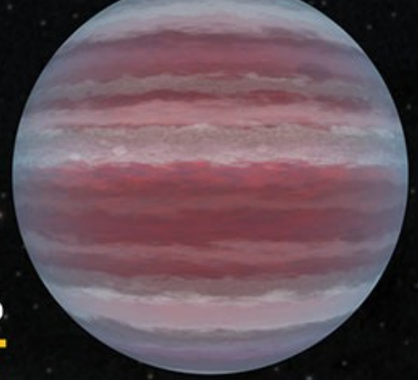
NASA's TESS Mission
Interactive Data Workshop

Internet Name:

Password:


How many planets are there in our Galaxy, and how many of these are habitable?
Illustration


Radial Velocity 0
Transit 0
Imaging 0
Microlensing 0
Year: 1991
Exoplanets: 0
0 Timing Variations
0 Orbital Brightness Modulation
0 Astrometry
0 Disk Kinematics

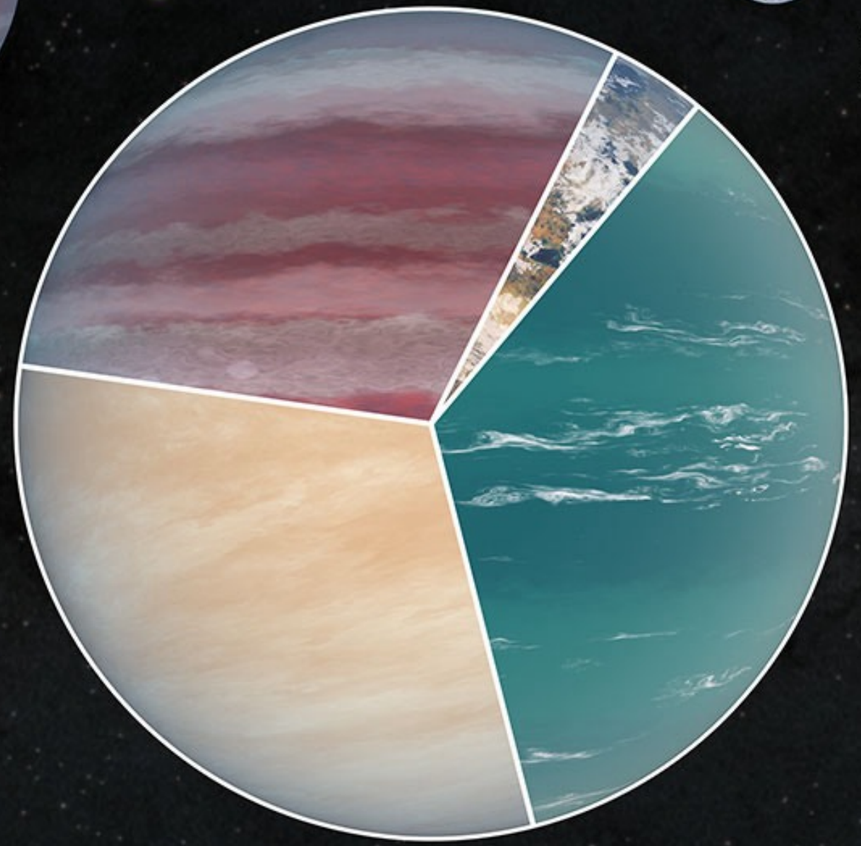


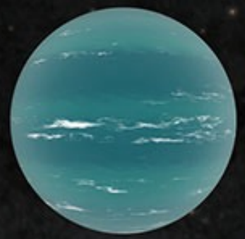
30%
GAS GIANT

The size of Saturn or Jupiter (the largest planet in our solar system), or many times bigger. They can be hotter than some stars!

4%
TERRESTRIAL

Small, rocky planets. Around the size of our home planet, or a little smaller.





35%
NEPTUNE-LIKE

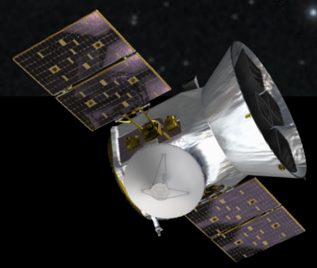
Similar in size to Neptune and Uranus. They can be ice giants, or much warmer. “Warm” Neptunes are more rare.

31%
SUPER-EARTH

Planets in this size range between Earth and Neptune don’t exist in our solar system. Super-Earths, a reference to larger size, might be rocky worlds like Earth, while mini-Neptunes are likely shrouded in puffy atmospheres.

