The NASA Landolt Mission

Arlo Landolt
1935-2022

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2024/12/09
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https://Landolt.gmu.edu

Mission Team

Experts in:
SN Cosmology, Exoplanets & Stellar Astrophysics
Flight missions, hardware & operations
Early career mentorship

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Project Scientist
Angelle Tanner, Miss. State U
Program Manager
Stephanie Wiles, GMU
Systems Engineer
Logan Jensen, GMU
Payload Lead
Piotr Pachowicz, GMU

Co-Investigators and Collaborators

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Brian Alberding – NIST

Greg Aldering – LBNL

Tabby Boyajian - LSU

Susana Deustua – NIST

Jonathan Gagne – U Montreal/ IREx

Daniel Huber – U Hawaii

Daniel Keusters - DESY

Peter Kurczynski – NASA GSFC

Michael Lund – NExScI

John Mather – NASA GSFC

Saul Perlmutter - LBNL

Joe Rice – NIST

Sara Seager - MIT

Brian Stalder – Rubin

Dan Stevens – UMN-Duluth

Jamie Tayar – UF

Allison Youngblood – NASA GSFC

Blue Canyon Technologies

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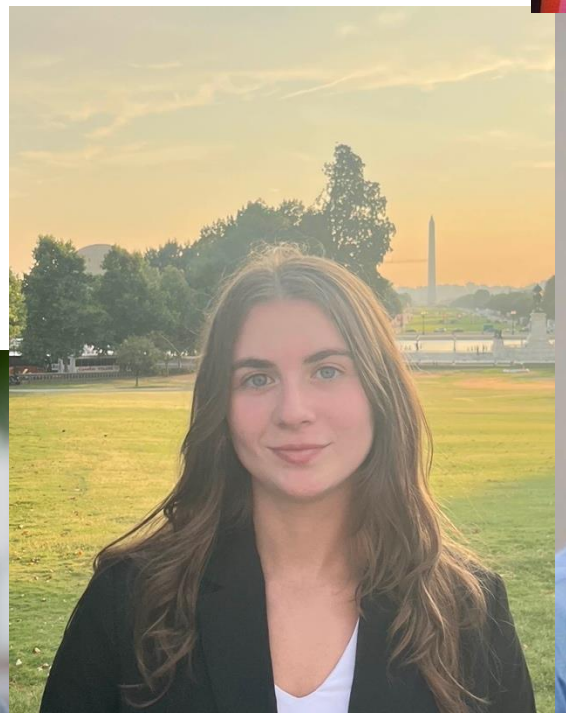
Joshua Collins
Fran Troy

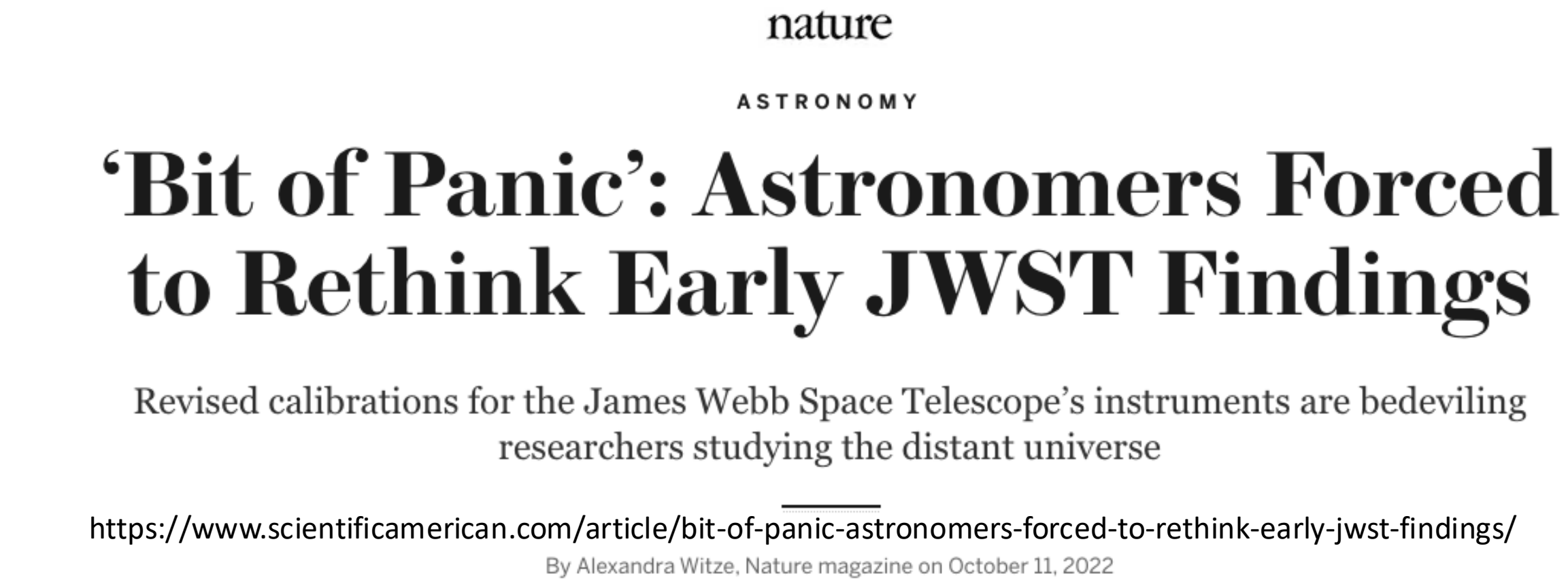








Motivation



nature

ASTRONOMY

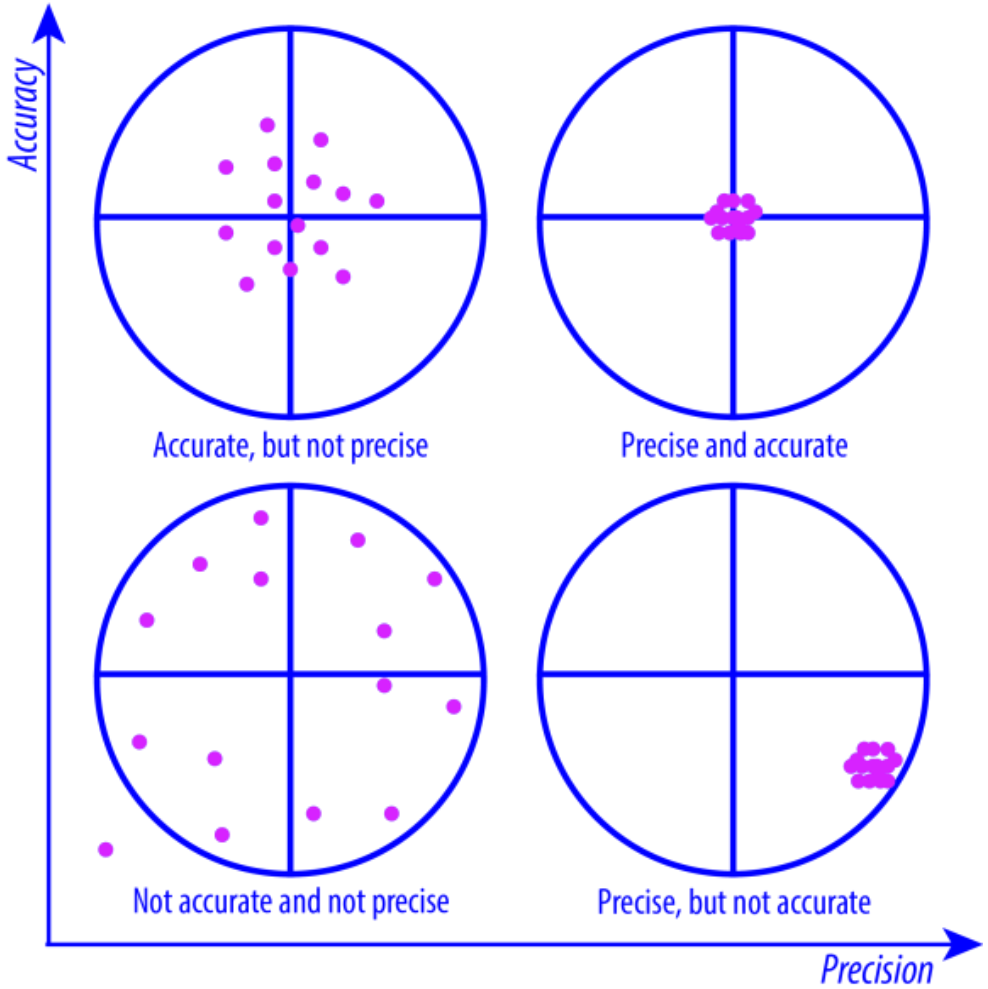
‘Bit of Panic’: Astronomers Forced to Rethink Early JWST Findings

