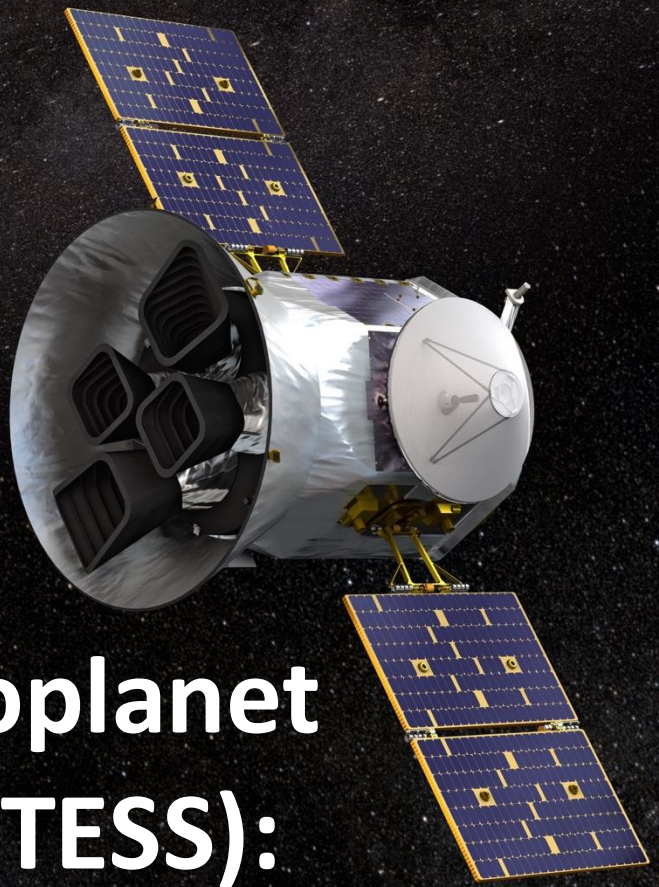


The Transiting Exoplanet Survey Satellite (TESS): Update for the APAC

Stephen Rinehart
NASA's Goddard Space Flight Center
TESS Project Scientist

Principal Investigator: G. Ricker (MIT)

Mission Overview

- NASA's next Explorer
- Lead institution MIT, PI: G. Ricker
  - *GSFC mission management*
  - *Orbital/ATK spacecraft*
- Launch no earlier than Mar. 20, '18
  - *Project schedule holding to Dec.*
- 2-year nominal mission
- Core Science: Discovery of small Exoplanets around bright, nearby stars
  - *Measure masses of 50 small planets*
- Guest Investigator Program to support broad range of community science

The Legacy of TESS

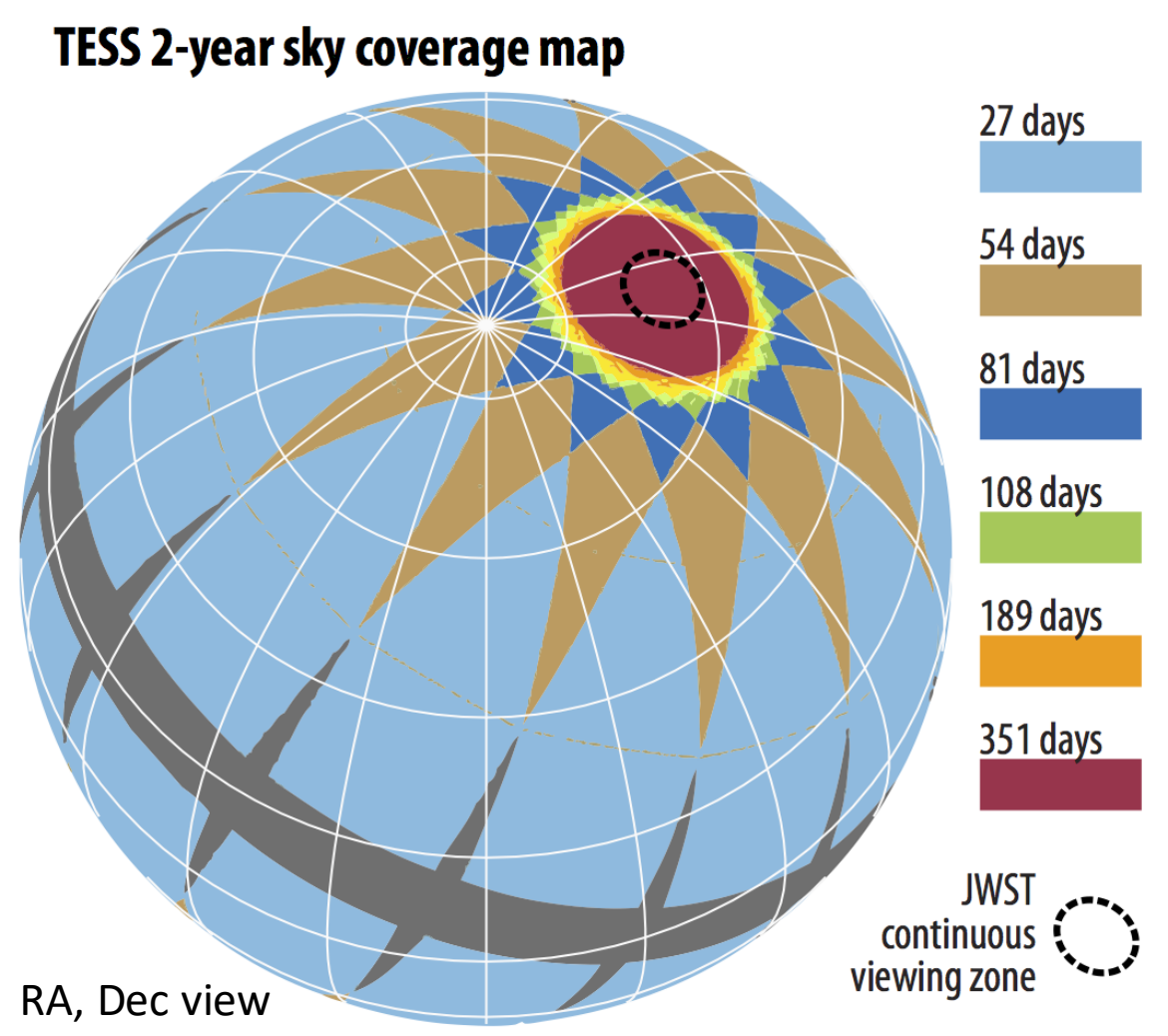
Core Science

Large-area survey looking for exoplanets around bright, nearby stars.