5811

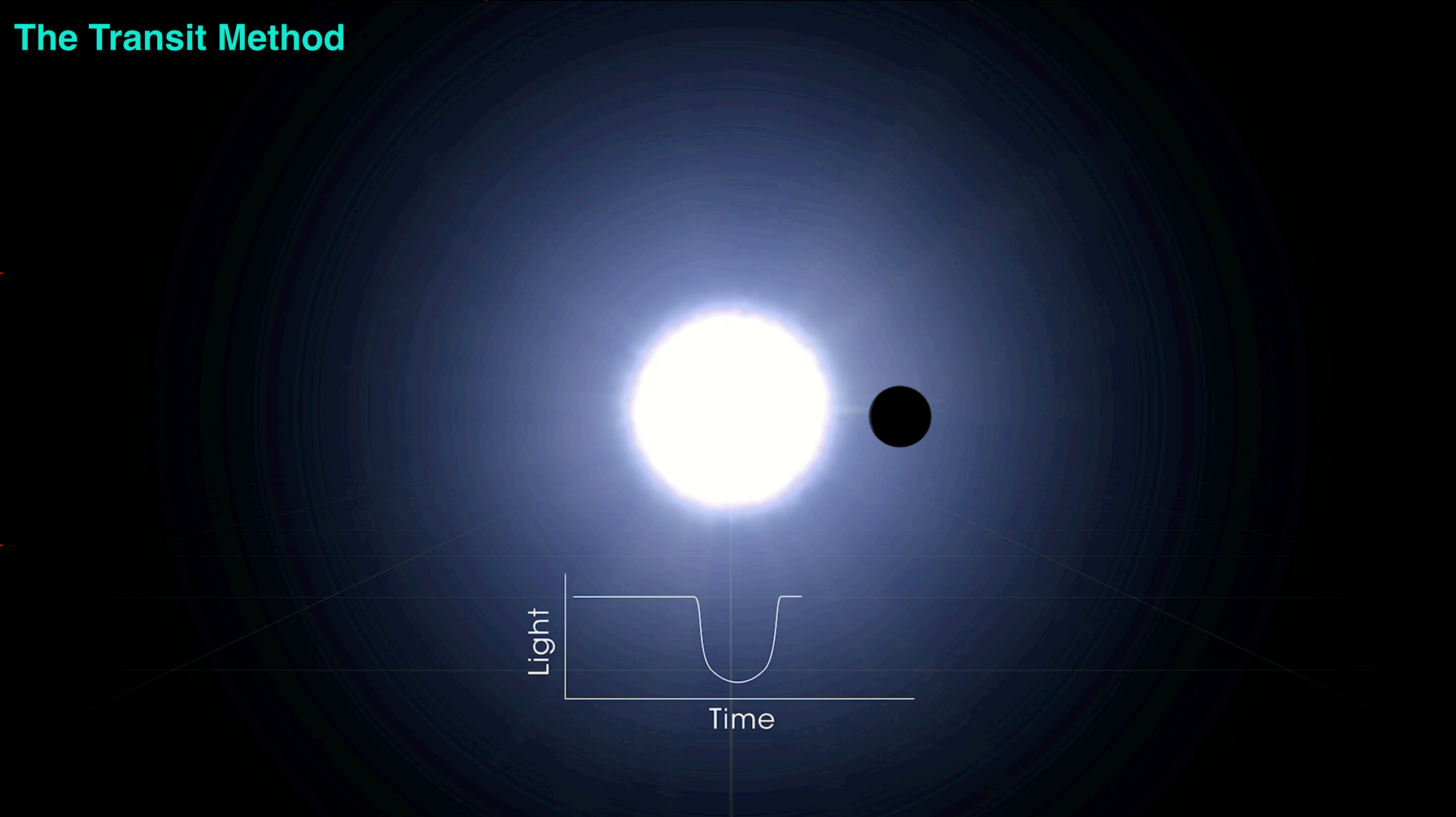
PLANETS FOUND

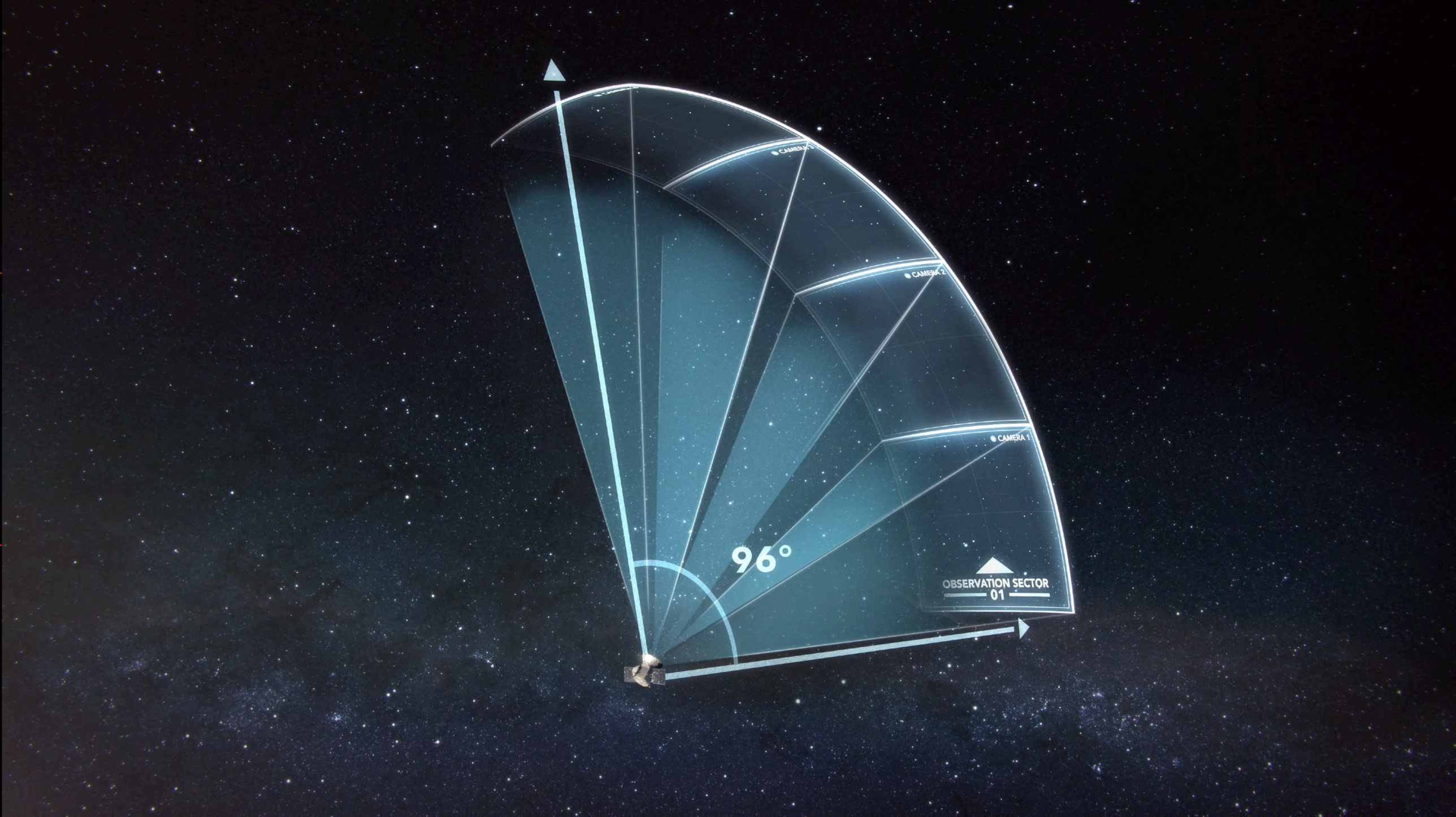


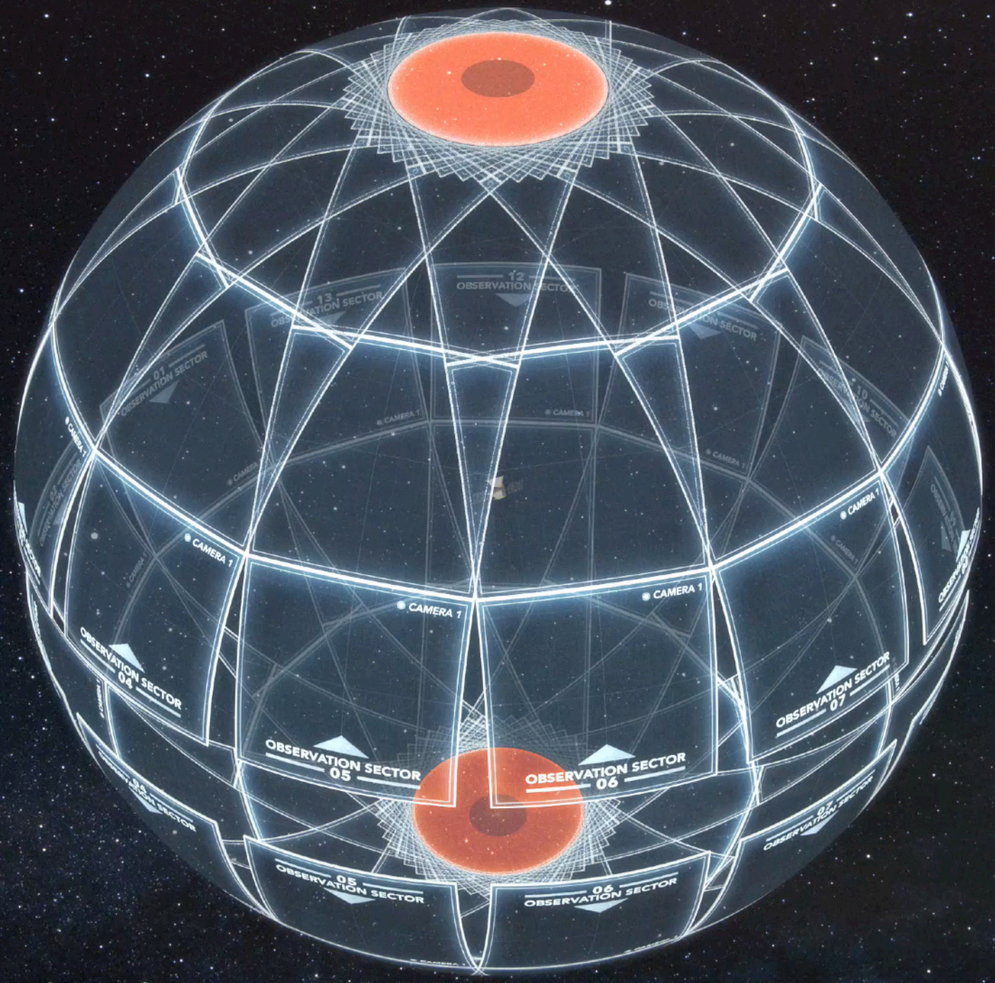
591 confirmed planets with **TESS**

Another **7,358** **TESS** planet candidates (Jan 9th 2025)