Revised calibrations for the James Webb Space Telescope’s instruments are bedeviling researchers studying the distant universe

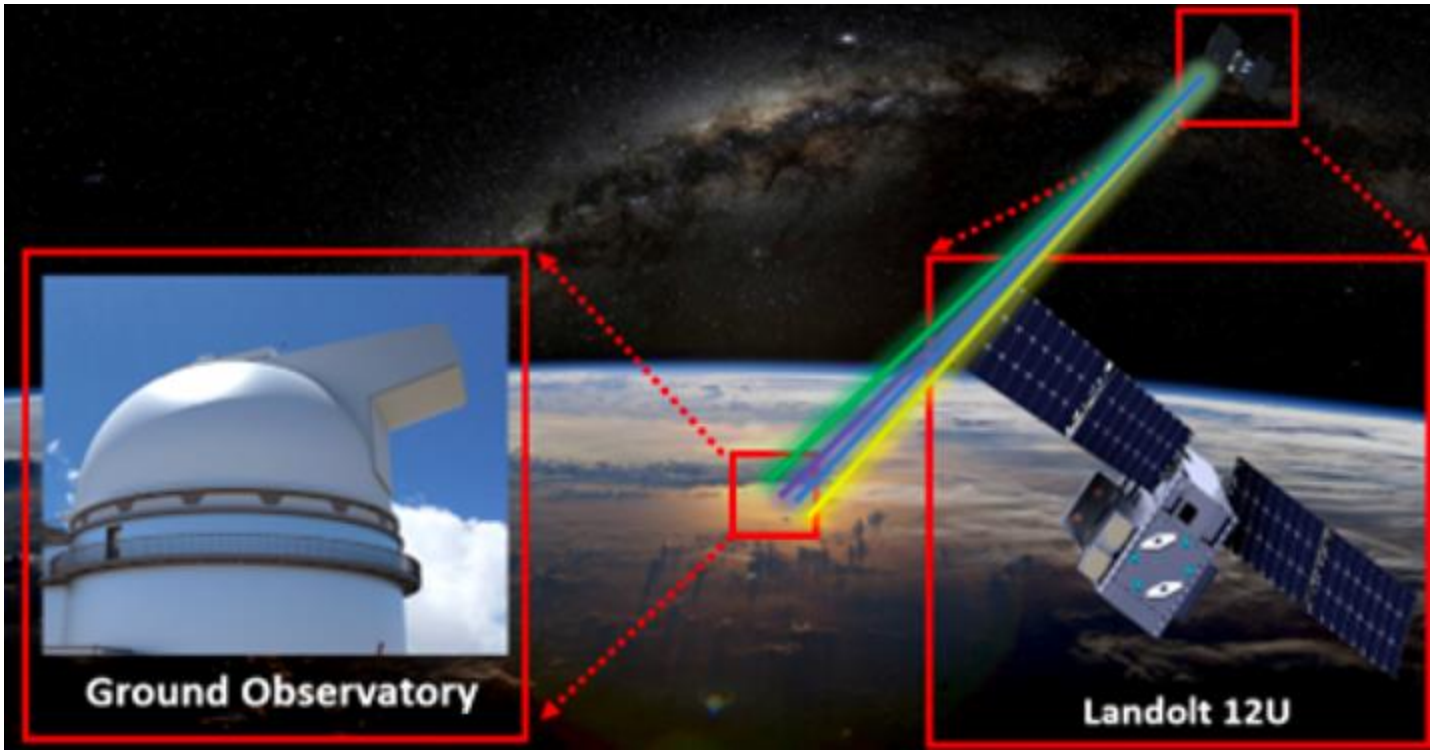
https://www.scientificamerican.com/article/bit-of-panic-astronomers-forced-to-rethink-early-jwst-findings/

By Alexandra Witze, Nature magazine on October 11, 2022

Motivation


Accuracy
Accurate, but not precise
Precise and accurate
Not accurate and not precise
Precise, but not accurate
Precision

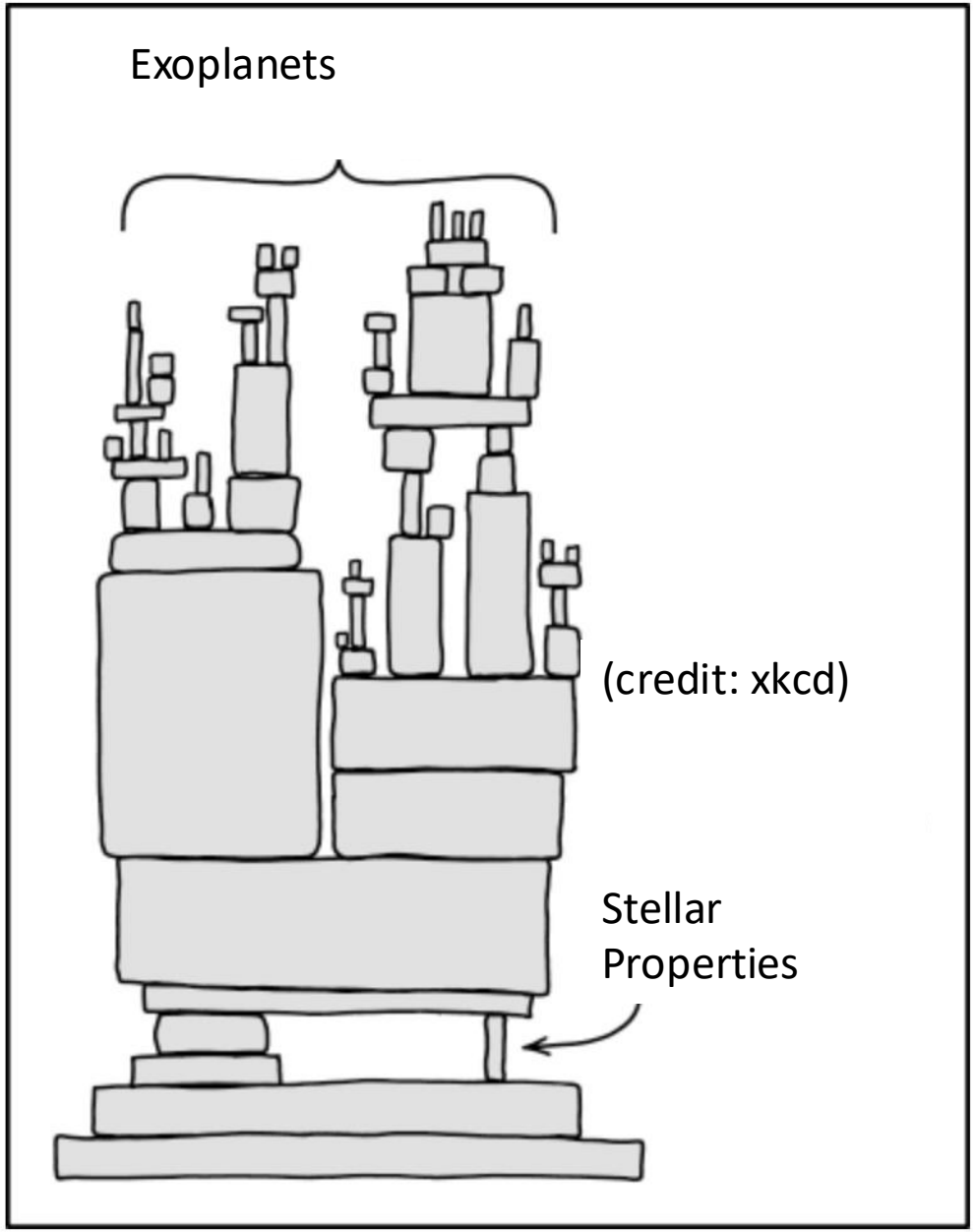
What is Landolt?