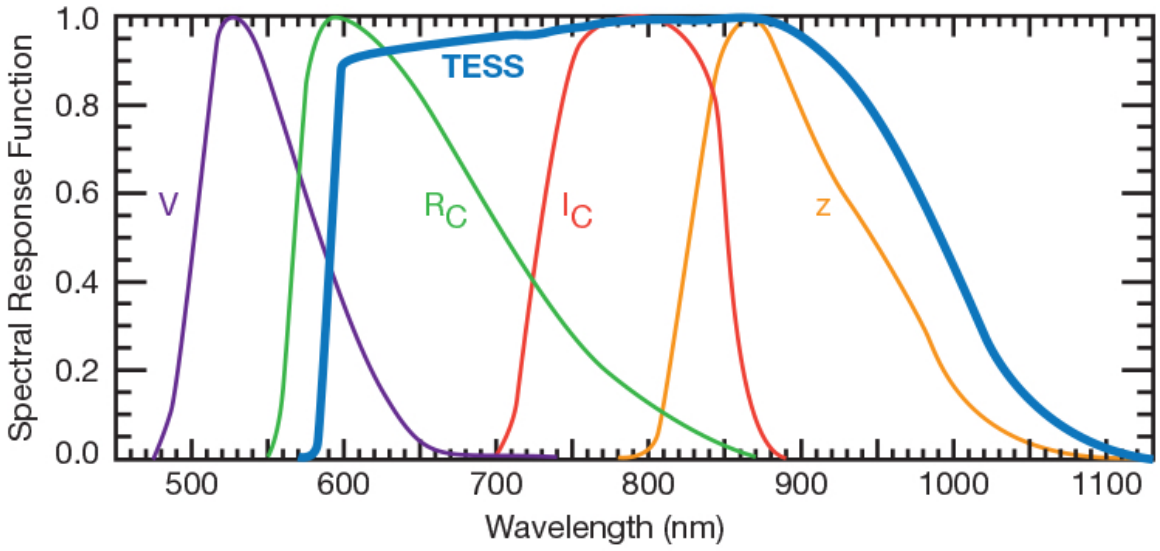
Over 200k stars on a 2-minute cadence.

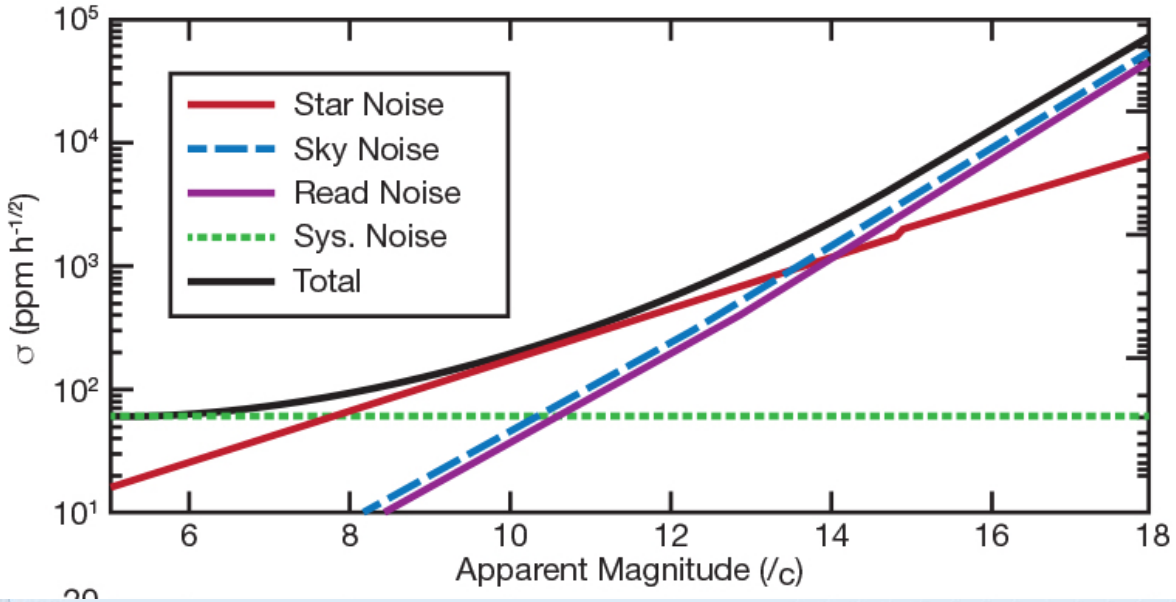
Full-frame images every 30 minutes.

No proprietary period on science data.



Instrument Details





~21” pixels

Wide spectral bandpass

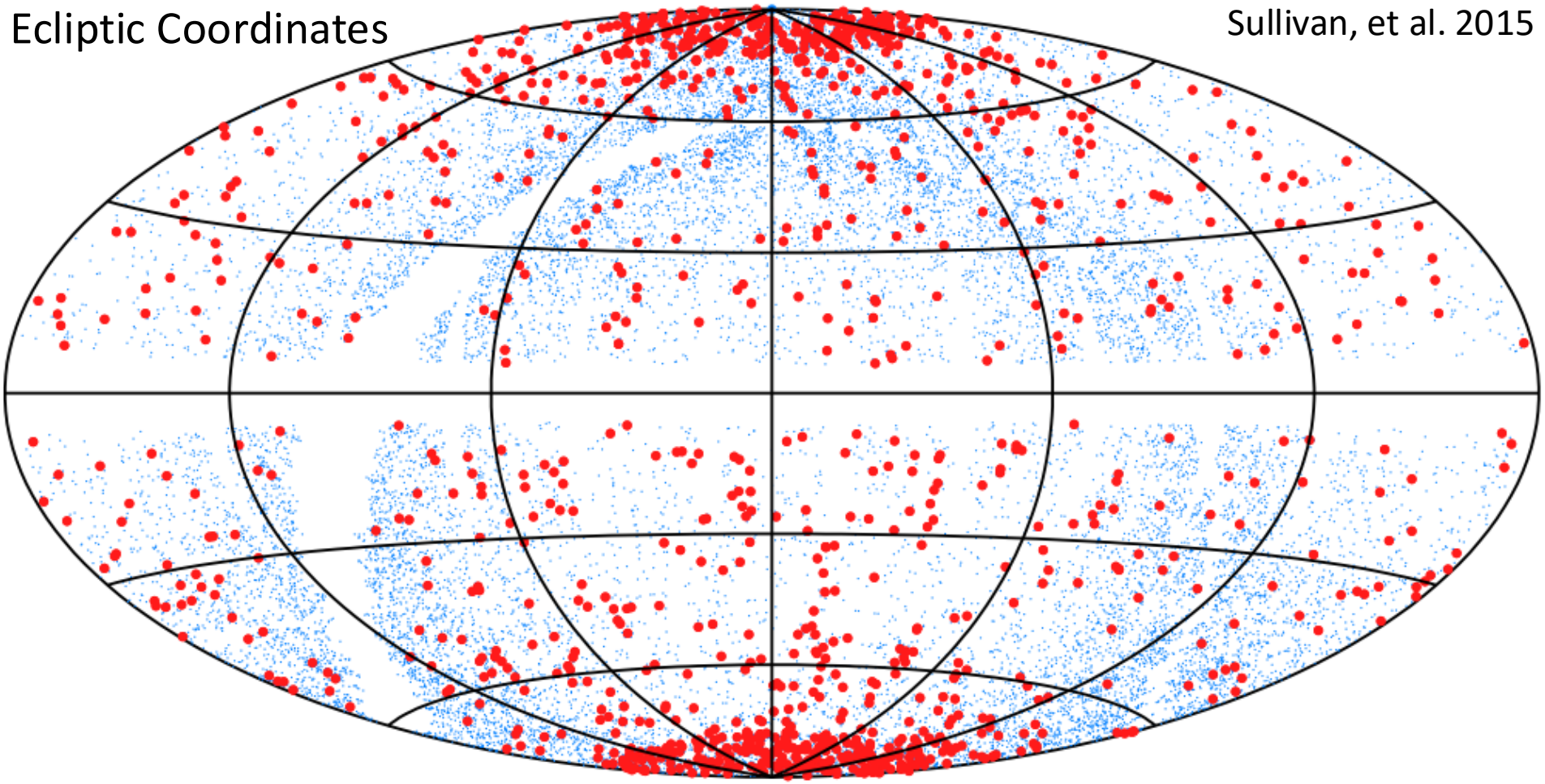
4 cameras, each w/ 24x24 degree FOV (24x96 degrees)