The Transit Method




CAMERA 3
CAMERA 2
CAMERA 1
96°
OBSERVATION SECTOR
01


OBSERVATION SECTOR 05
OBSERVATION SECTOR 06
CAMERA 1

Full Frame Images (FFIs)

24 Degrees

200-sec FFIs in the second extension

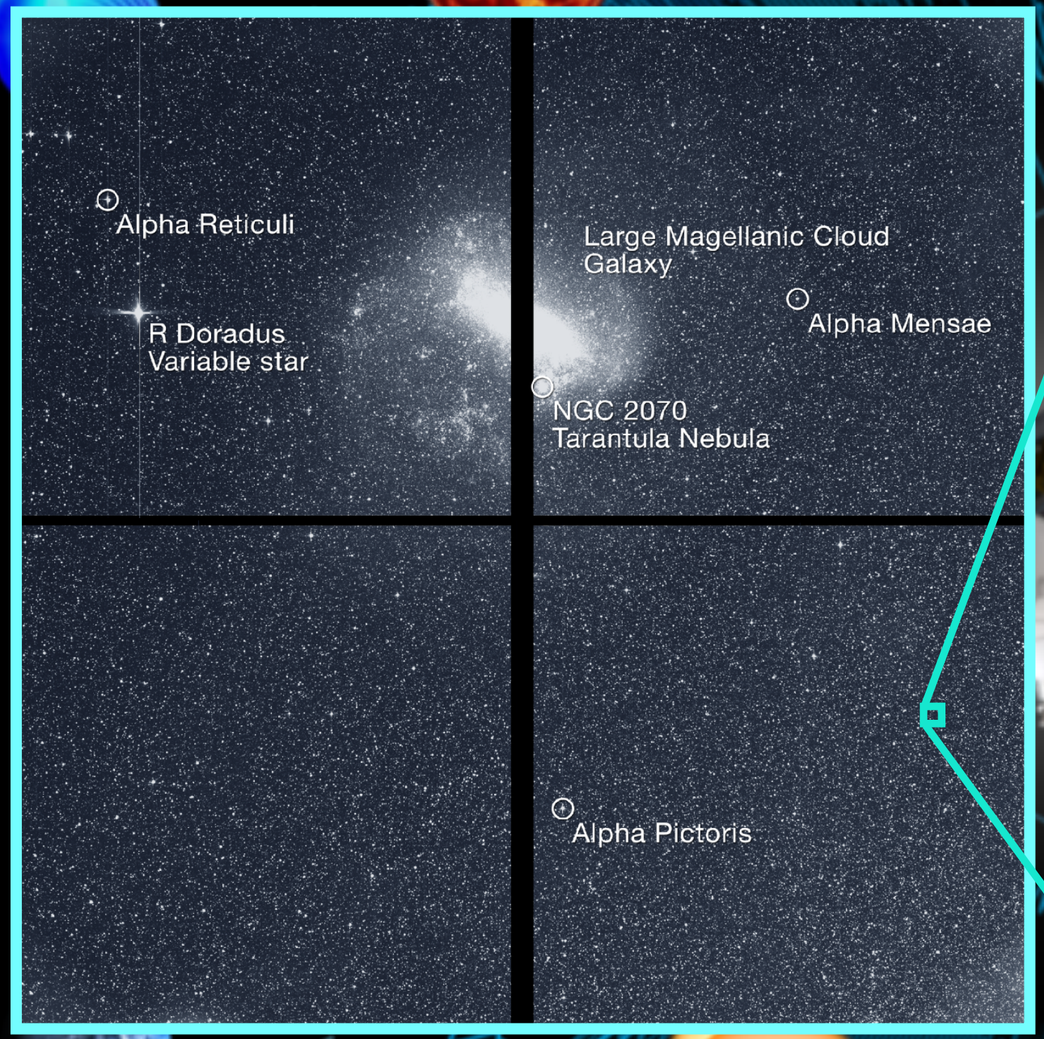
~300 million stars & galaxies in 3 years

There is no proprietary period for TESS data.

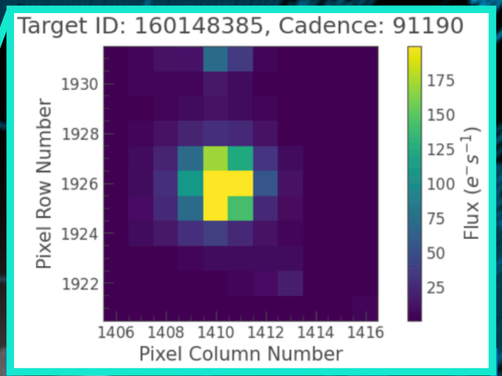
96 Degrees

Image credit: George Ricker

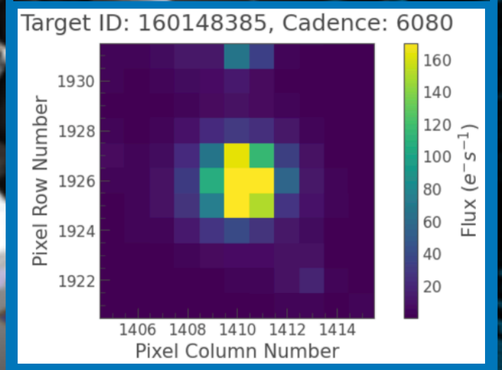
Target Pixel Files (TPF)



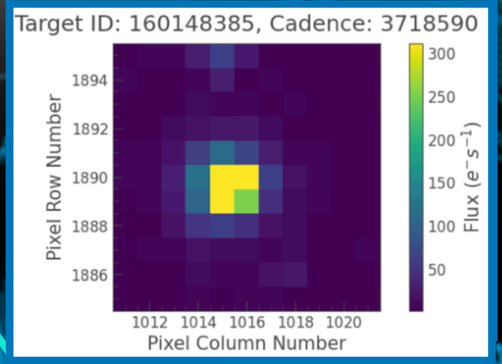
Cadence 1



Cadence 2



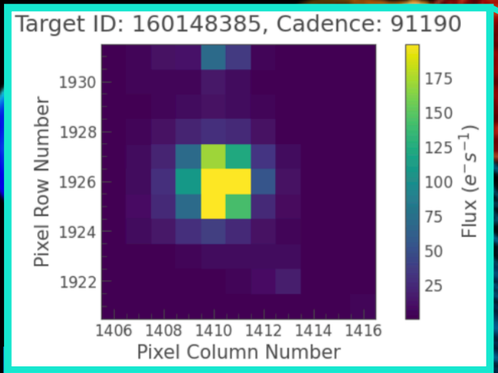
Cadence 3



- Each year General Investigators can propose to view their targets of interest at a higher cadence.
- Selected targets are “cut out” of TESS FFIs at a cadence of 2-min or 20 sec.
- More than 8,000 target slots available per sector for 2-min cadence data.
- Approximately 2,000 20-sec cadence target slots available per sector.

