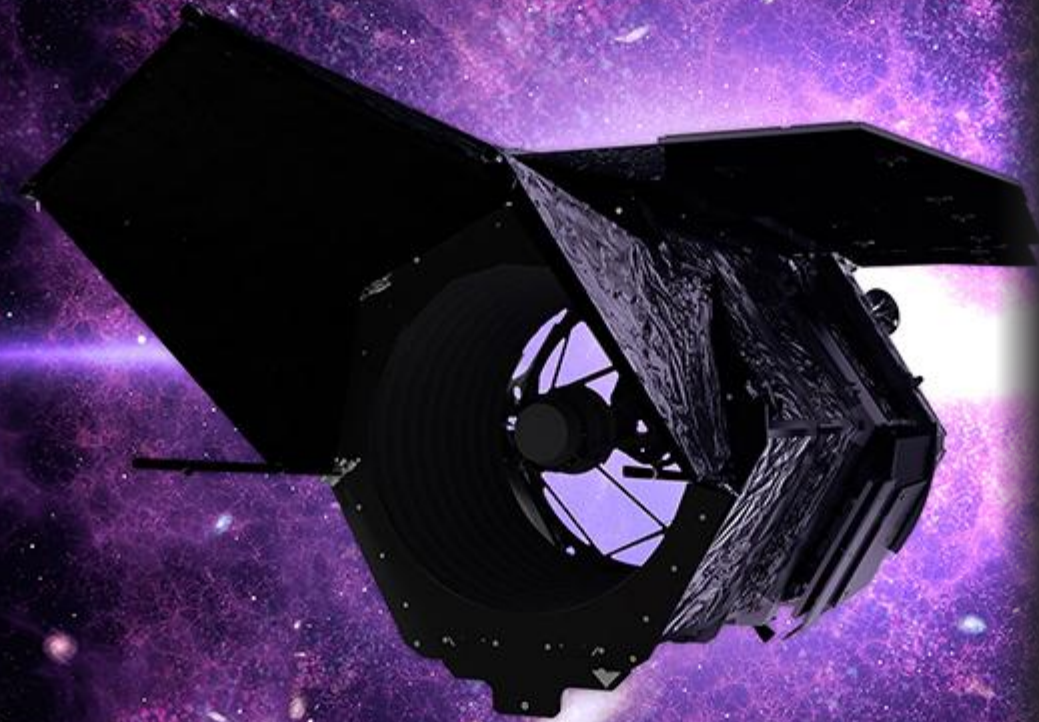


Roman & Rubin - Synergies for Exoplanet Science



R. Street 

Nancy Grace Roman Mission Overview

roman.gsfc.nasa.gov

L2 orbit

Aperture: 2.4m

Wavelengths: 480 - 2300nm

Instruments:

- Wide Field Imager (FoV: 0.281 sq.deg)
(inc prism, grism)
- Coronagraph

Limiting magnitude: ~24mag

Launch: ~ mid-2026

Lifetime: 5yr mission

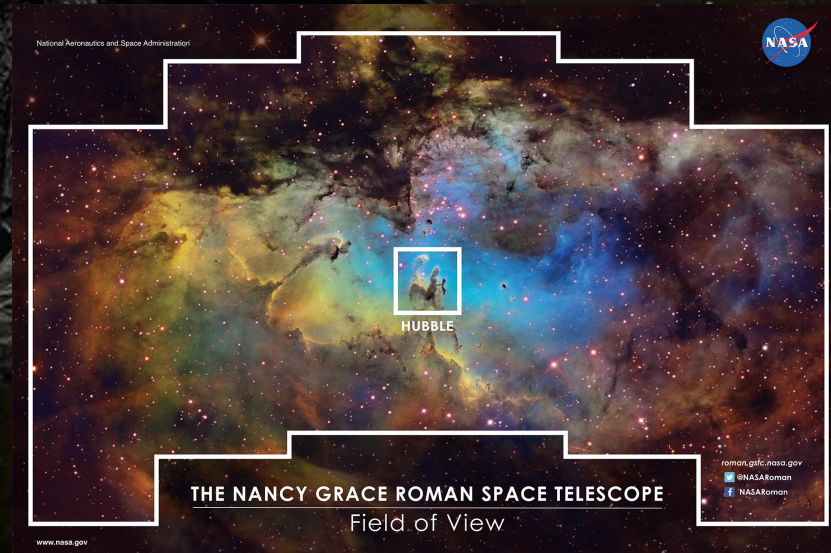
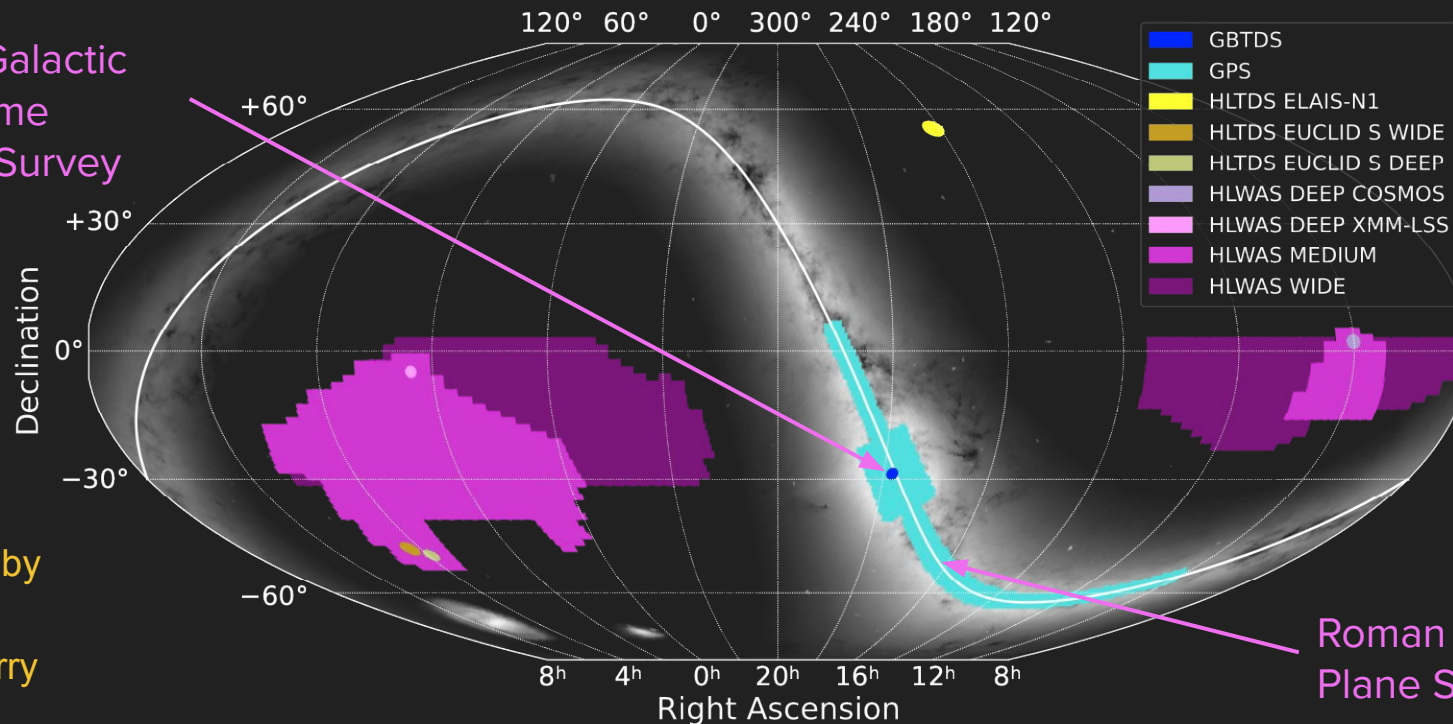


Image: NASA Goddard

Nancy Grace Roman Mission Overview

~75% of time dedicated to community-defined Core Community Surveys

Roman Galactic
Bulge Time
Domain Survey



See talks by
R. Wilson
and S. Terry

Roman Galactic
Plane Survey

Vera C. Rubin Observatory Overview

Cerro Páchon, Chile

Aperture: 8.4m (eff. 6.4m)

Field of view: 9.6 sq.deg.

Pixel scale: 0.2"/pixel

Limiting magnitude: in 30s:

u: 23.9 g: 25.0

r: 24.7 i: 24.0

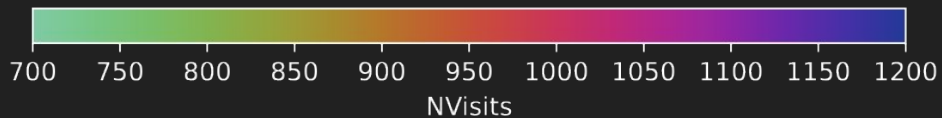
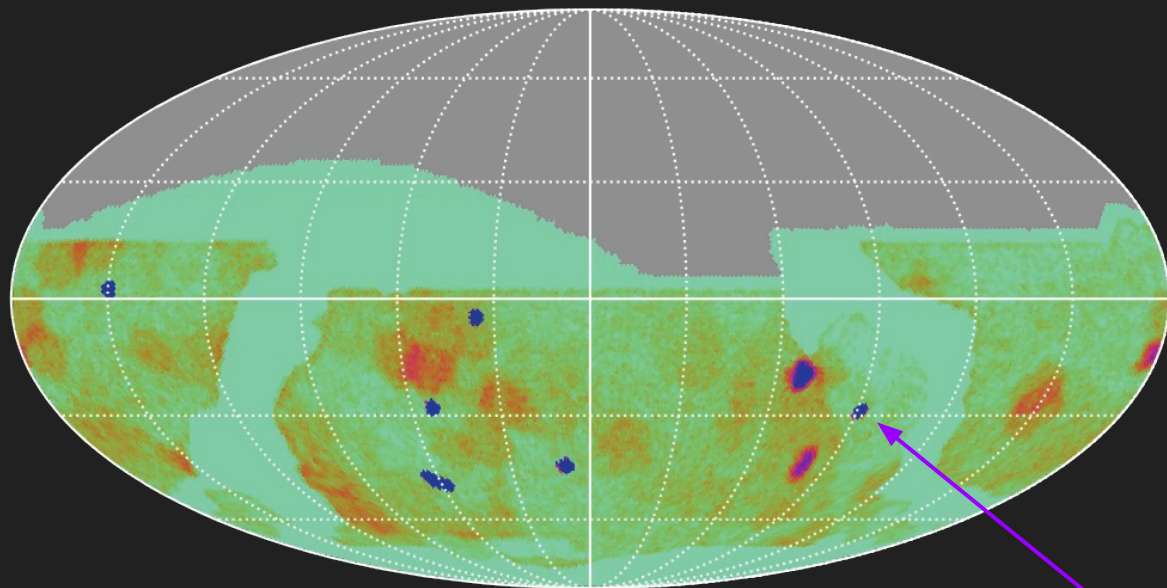
z: 23.3 y: 22.1

