PP Difference Images						\checkmark
PP Catalogs (DIASources, DIAObjects, DIAForcedSources)						
PP SSP Catalogs						\checkmark
DRP SSP Catalogs						\checkmark

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- Precursor Alerts based on DP02 reprocessed data products. Targeting Q3/Q4 CY 2023. *Dates still flexible while we get prompt processing stood up at the USDF.*
- LSSTCam alerts will be scaled up during commissioning with the aim of beginning routine Alert Production as soon as is feasible following System First light.
- Once begun, Alert Production will then proceed continuously without interruption into and throughout the full LSST. *Alerts generated during commissioning may be produced with higher latency that planned during the full survey.*
- All alerts will be distributed to Brokers and will be world public. *We will never send* out any alerts to proprietary or embargoed data.
- Community Science Team will support the Community to work with early Alerts.



Data Access and Environment



The <u>Rubin Science Platform</u> (<u>LSE-319</u>) enables peta-scale analysis of LSST data by providing services for scientists to access, visualize, subset and perform next-to-the-data analysis of Rubin Data products. Deployed in the Google cloud the RSP provides 1TB storage and 2 cores per user.

Community Brokers

Community alert brokers provide the public interface to the LSST alert stream.