Light Curve Files

Cadence 1



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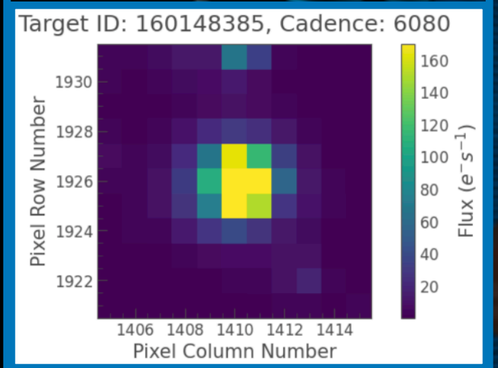

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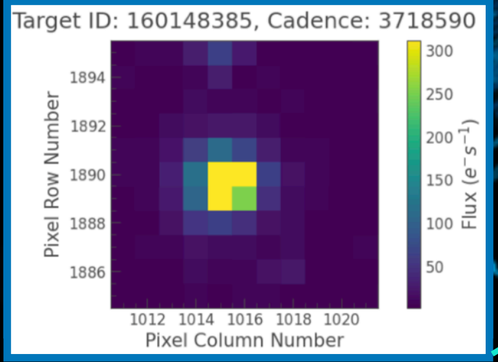
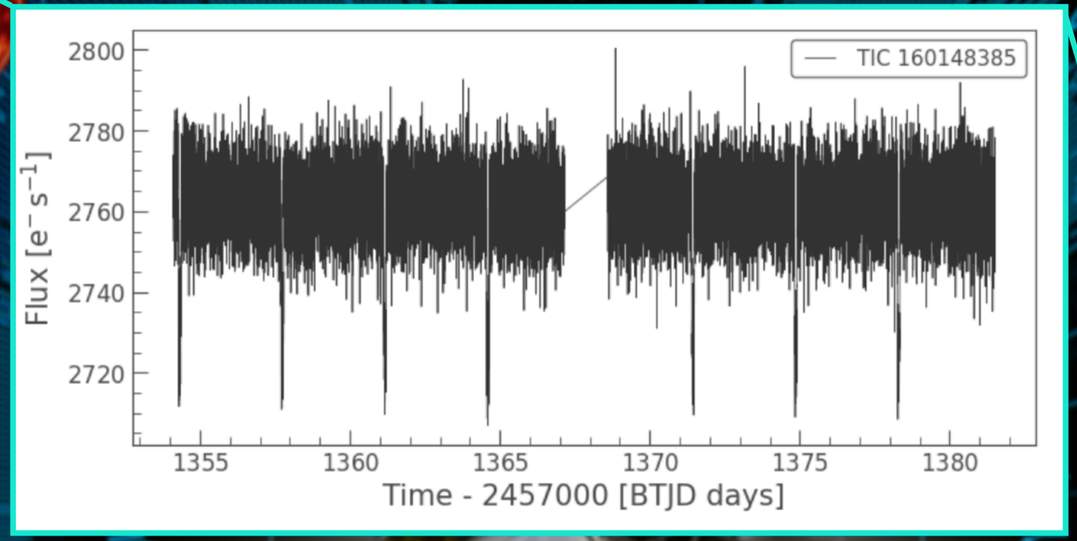
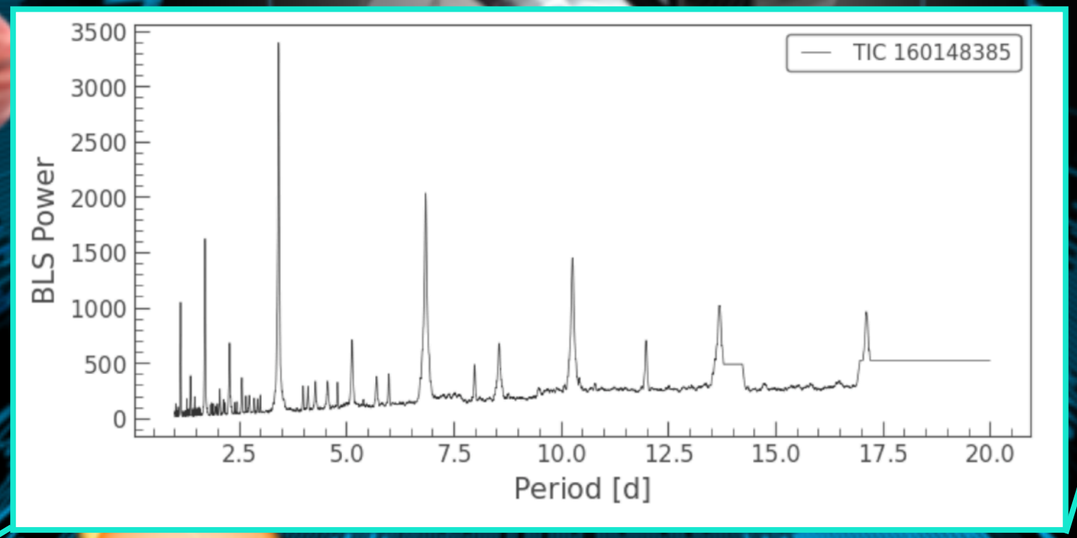
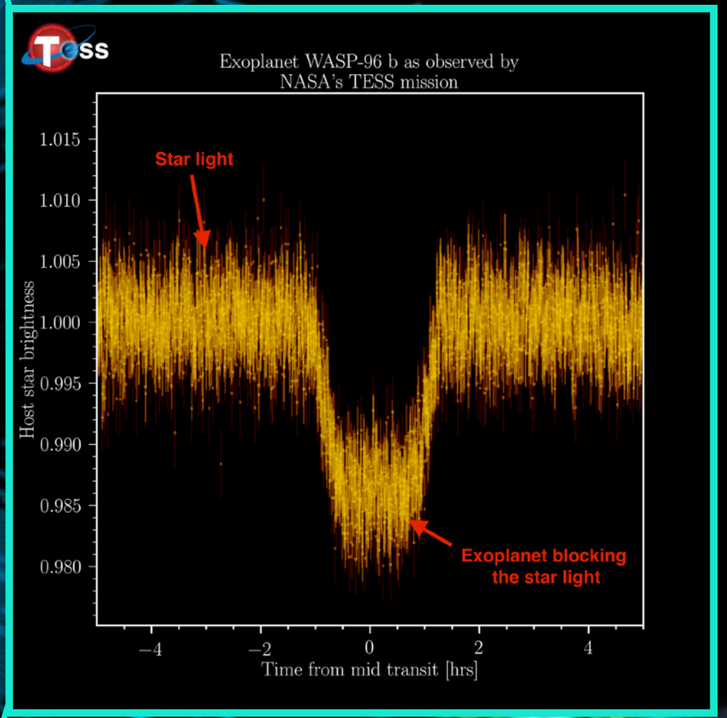
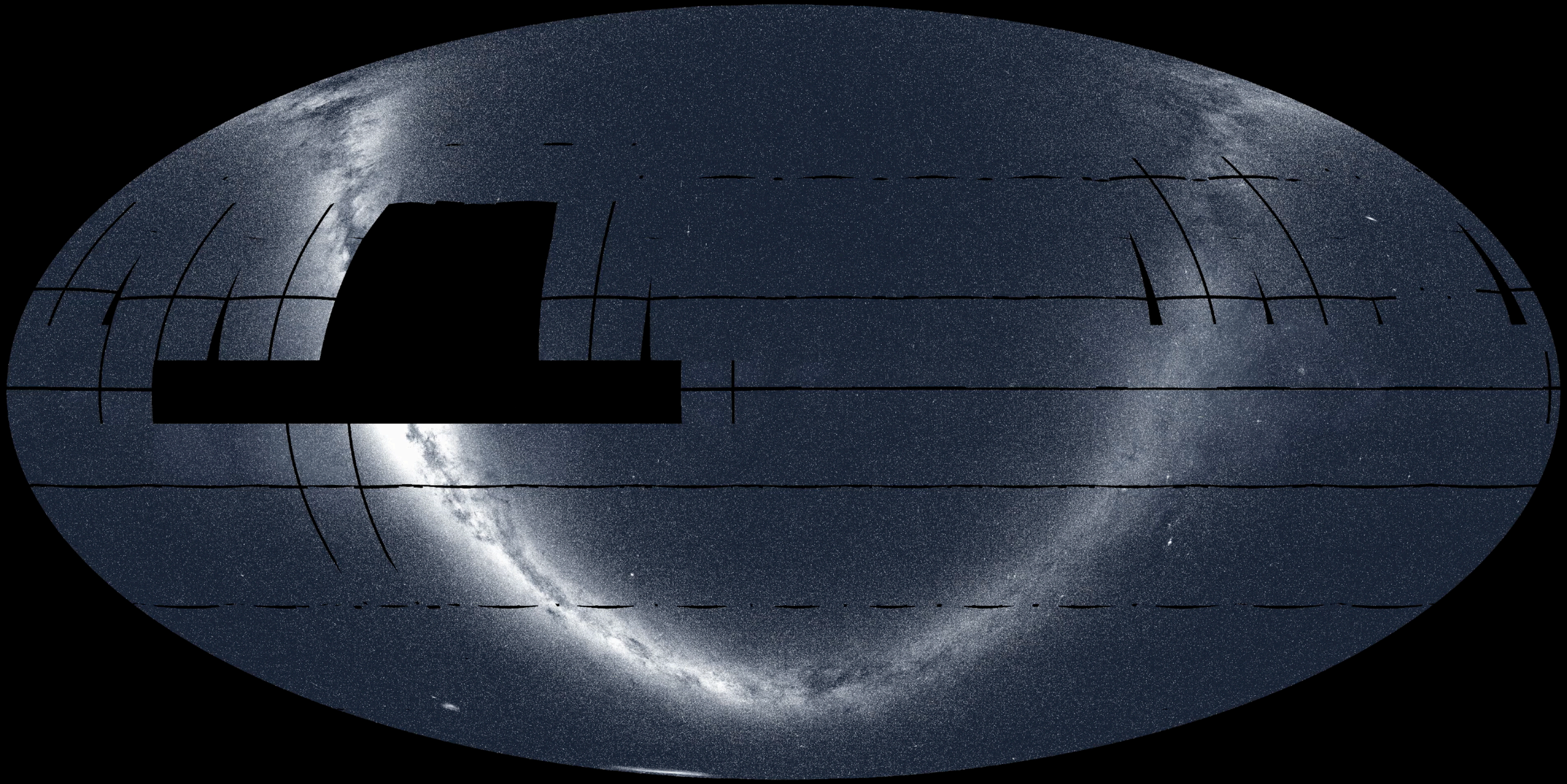
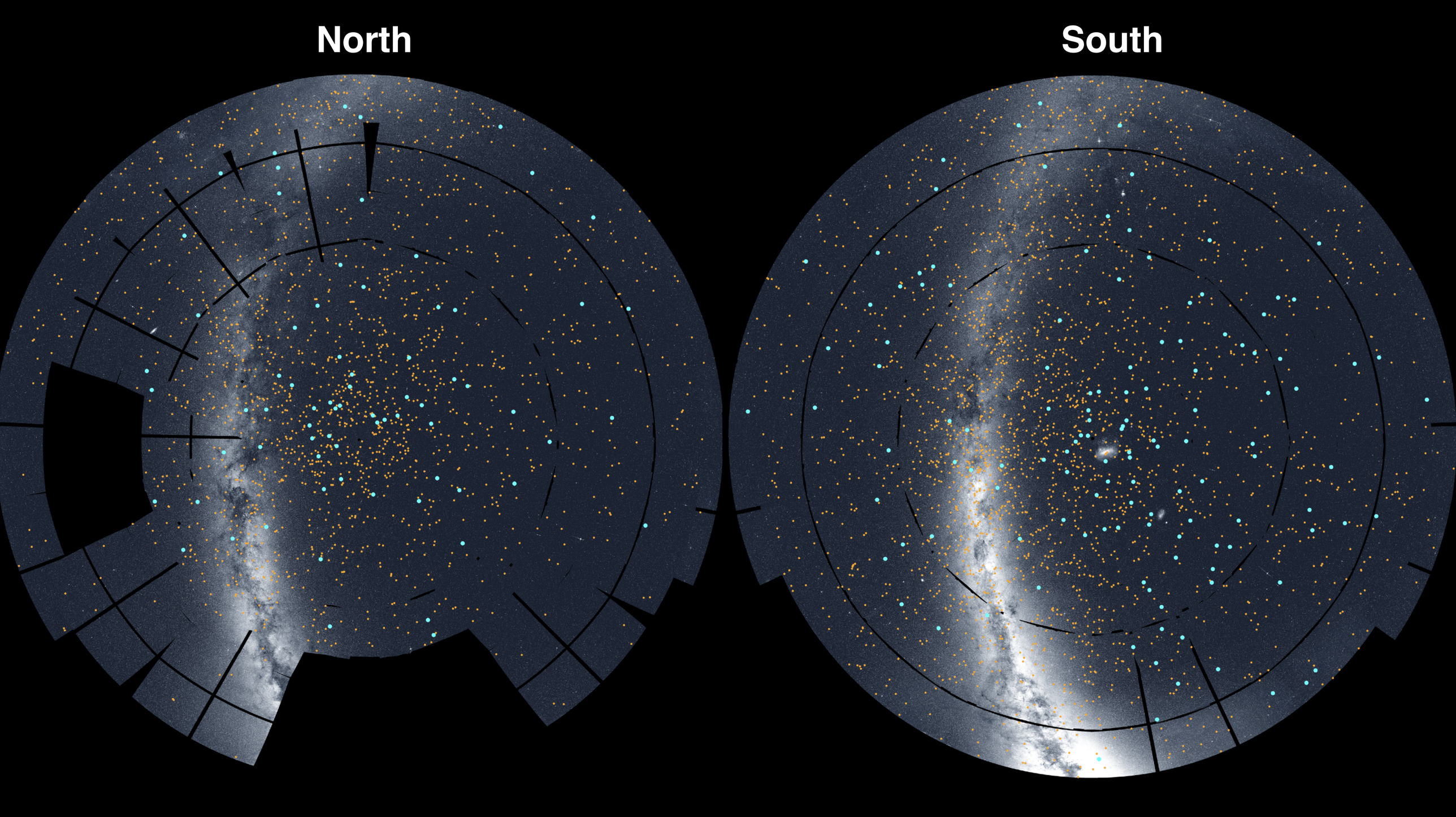