[Ivezić, Z et al. 2019, ApJ, 873, i.111]

- Science verification surveys Fall 2025
- Transitioned to operations
- LSST expected to begin January 2026

Rubin's Legacy Survey of Space and Time (LSST)

baseline_v5.1.0_10yrs All sky all bands: NVisits



10yr, 6-color, time-domain
survey of the Southern sky

Typical ~3day cadence

Deep Drilling Fields

Augmented cadence for
Roman Galactic Bulge field

Roman
Galactic Bulge
field

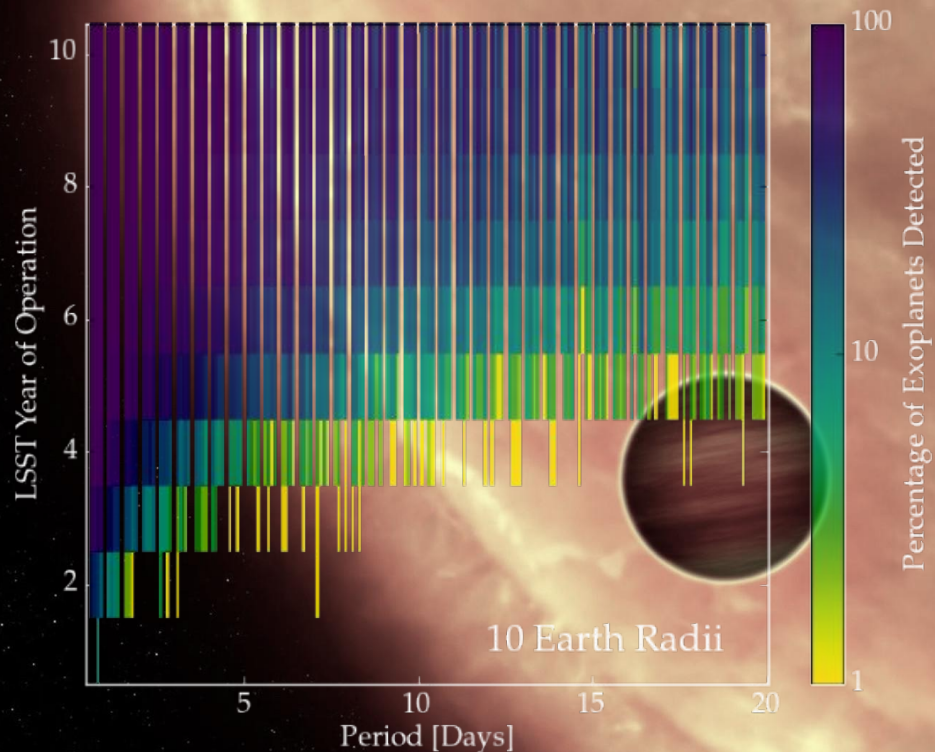
Synergies for Transiting Planets

RGBTDS will detect ~60,000-100,000 transiting planets

[Wilson+ 2023]

Rubin will provide:

- Medium cadence contemporaneous observations in 4 (+2) optical passbands
→ Constrain transit amplitudes
- Longer baseline observations
→ Constrain ephemerides, transit timings
→ Proper motions
- Deep Drilling Field data will provide additional transit discoveries [Jacklin et al. 2017]