- The sixth and newest NASA Astrophysics **PIONEERS** program selection.
  - Proposed: Early 2023
  - Selected: 2024/02/27
  - Start: 2024/10/01
  - $20M cost cap, 5 years
  - Early Career Development
- A **hybrid** mission architecture – ground and space
- A 12U SmallSat with 4-7 flux-calibrated lasers in a GEO orbit viewable by ground-based telescopes for **VIS-NIR absolute flux calibration to a baseline of <0.5% (threshold <0.75%)**.

Why Landolt?

- An independent, complementary, and new approach
  - SI-traceable
- Timeliness: enhances the science of many current and upcoming astrophysics space missions and ground projects, beyond Roman and Rubin
- Cross-cutting science cases



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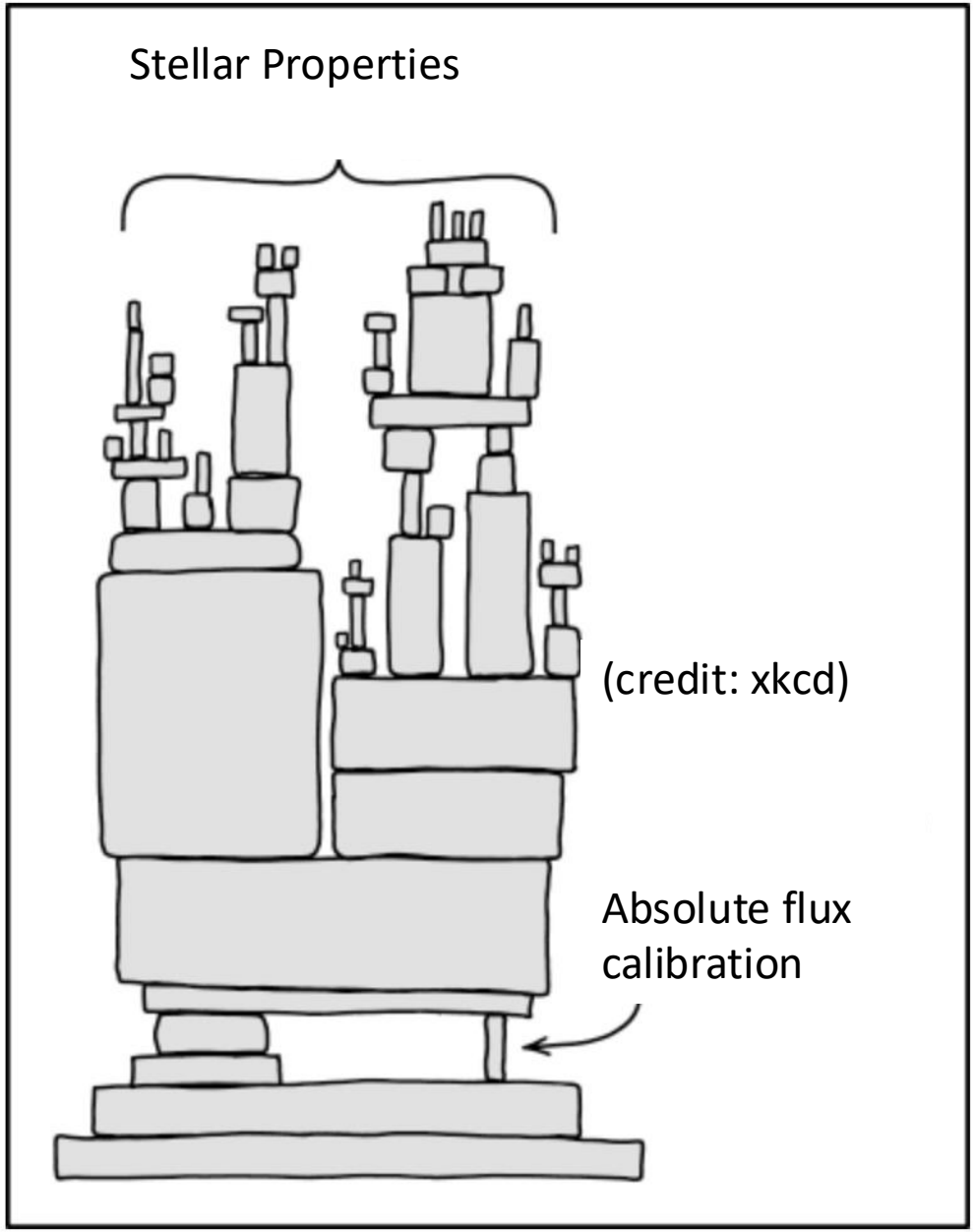

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Know Thy Flux,
Know Thy Star,
Know Thy Planet