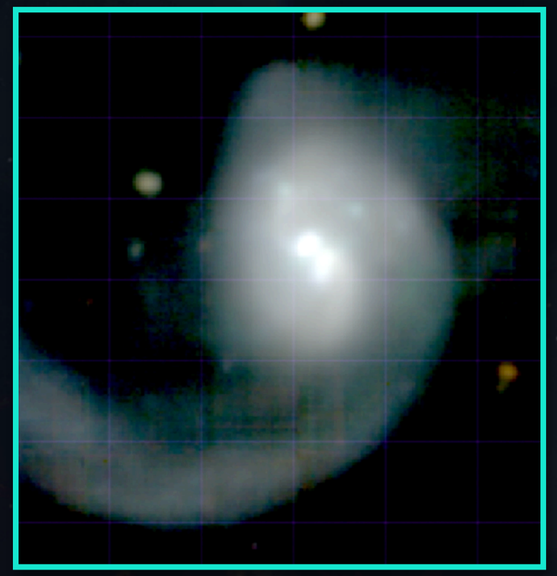






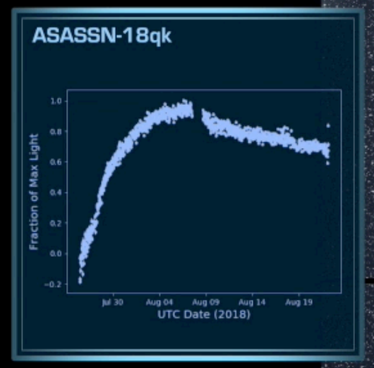

North
South

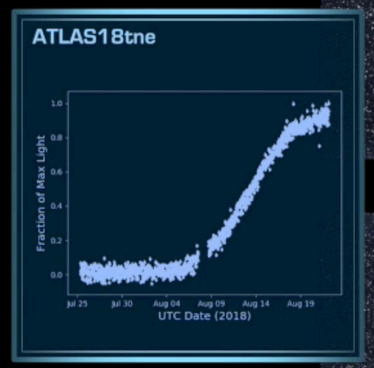
More than exoplanets have been found with TESS…

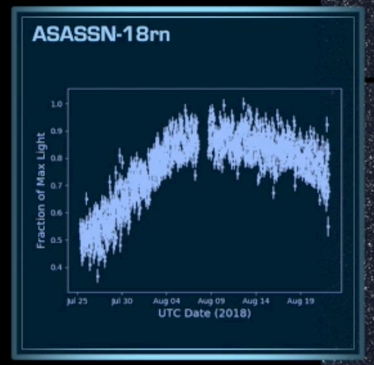


Partial Tidal Disruption Event

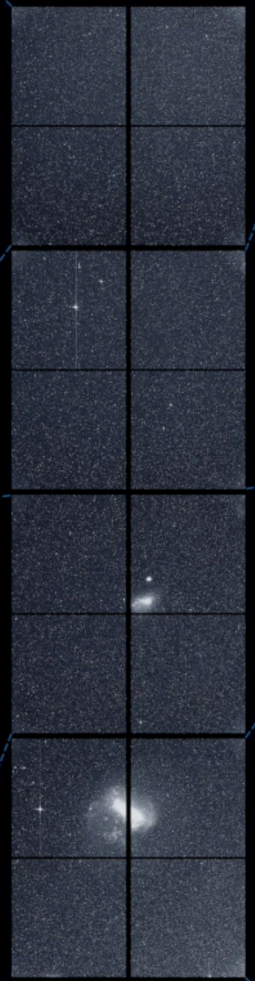
Supernovae


ASASSN-18qk
Fraction of Max Light
UTC Date (2018)

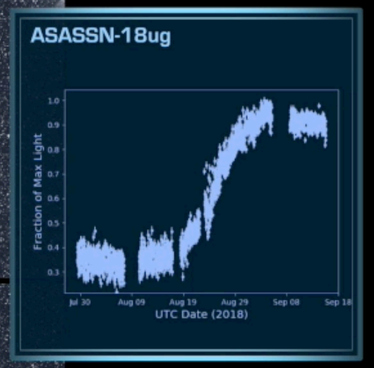

ATLAS18tne
Fraction of Max Light
UTC Date (2018)


ASASSN-18rn
Fraction of Max Light
UTC Date (2018)


ASASSN-18qk
ATLAS18tne
ASASSN-18rn
ASASSN-18ug




ASASSN-18tb
ASASSN-18qv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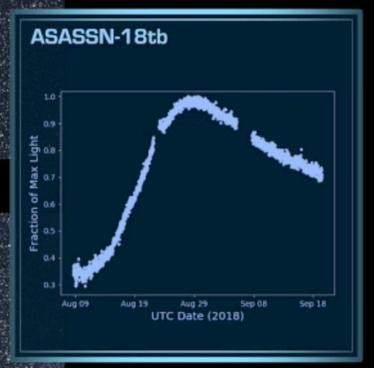
UTC Date (2018)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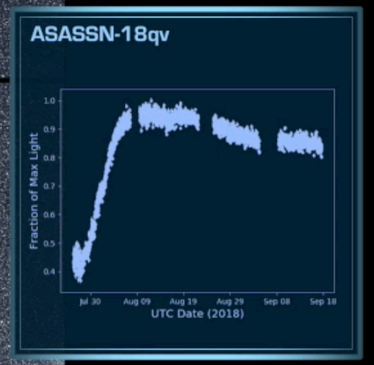
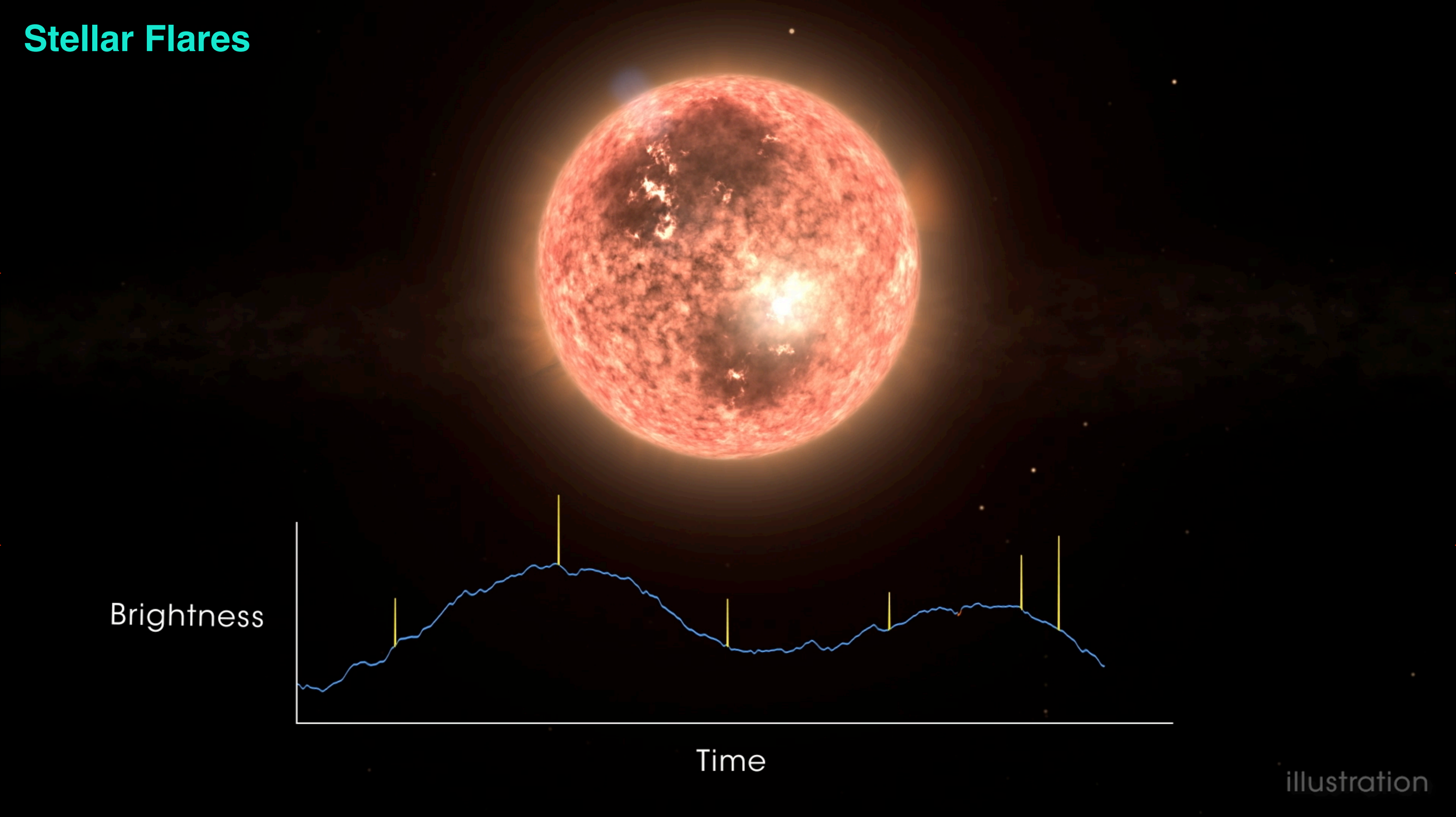
Fraction of Max Light
UTC Date (2018)