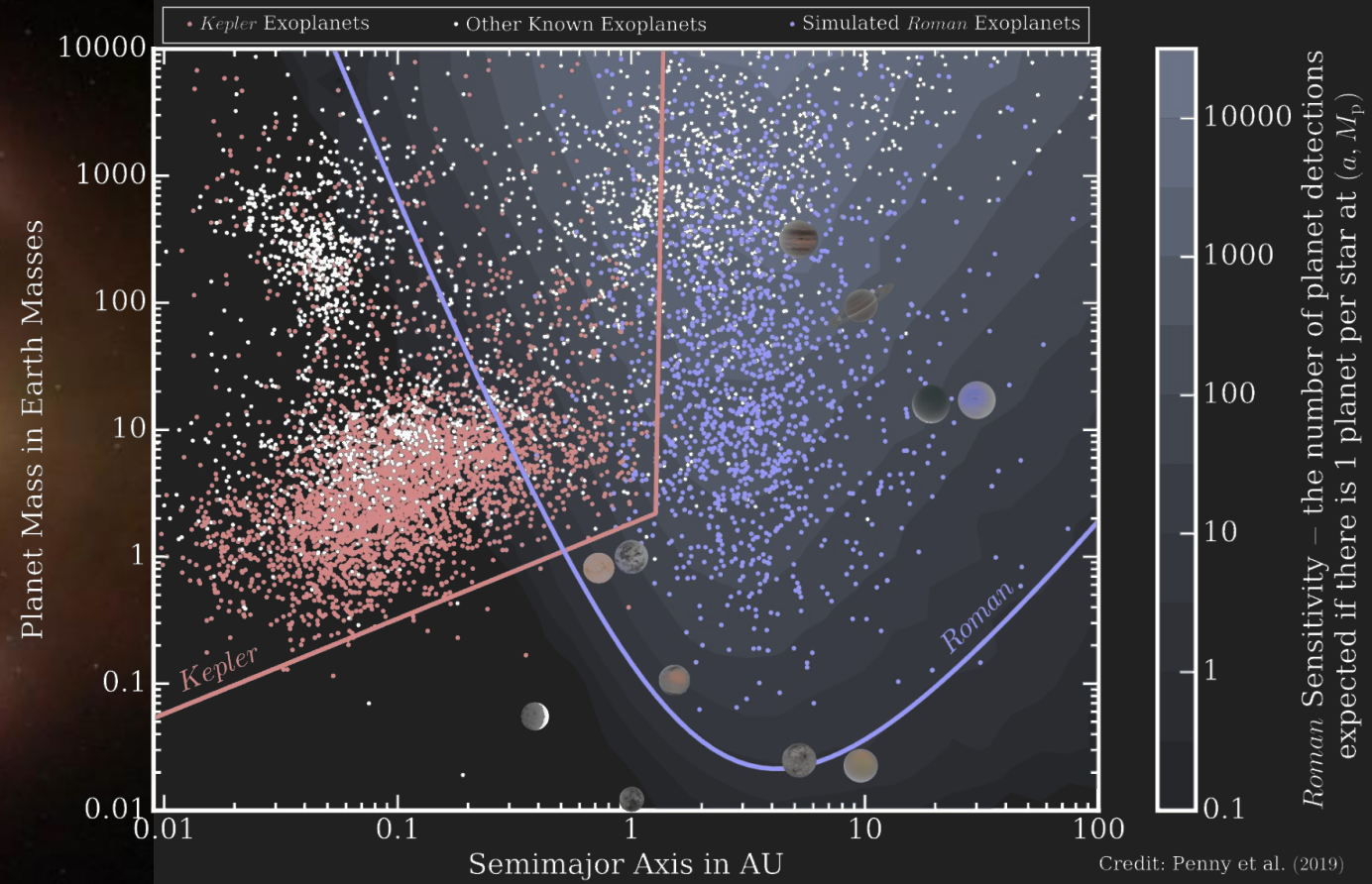


[Fig. 3 from Jacklin + 2017] Image: NASA, ESA, G. Bacon (STScI)