13.7 day orbit (2:1 lunar resonance)

Expected Exoplanet Yield

Ecliptic Coordinates

Sullivan, et al. 2015

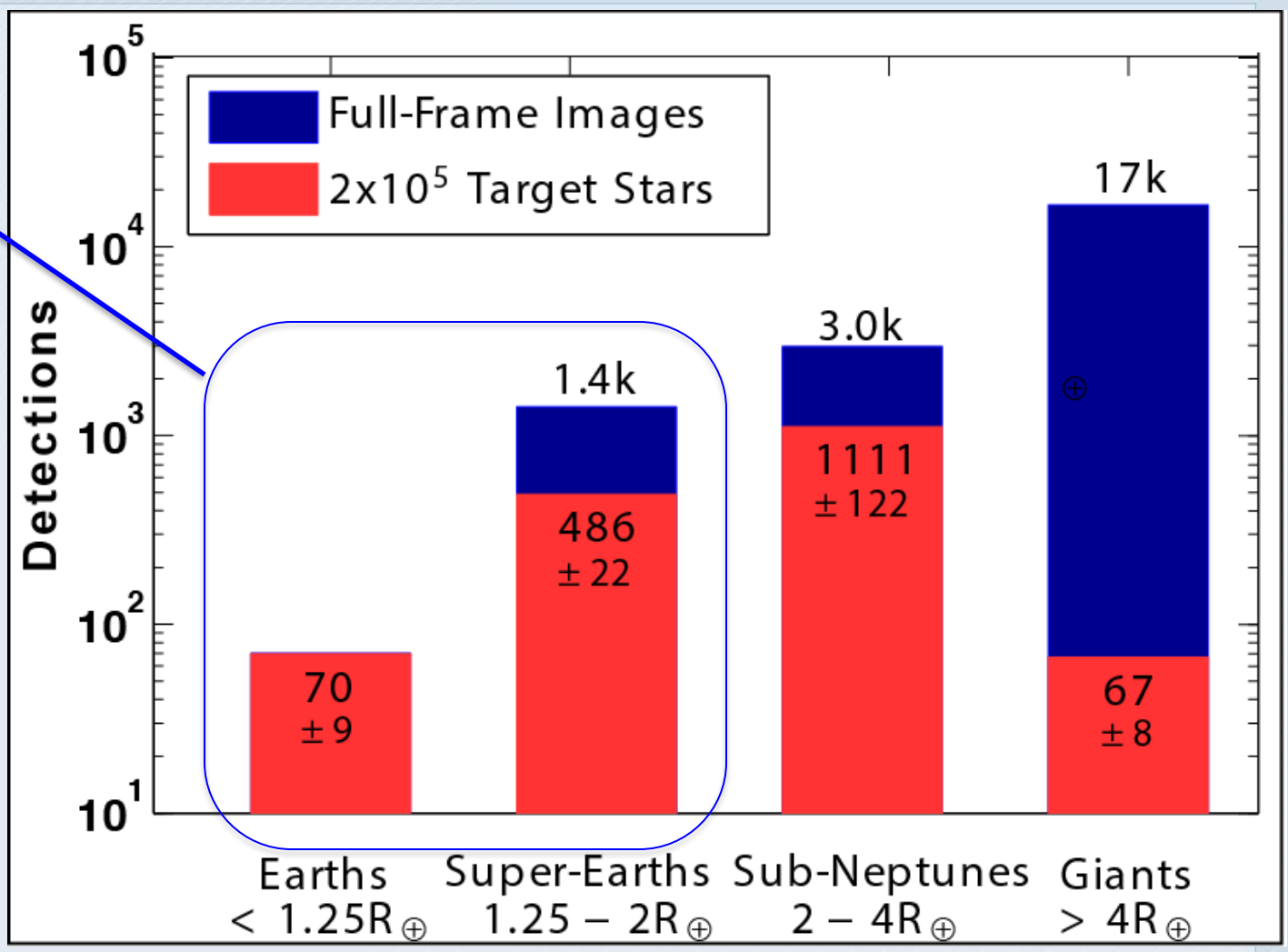


Detectable planets around **200,000 pre-selected stars**

Detectable planets around **20,000,000 stars in full images**

Yield: The Numbers

Over **500**
Small Planets!