ASASSN-18qv
Fraction of Max Light
UTC Date (2018)

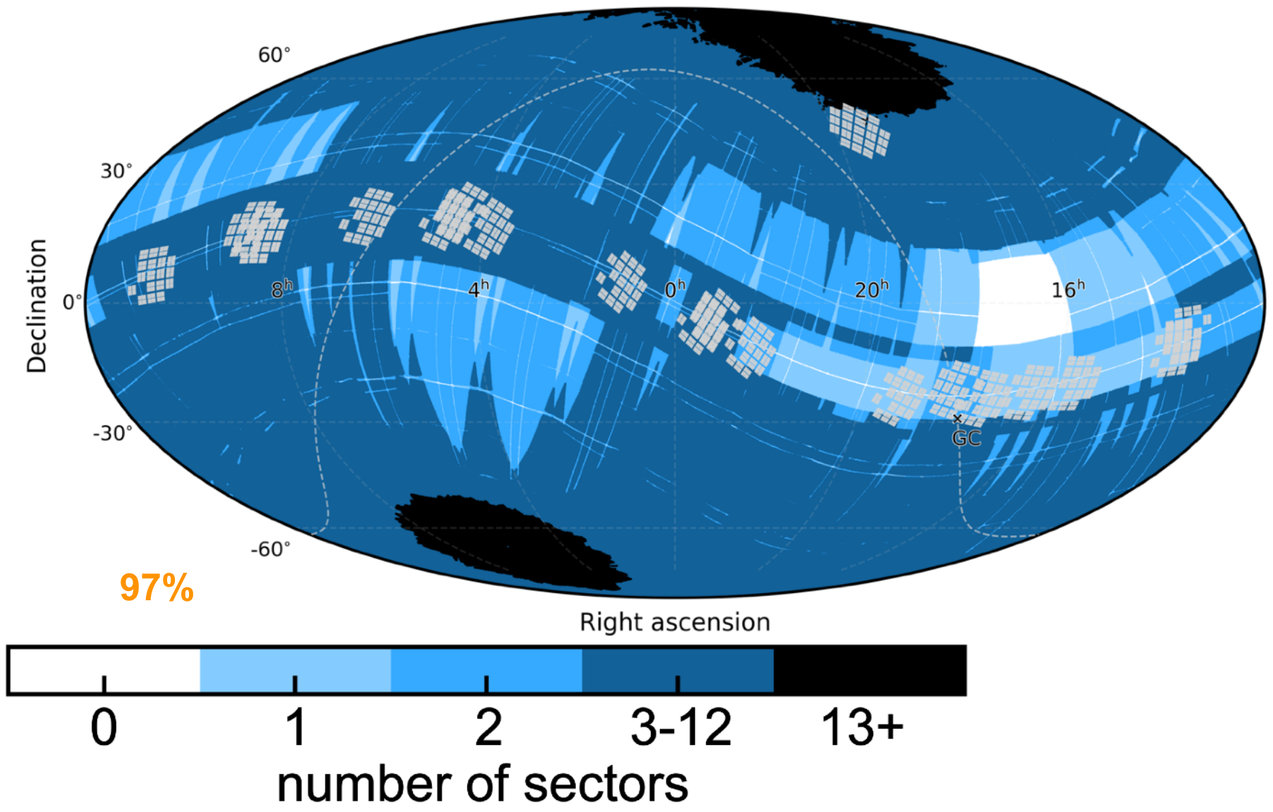
Stellar Flares



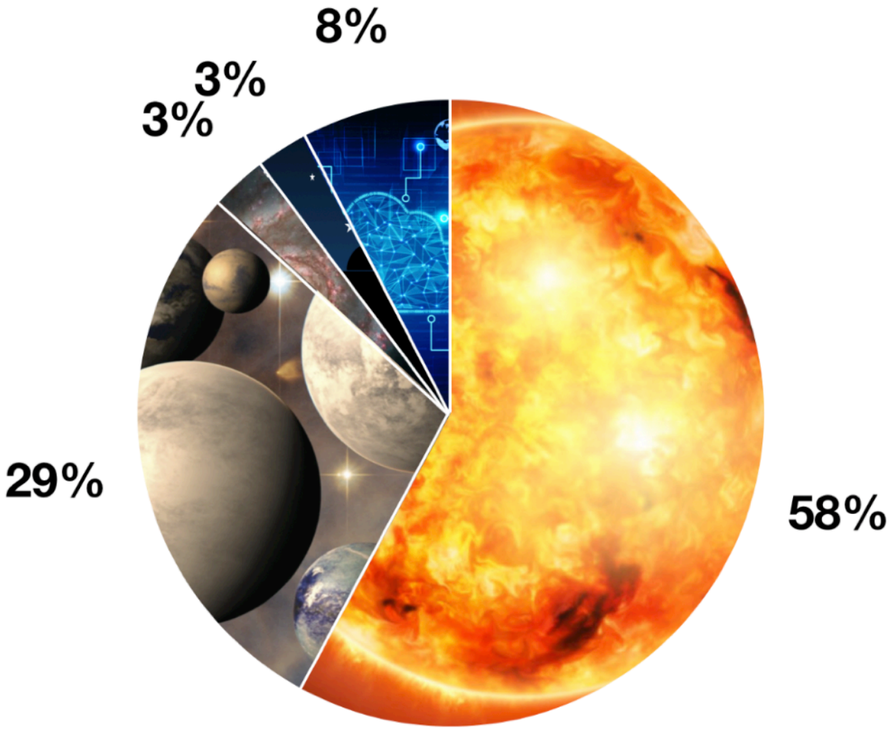
illustration

Cycle 7 of the TESS Mission

Second Extension: Cycles 5+