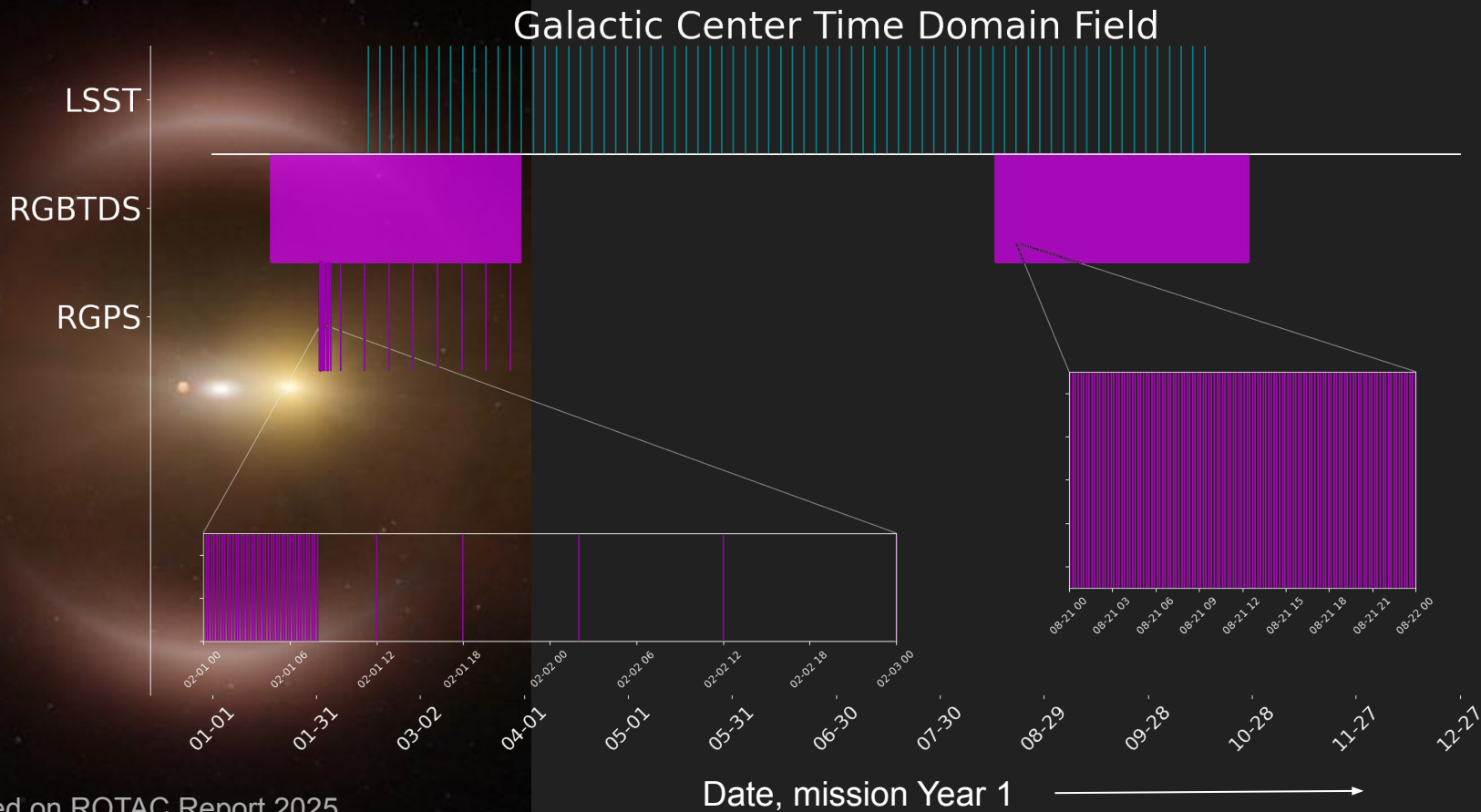
Synergies for Microlensing

~1400 bound planets with $M > 0.1 M_{\text{Earth}}$
[Penny+ 2019]

~250 free-floating planets
between 0.1-100 M_{Earth}
[Johnson+ 2020]