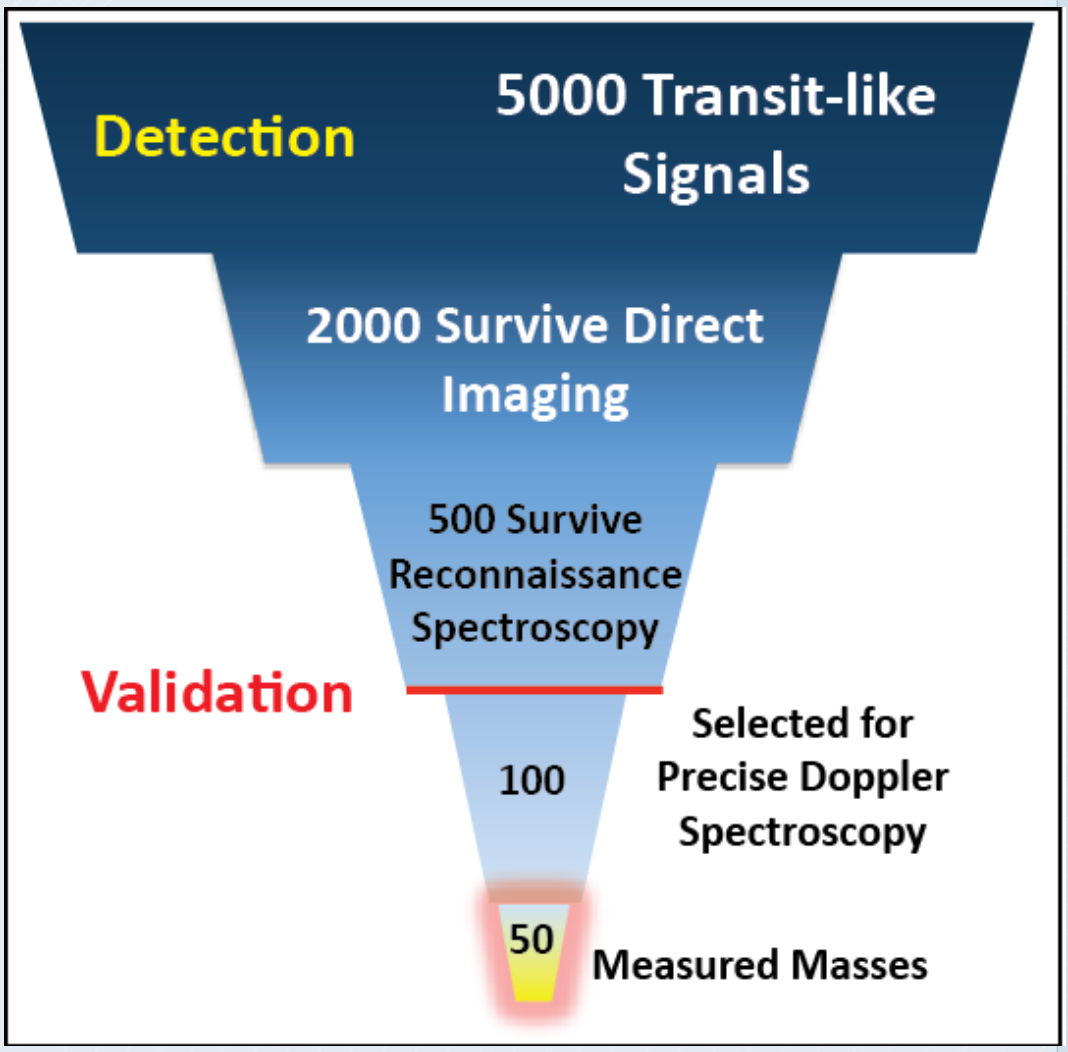


Sullivan, et al. 2015

Follow-up Program

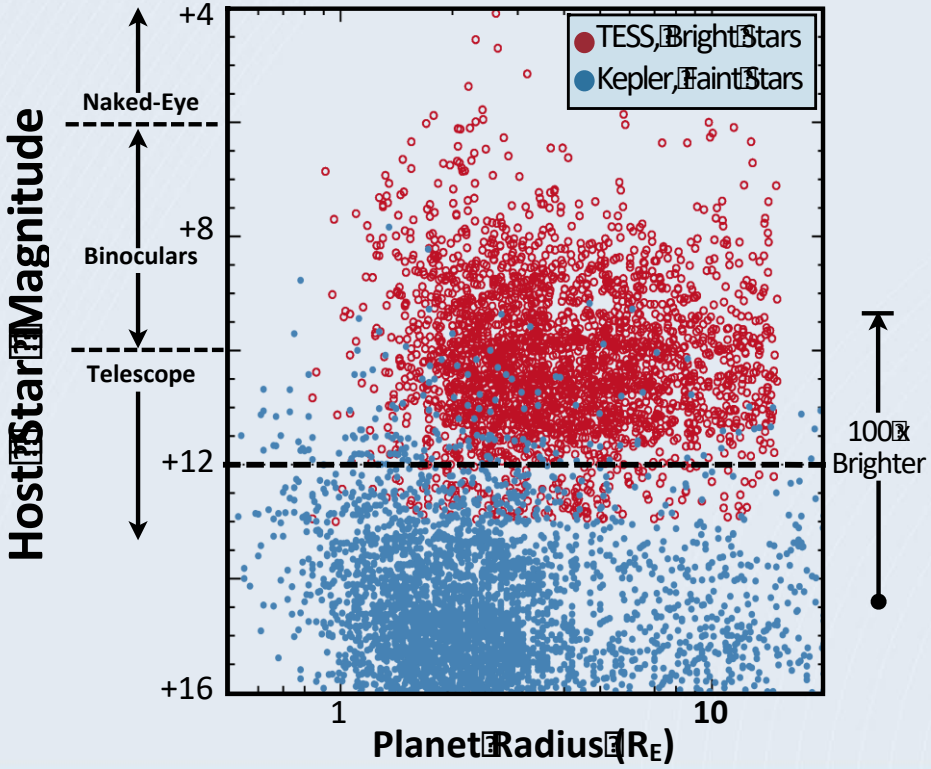
Follow-up Program necessary for confirmation of exoplanet candidates

- False positive identification
  - Contamination
  - Light curves
- Stellar properties
- Radial velocity (mass) measurements



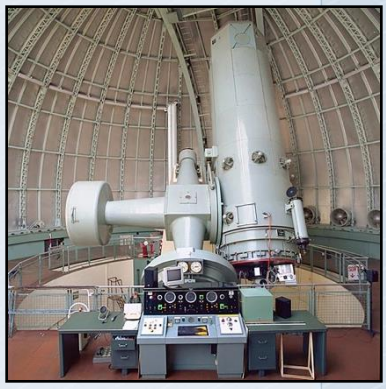
Follow-up Facilities

- TESS-funded facilities
- Partners
- Space-based assets (proposals)
  - *JWST and HST for transit spectroscopy*