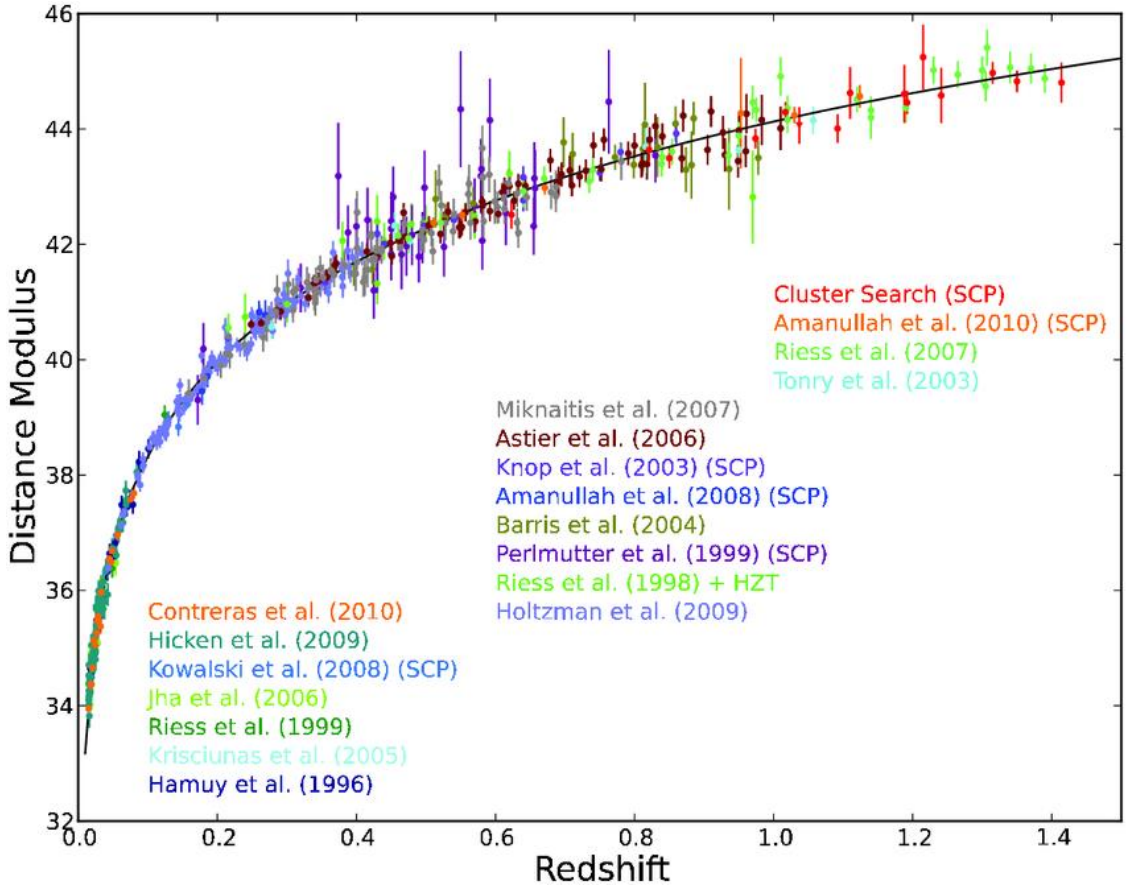
Landolt Science Programs

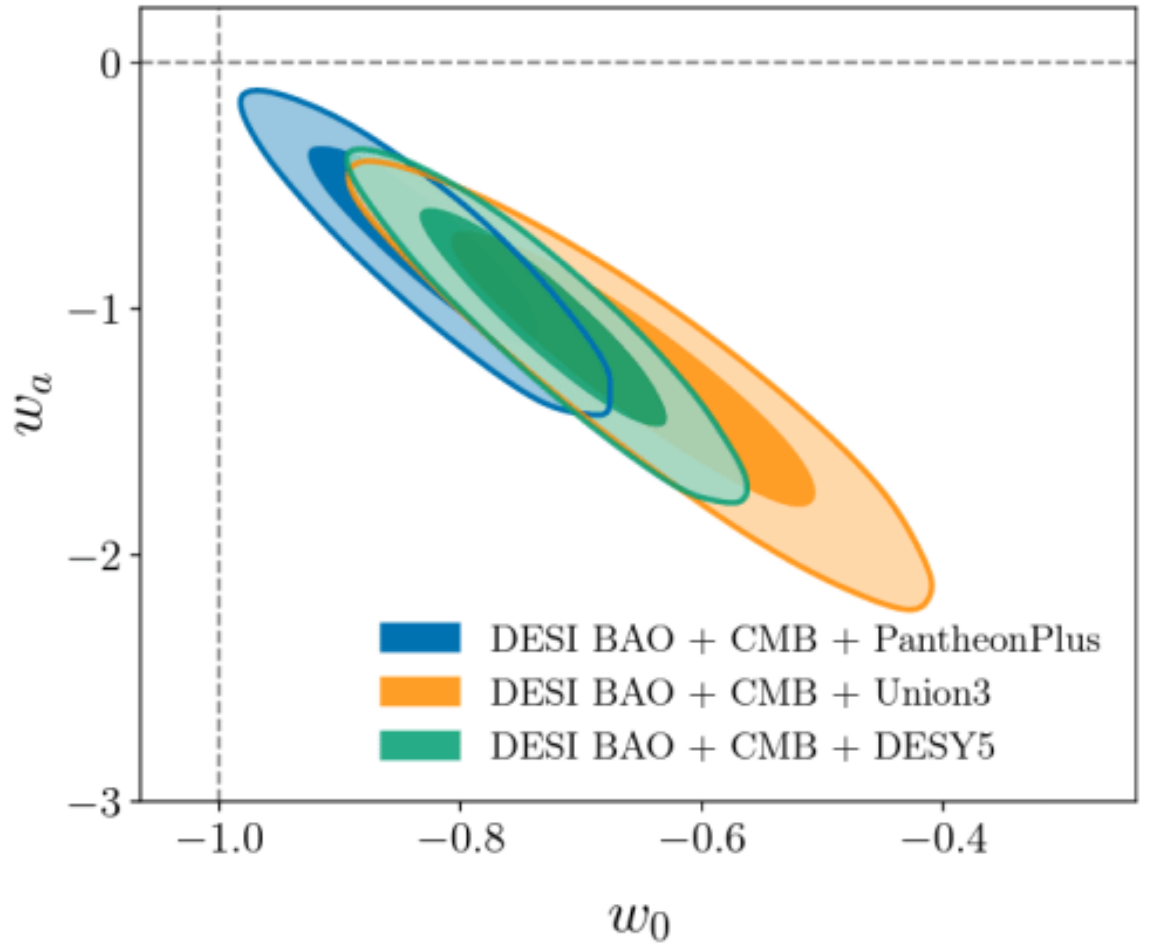
Cosmology

Current SNe cosmology studies depend on WD atmosphere models

Landolt will be used to observe the standard stars and reduce the absolute uncertainty to 0.5%.