Roman GBTDS Observing Cadence

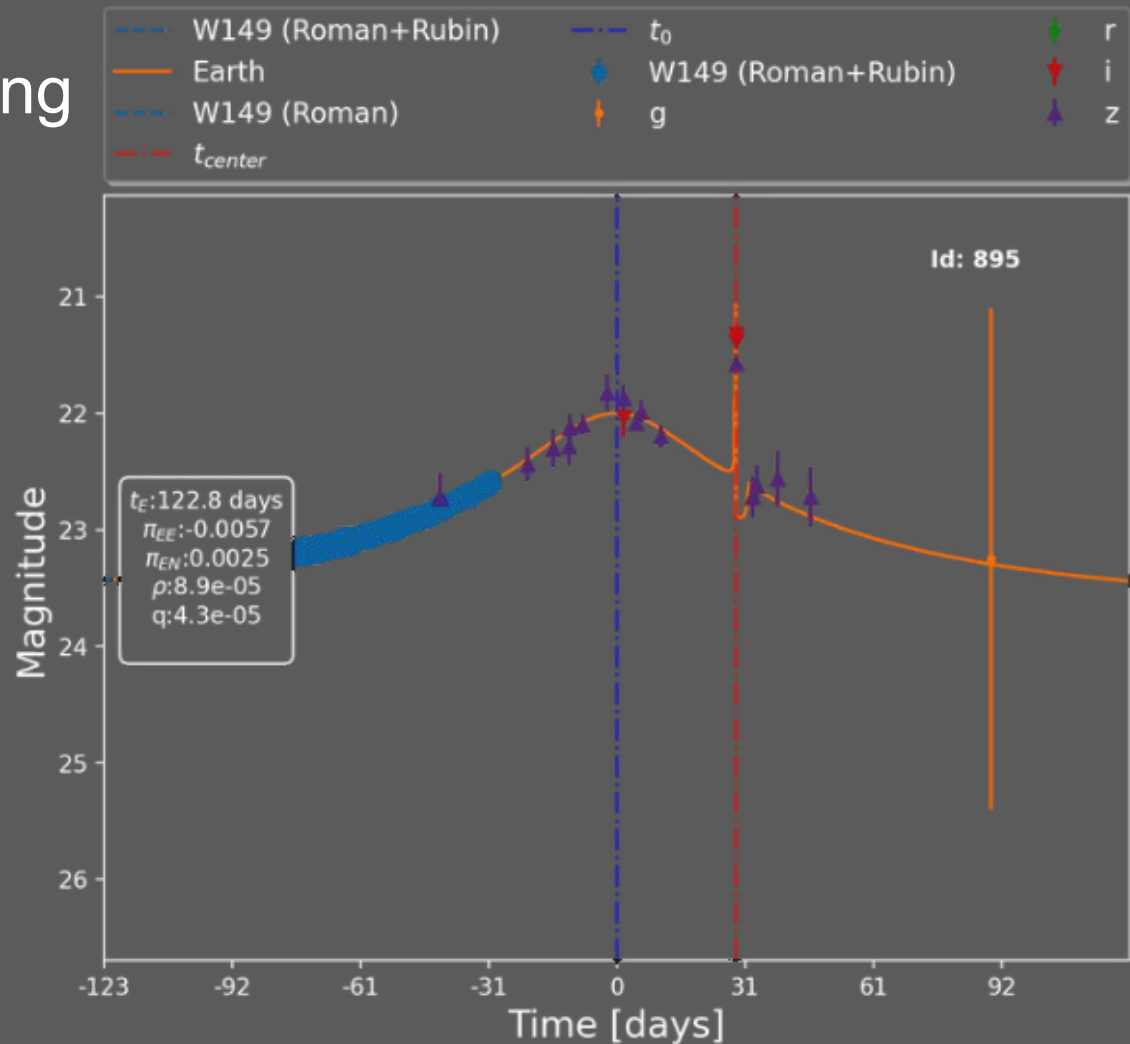


Based on ROTAC Report 2025

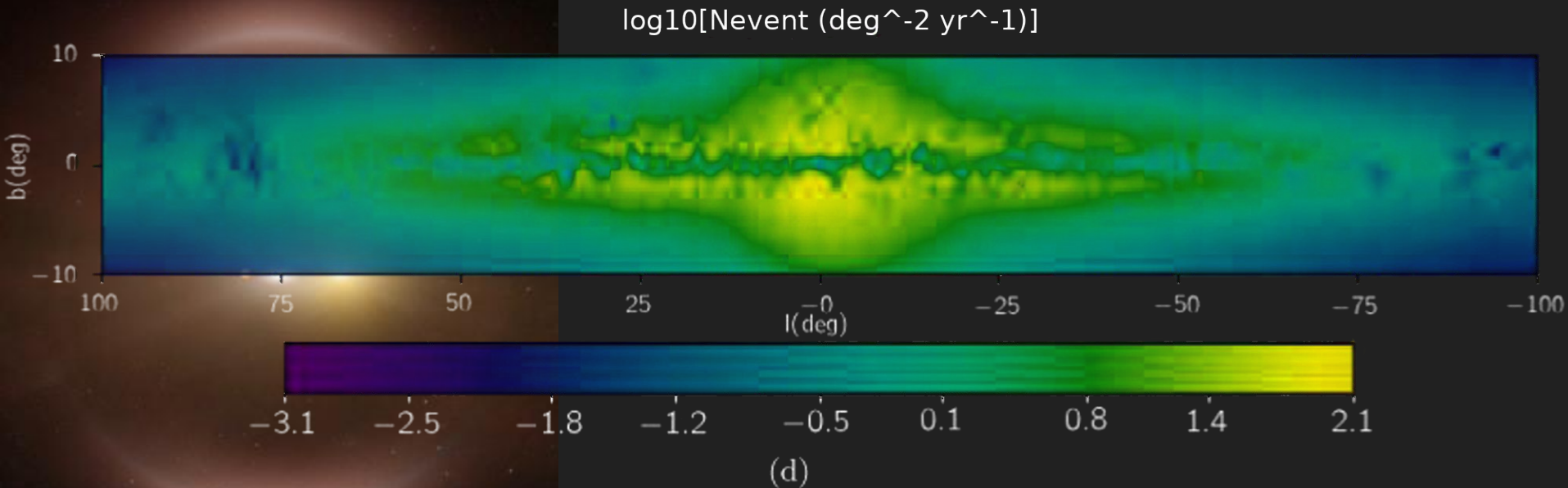
Synergies for Microlensing

Rubin's long baseline constrains lightcurve features during season gaps, improve measurement of parallax

[Simulation by A. Varela+]



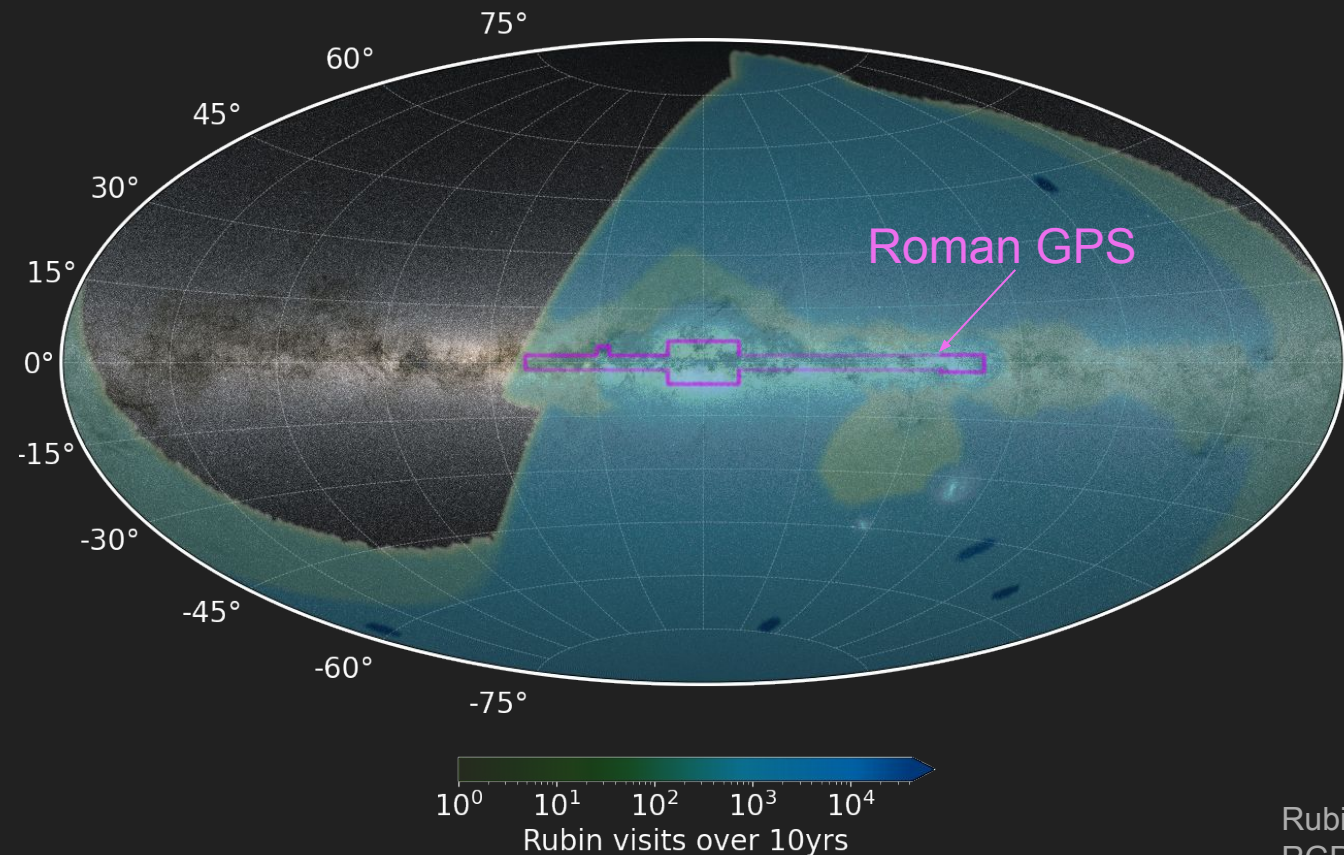
Rubin will detect thousands of events across the Galactic plane