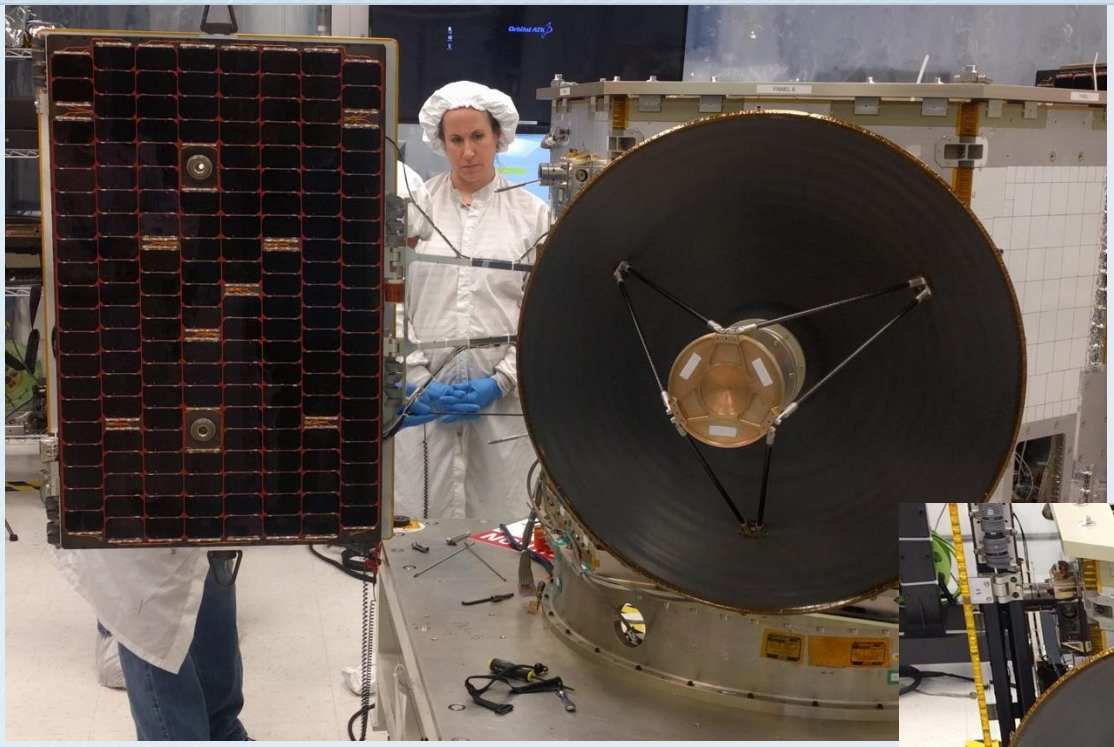
LCOGT

OHP

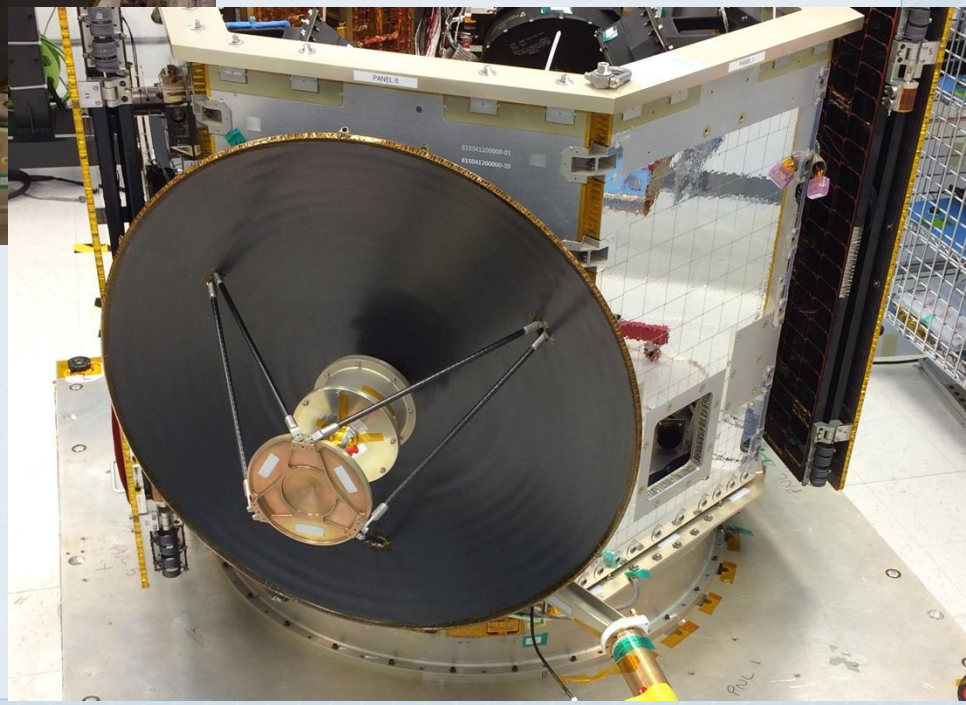


HARPS

Current Status: Spacecraft

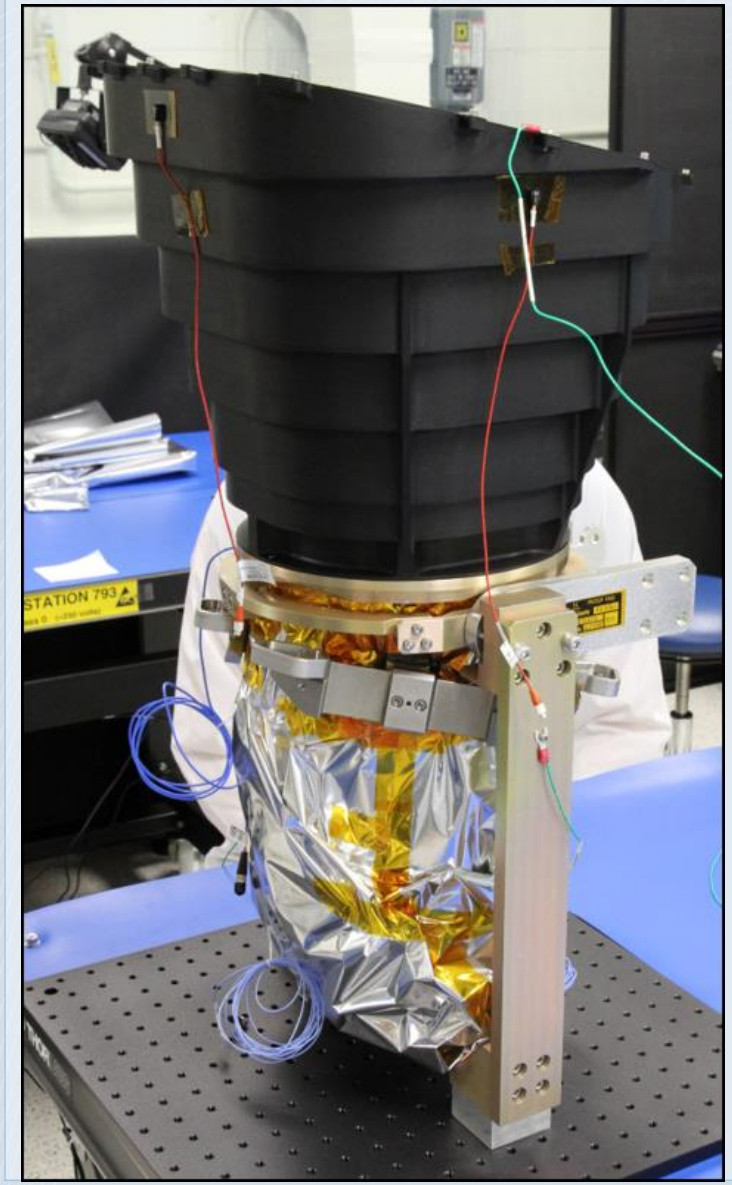


Solar array installed on the TESS spacecraft



Critical path:
Ka band transmitter

Current Status: Instrument



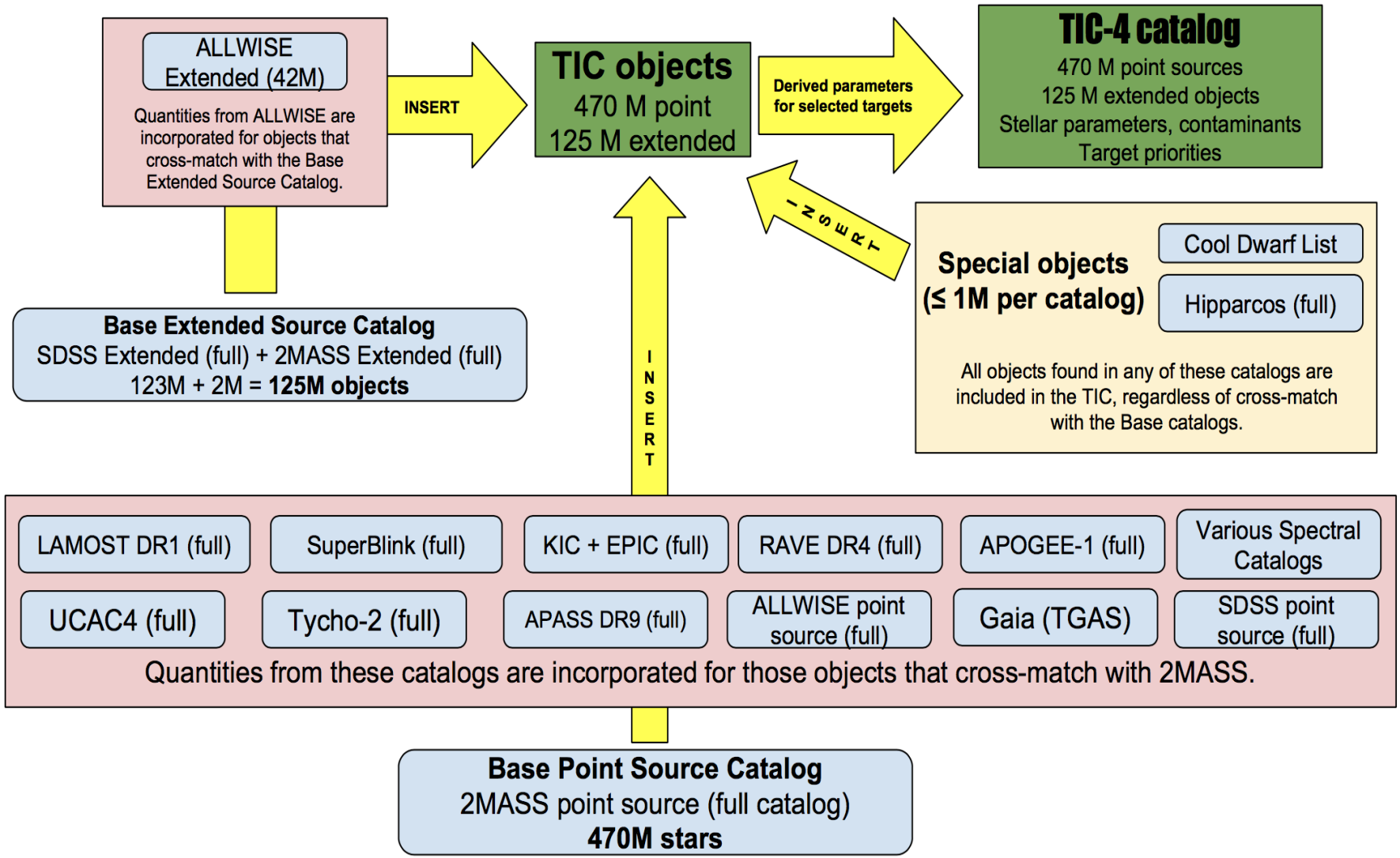
Key Decision: Proceeding with Seakr Data Handling Unit (critical path)

Cameras complete, in testing now.