Landolt Science Cases – SNe Cosmology & Standard Stars





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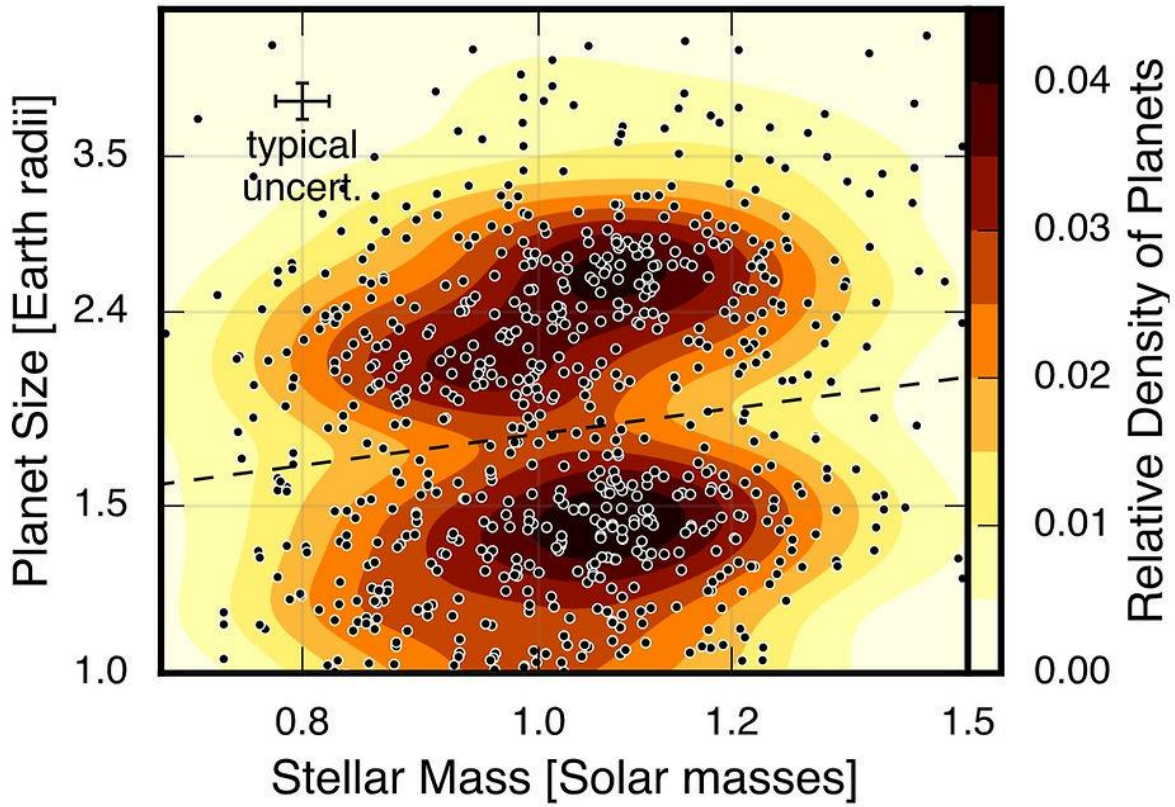
Exoplanets

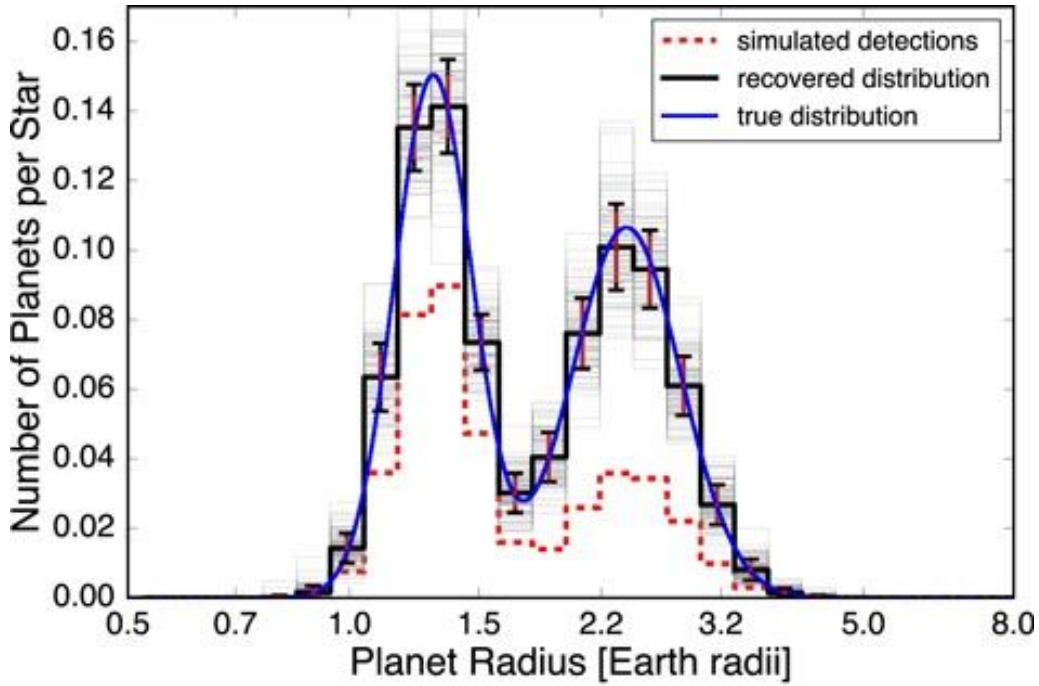
Determining the masses & radii of exoplanets scales with stellar flux which is now the dominant source of uncertainty post-Gaia.

Landolt will reduce uncertainties on host stellar and exoplanet parameters by at least a factor of three.