Long baseline timeseries photometry in 4+2 SDSS passbands

[Sadajian & Poleski 2019]

Rubin and Roman Galactic Plane Surveys



Roman GPS

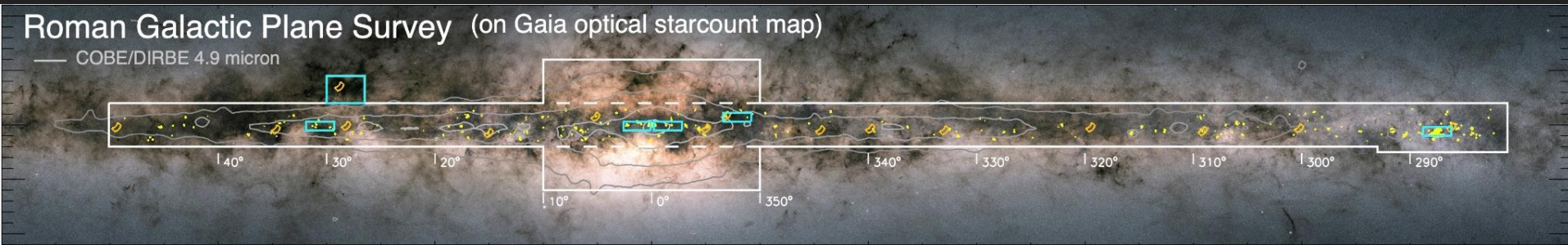
High resolution imaging

Year 1: F129, F213

Year 2: F158 (Bulge), F158 + F184 (Disk)

→ Color information, astrometry, proper motions for ~20 billion stars in F158

Star Forming Regions in Galactic Plane Surveys



RGPS Time Domain Fields

Central Molecular Zone/Nuclear Stellar Disk
Serpens South
W43
NGC 6334/57
Carina

RGPS Deep/Spectroscopic Fields

Six star formation regions $d=436$ to 6100 pc
Four fields with open clusters
Two fields with IR extinction windows
One field with large SNR (W44)
One field with Sco-Cen group ($d=105$ pc)
+ stellar wind bowshock (alpha crux)
One field with two globular clusters

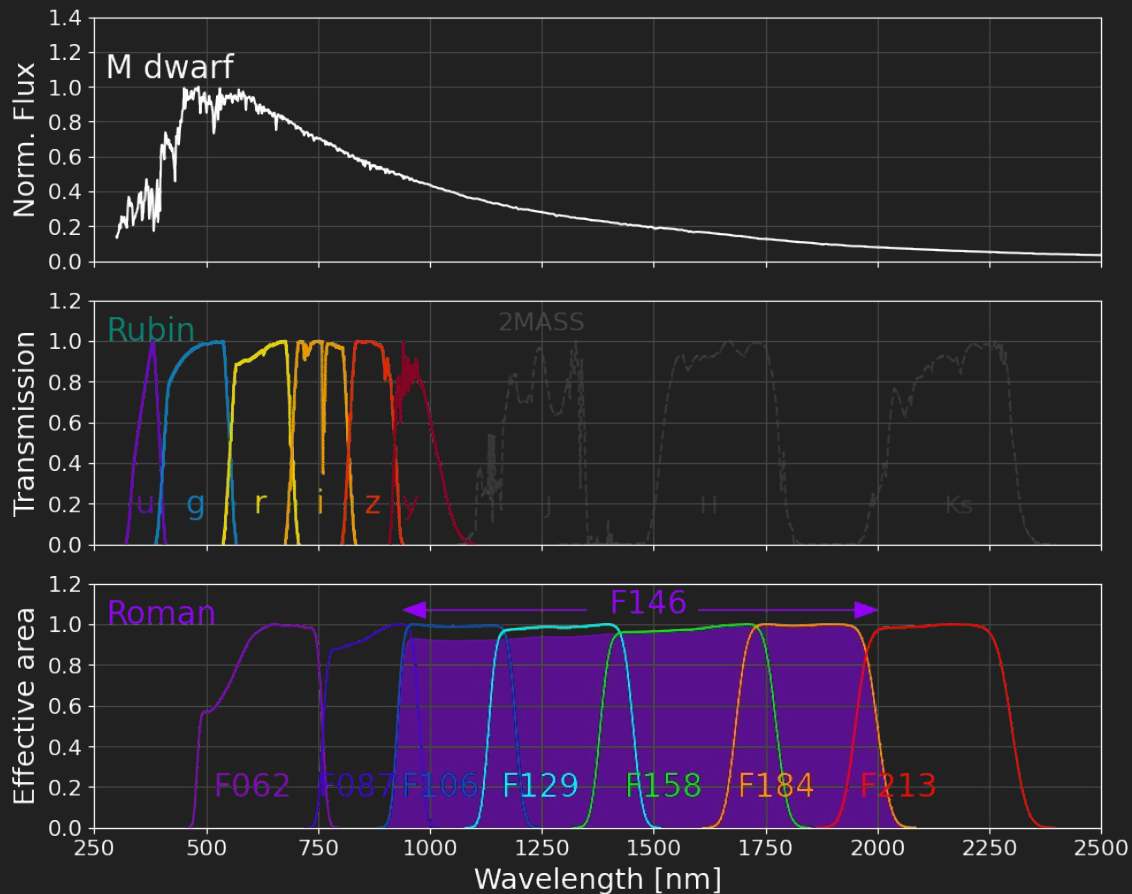
All overlap the Rubin Galactic plane survey region