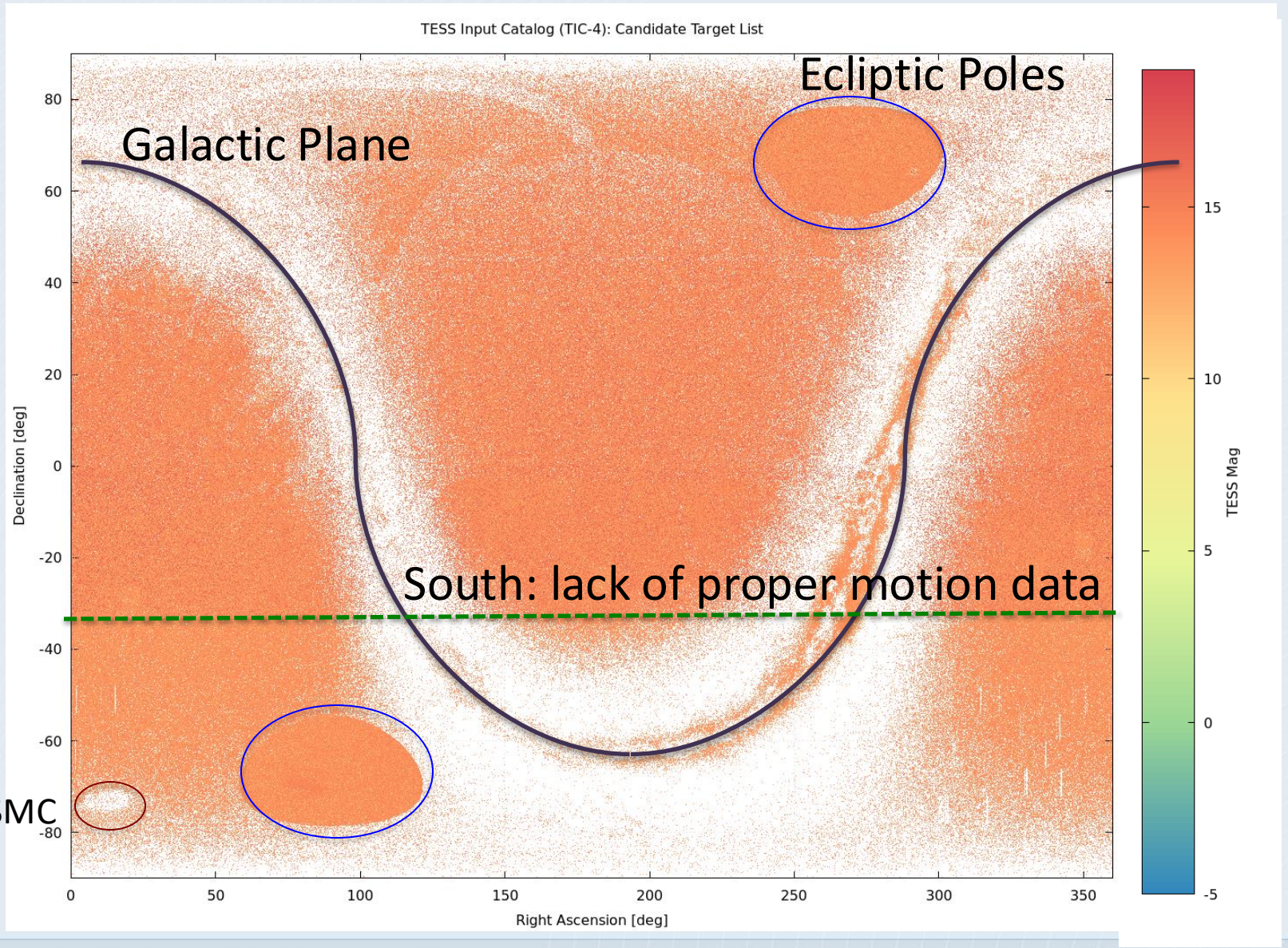
Going Forward

- Upcoming milestones
  - *S-band transponder (May 5)*
  - *Camera integration start (May 19)*
  - *ADHU Delivery to MIT (May 19)*
  - *Ka transmitter delivery (June 8)*
- Upcoming mission reviews
  - *June 28: KDP-D*
  - *January 5: Pre-Ship Review*
  - *Feb 27: KDP-E*
  - *March 20: Launch*
- Just over $5M Reserves: 25% of cost-to go.
  - *Additional $2M for Phase E-F*