Landolt Science Cases – Accurate Exoplanet Characterization



Small Planet Radius Gap



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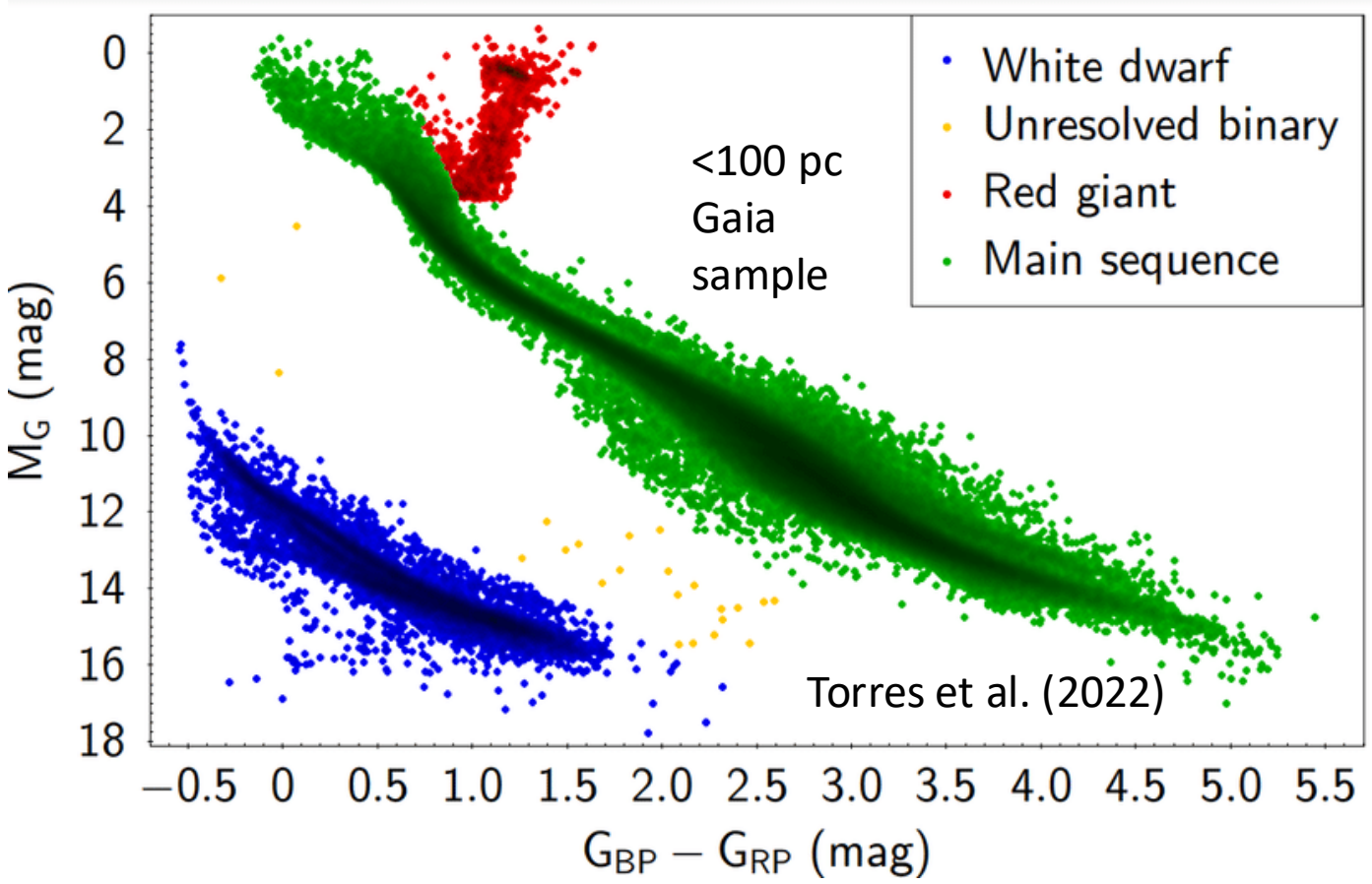
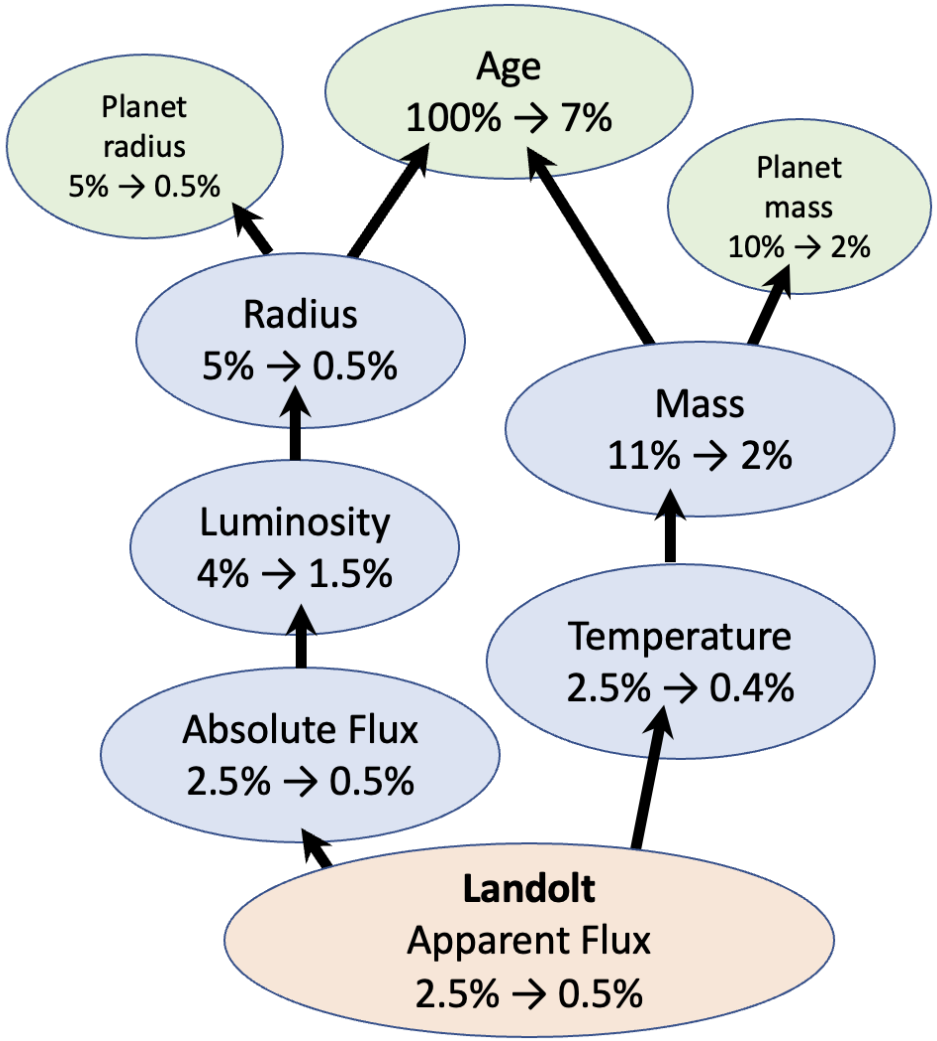
Stellar Astrophysics

The standard star network includes a few bright stars.

Landolt will expand this network & allow for cross- and re-calibration of millions of additional stellar fluxes.

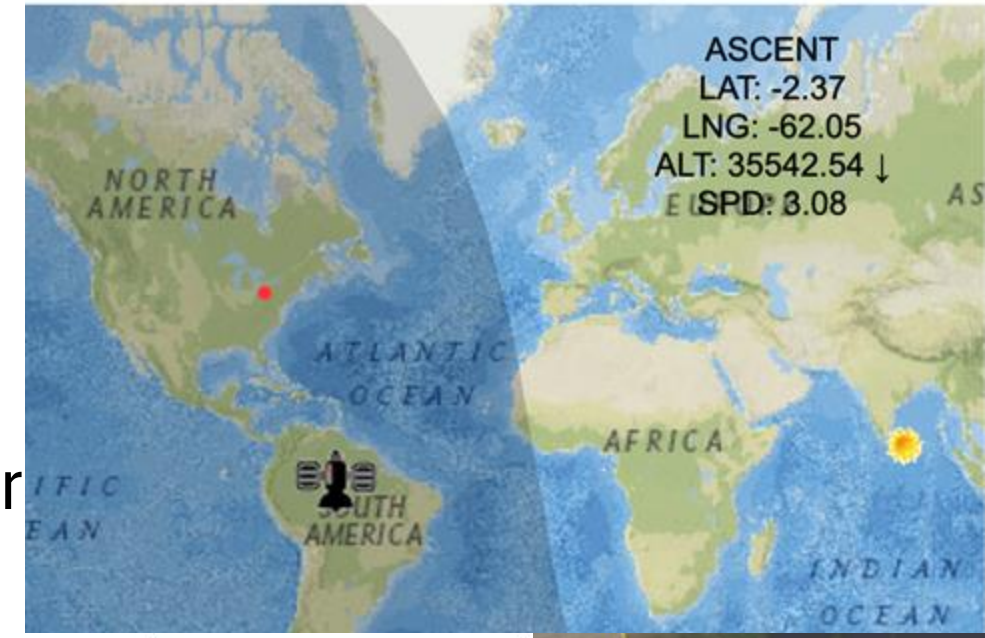
Landolt Science Cases – Enabling a Stellar Astrophysics Renaissance