Synergies for Stellar Characterization

Complementary - and overlapping - wavelength coverage

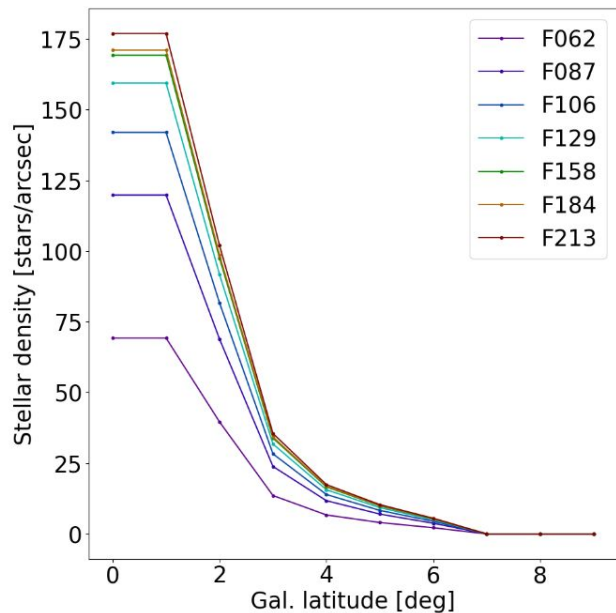
u \rightarrow F213 constrains stellar SEDs, enables estimation of stellar parameters

Essential for transit host and microlensing sources stars

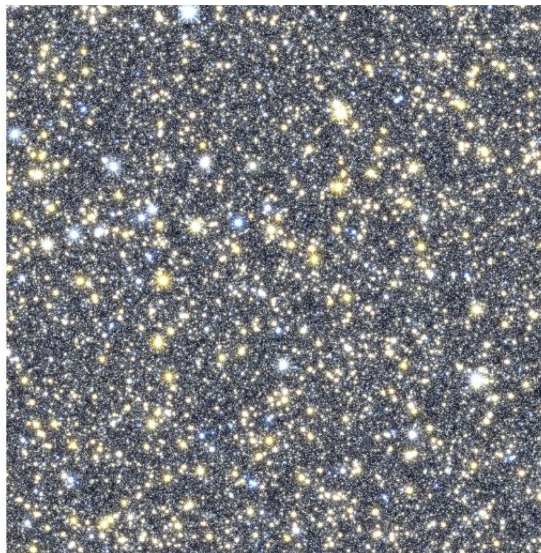


Blending Challenges

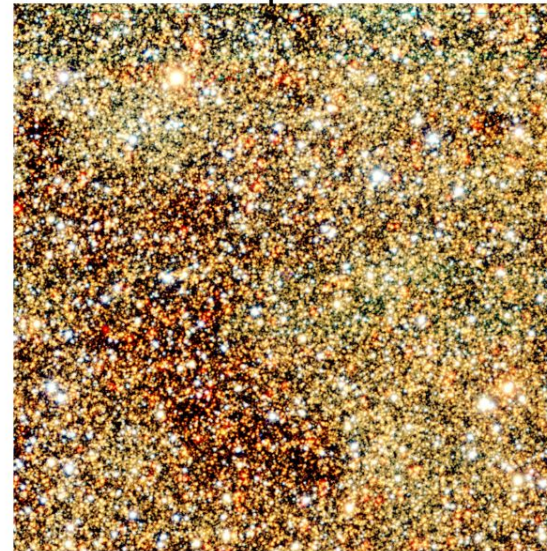
Stellar density plot based on TRILEGAL model; Roman image simulation of the Bulge [RGES-PIT], DECaps DR2 [Schlafly+2018]



Roman, F146+F087+F184



DECaps DR2



Roman's high resolution imaging can resolve stars blended in Rubin imaging of Galactic center fields

Roman-Rubin Synergies for Exoplanets

Deep survey imaging of overlapping footprints including Roman Galactic bulge, plane, Star Forming regions

Complementary timeseries cadence and seasons valuable for complete microlensing event lightcurves, extending transit ephemerides

$u \rightarrow$ F213 color information to characterize host/source stars, measure transit depths and eliminate false positives

Deblending in crowded regions