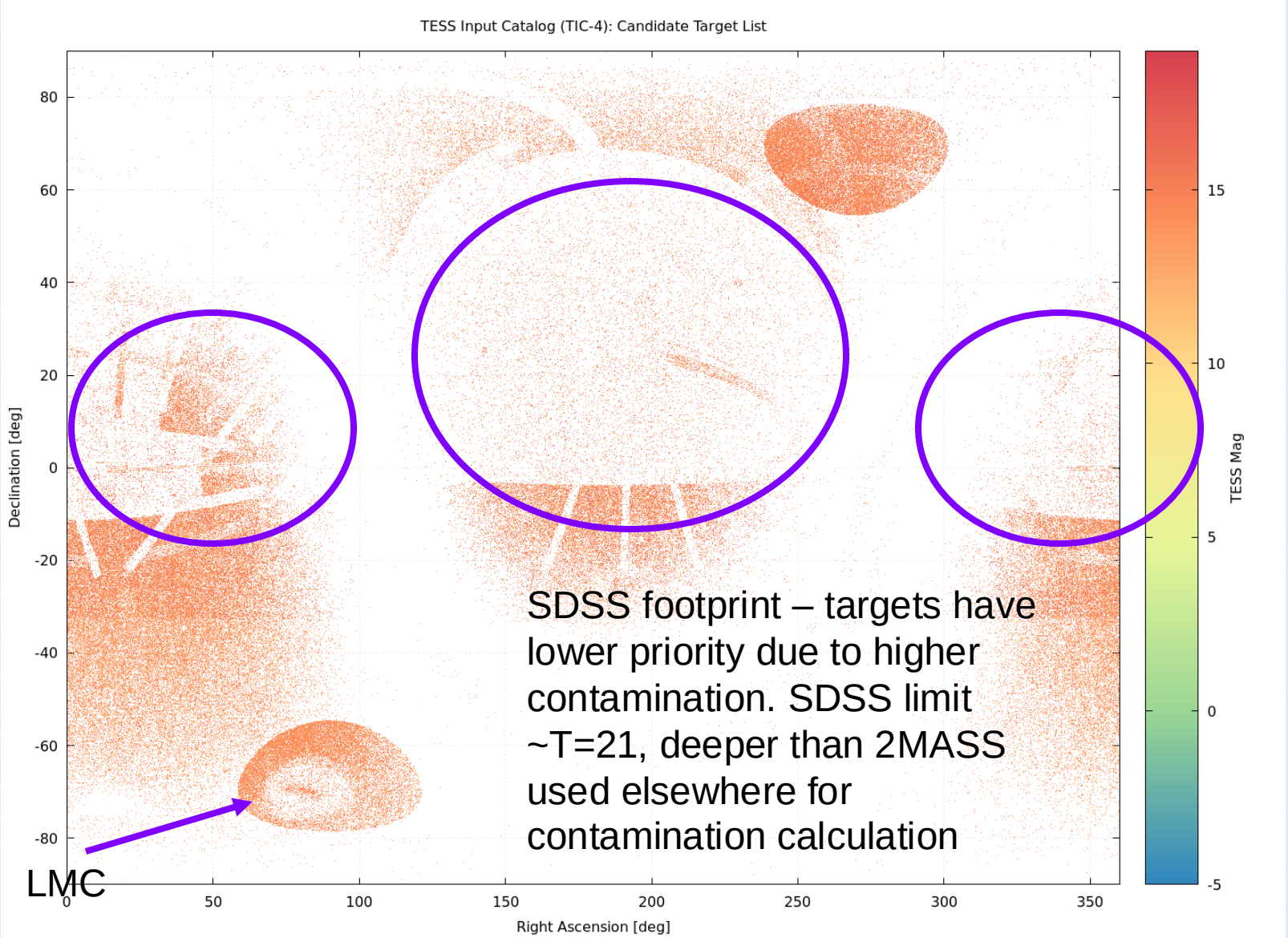
TESS Input Catalog



Top 2.33 million targets in the TIC



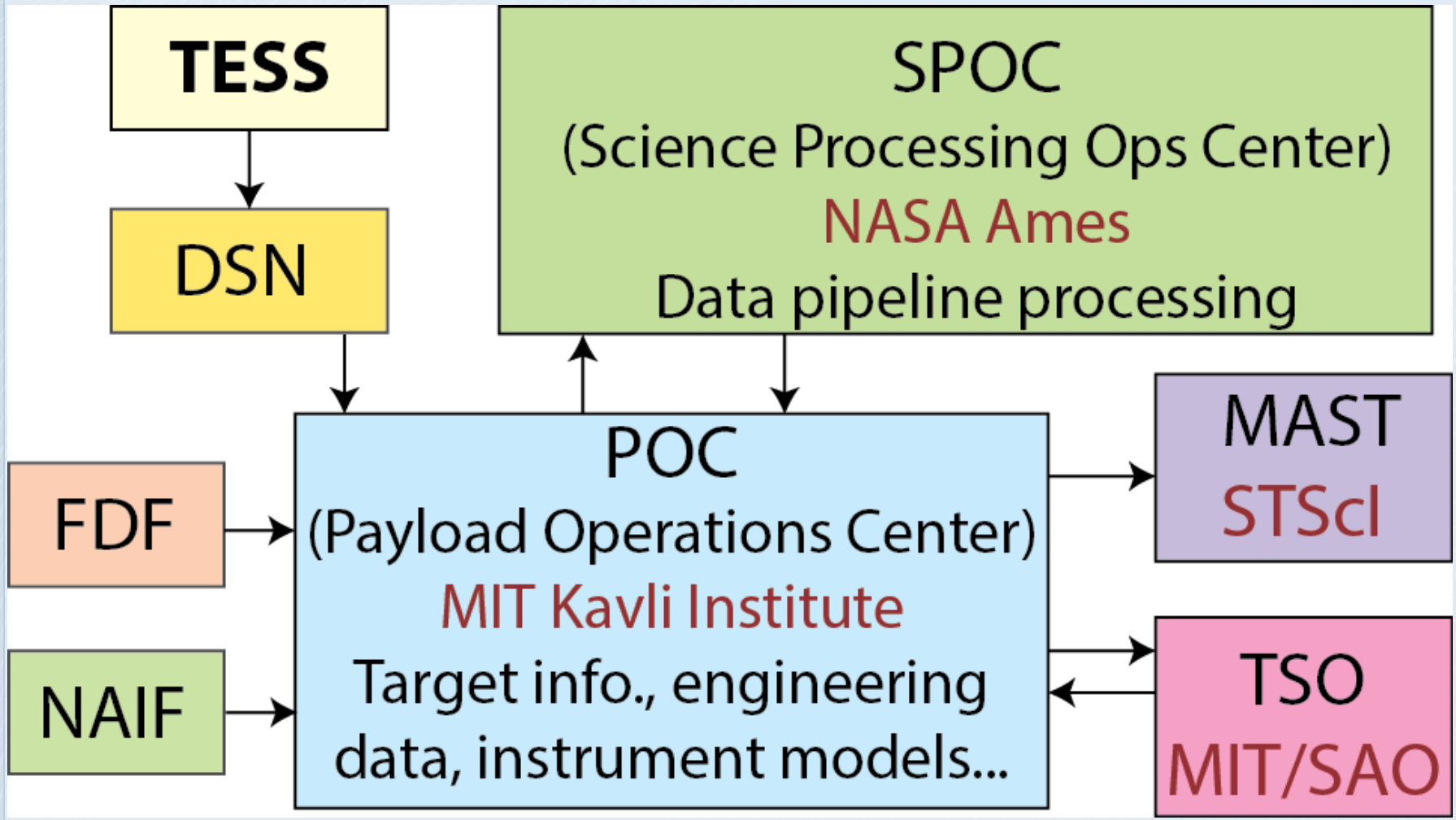
Top 200,000 Targets



Future steps for the TIC and CTL

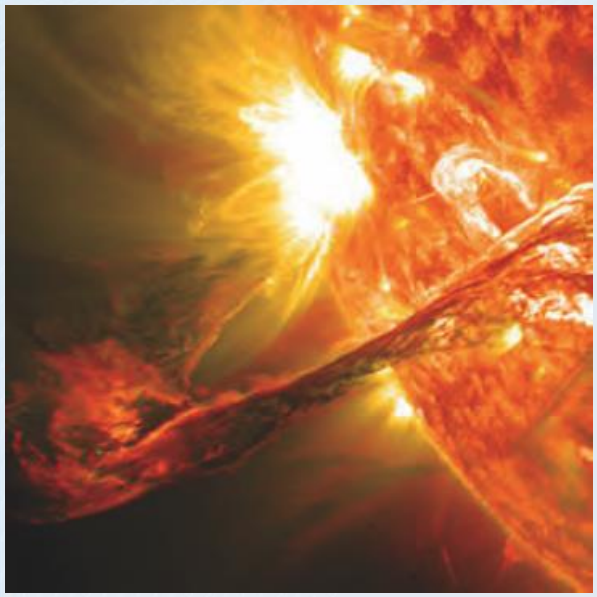
- **Improvements to CTL**
  - *Address proper motion issues in south with new catalogs*
  - *Address priority differences in SDSS footprint*
  - *Update reddening calculation for TIC-5 (early June)*
- **TIC/CTL release**
  - *TIC-5 will be made available for TESS GI cycle 1 call to facilitate proposal preparation*
  - *Companion paper that describes TIC/CTL will be posted to arXiv*
  - *Public access through STScI MAST server*
  - *Possible public access to plotting with Filtergraph*
- **Future TIC**
  - *TIC-6 will include Gaia DR1 data*
  - *Version after TIC-6 will include Gaia DR2 (parallaxes for most stars)*

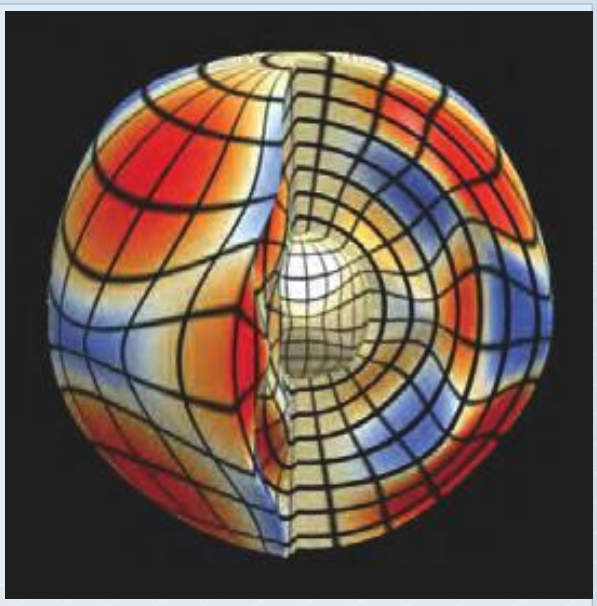
Data Reduction and Archiving



First data: within 6 months of collection. After that, all data within 4 months of collection

Science beyond Exoplanets





Time-domain astronomy:

- Binary stars
- Active Galactic Nuclei
- Exoplanets
- Stellar Pulsation
- Solar System Objects
- Transient counterparts
- Supernovae
- Tidal Disruption Events
- Brown Dwarfs

And much, much more…

The TESS Guest Investigator Program

- **Schedule**
  - ***Launch-9 months (June): Cycle 1 call released***
  - ***Launch-6 months (Sept): Proposals due***
  - ***Launch-4 months (Nov): Review***
  - ***Launch-2 months (Jan): Selections announced***
- **Soliciting proposals for new 2-minute cadence data**
  - ***~20,000 targets over 2 years***
  - ***For either exoplanet or general astrophysics***
- **Also for working with Full-Frame Images (FFIs)**
- **Allow for a wide range of different investigations, but all proposals must be focused on TESS data**
- **GI Program Lead: P. Boyd (GSFC)**

Possible Extended Mission

Possibilities for an extended mission already under consideration

- Potential Senior Review in 2018?