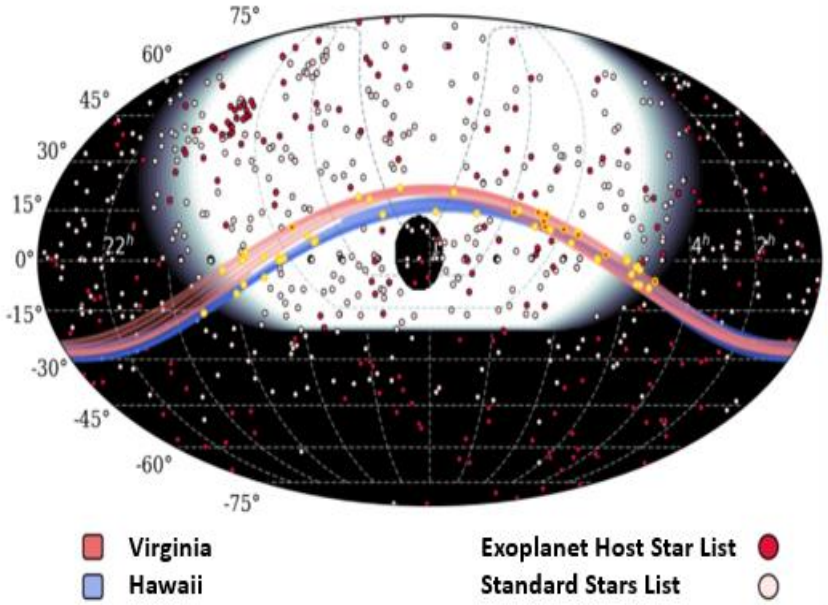


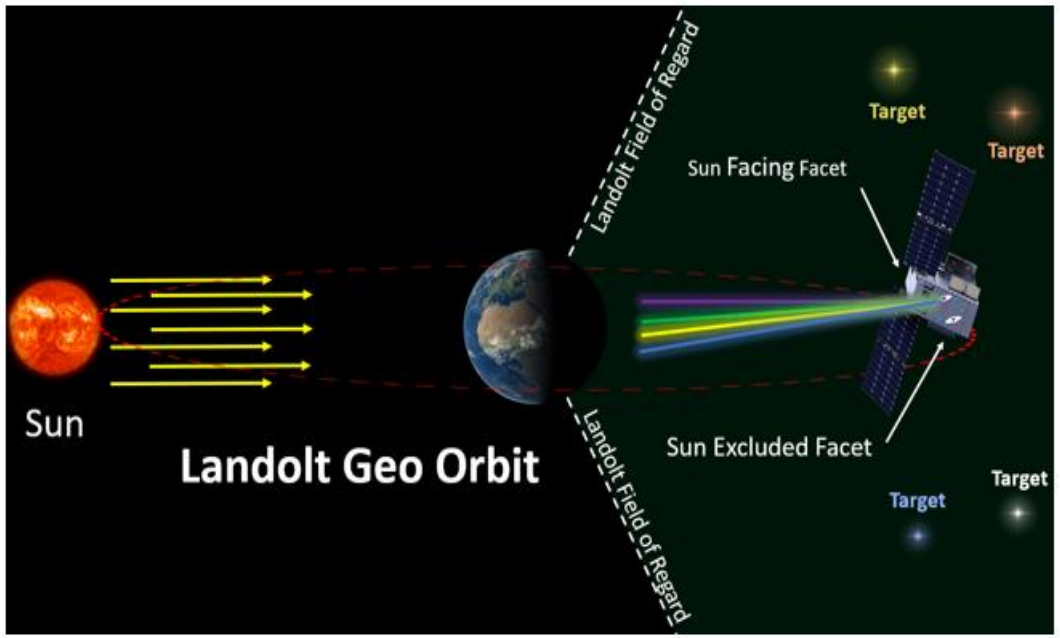


Landolt Mission Orbit

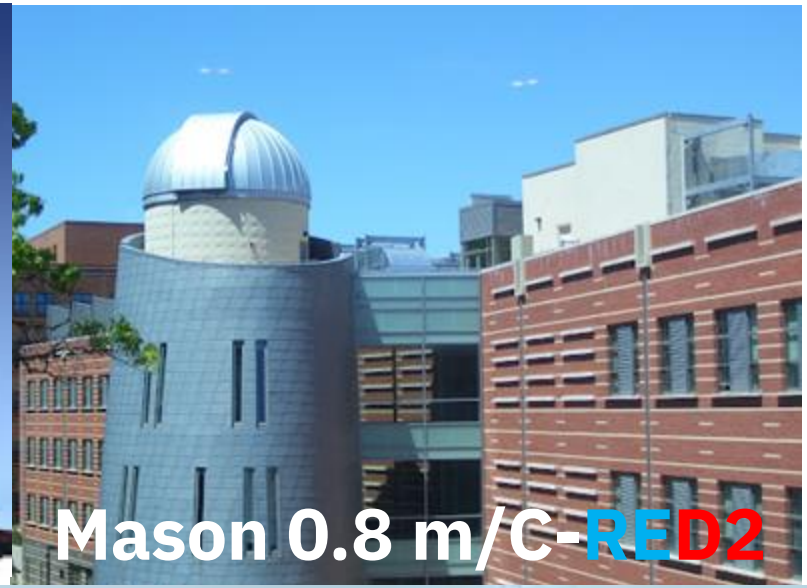
- **Higher GEO orbit** (relative to LEO) – Slower angular drift rate balances against increased power requirements; umbral crossings for solar reflectance





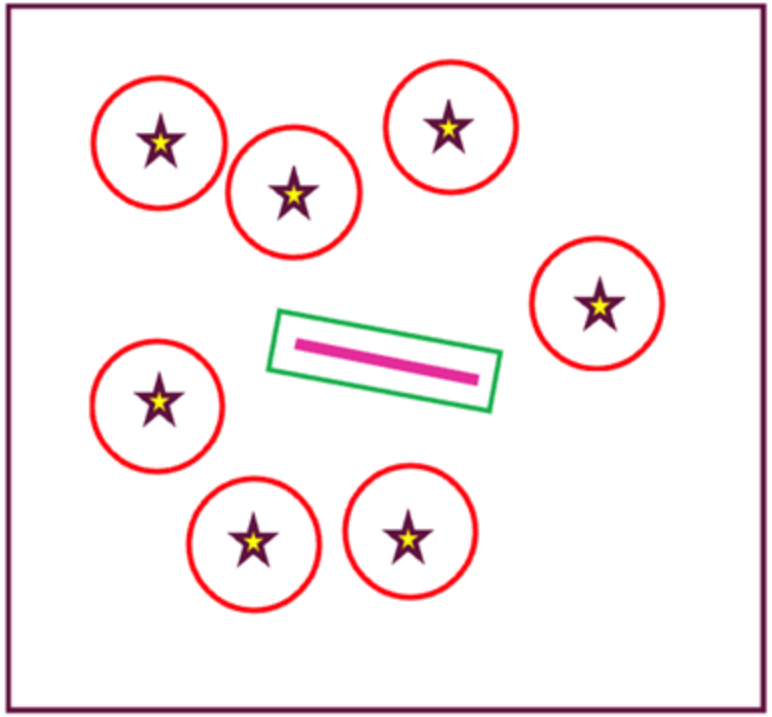


The Landolt Mission Ground Stations

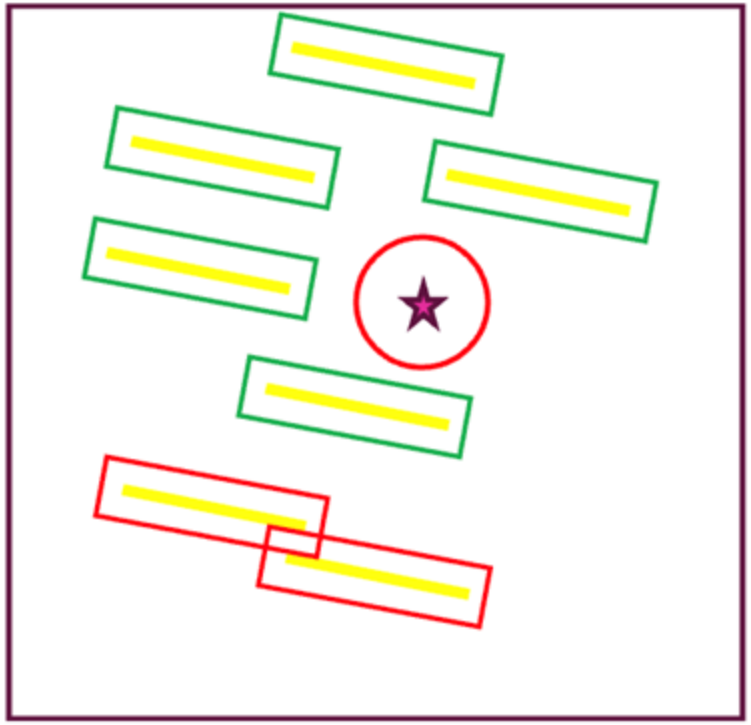


Path to Science

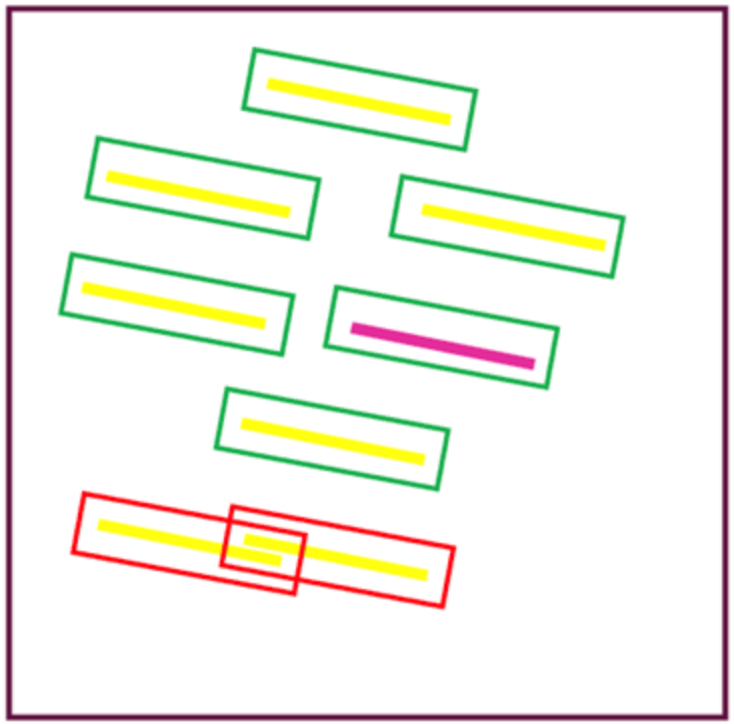
Mode 1 – Sidereal Tracking
Stars are points
Satellite is streak



Mode 2 – Satellite Tracking
Stars are streaks
Satellite is point



Mode 3 – Track at rate between
Both stars and satellite are streaks



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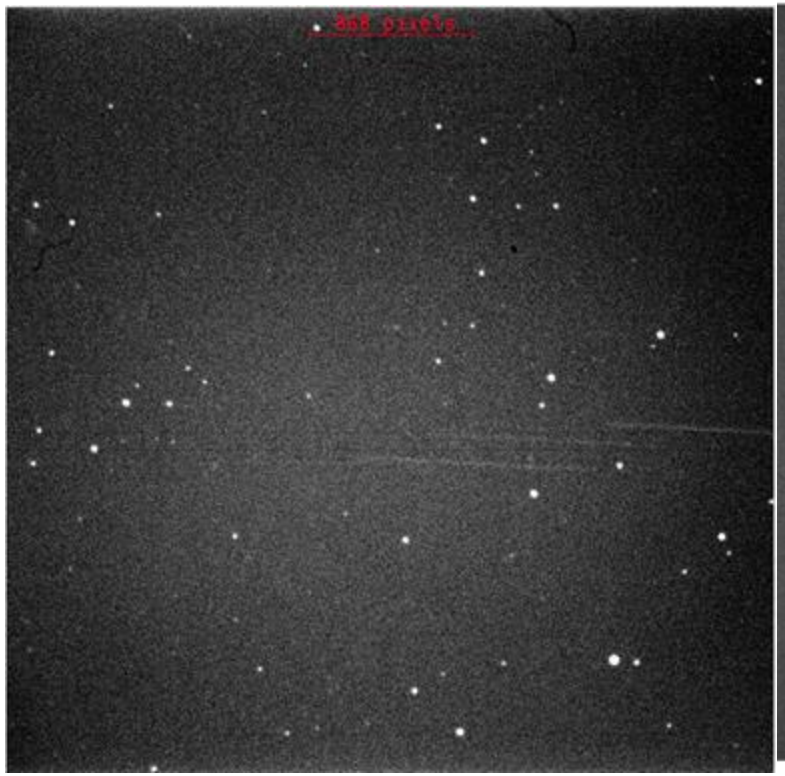

Mode 2 – Satellite Tracking
Stars are streaks
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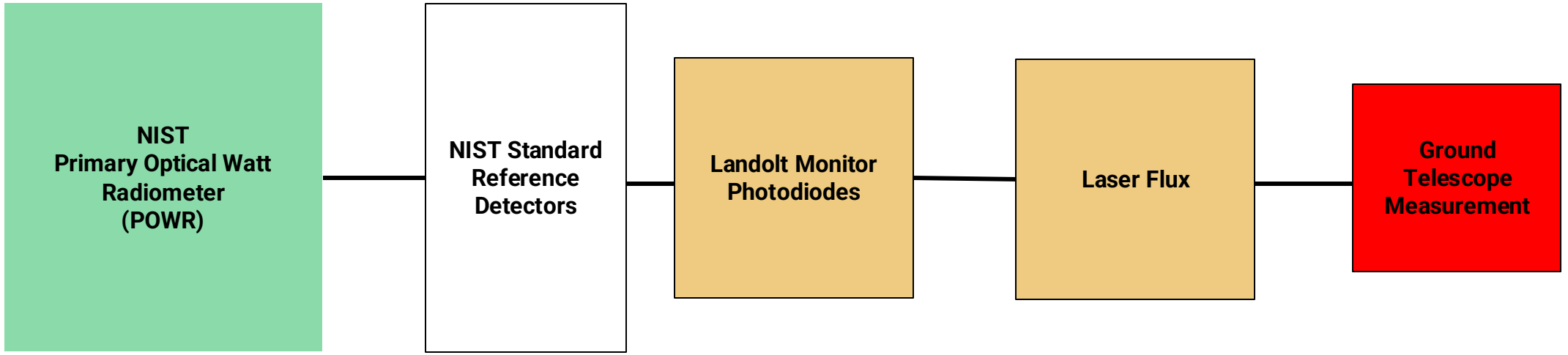
Mode 3 – Track at rate between
Both stars and satellite are streaks

Path to Science – SI Traceability



Timeline

We are here

Year	FY24				FY25				FY26				
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Mission					Phase A				Phase B				
		Selection											
Major Milestones							CSR	SRR			PDR		
Payload											PDR		

	FY27				FY28				FY29				FY30
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
	Phase C			Phase D					Phase E				
									Start of		End		
		CDR				I&T							
	CDR			I&T									

Looking forward

- The NASA Landolt mission officially started October 1st
- We are in Phase A – mission formulation, with launch no earlier than late 2028
- We are currently developing mission plans and a concept study report
- A paper about the mission is in prep
- We are building a community of supporters. Sign up for our Landolt Mission Interest Group (see QR code at right): https://forms.gle/CbSgWu6LBjnMTV1e7