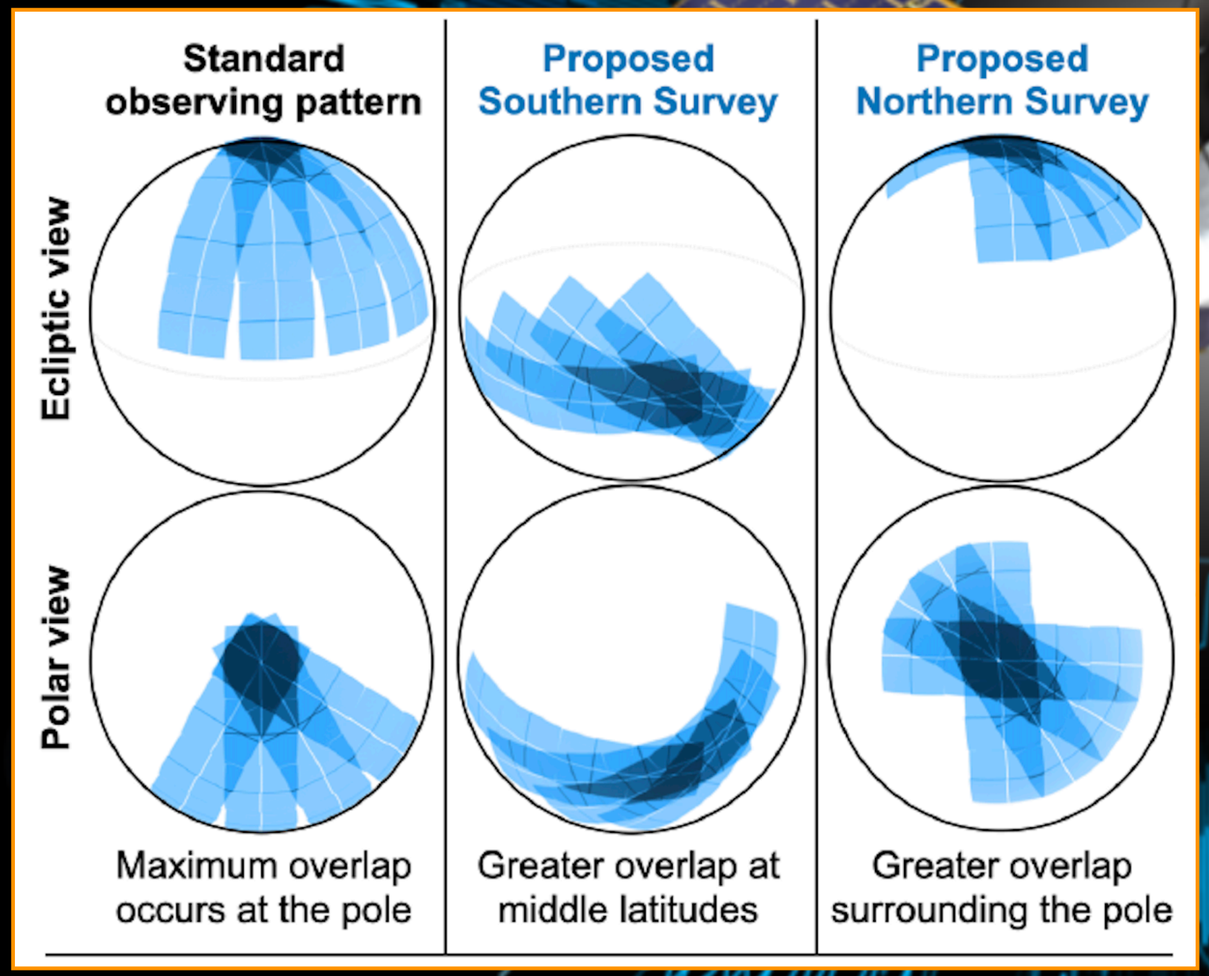


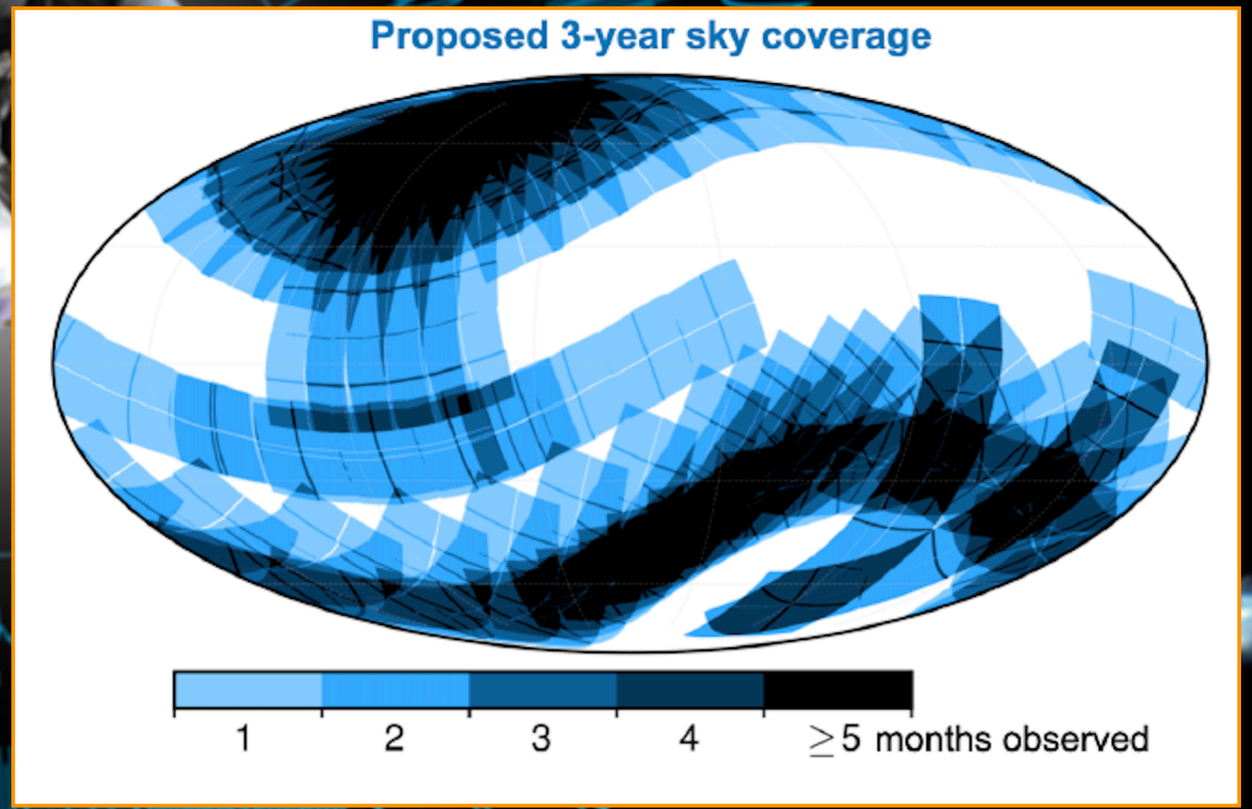
97%



- Stellar Astrophysics
- Exoplanets
- Accretion & Extragalactic
- Solar System
- Other

TESS EM 3
What the future holds



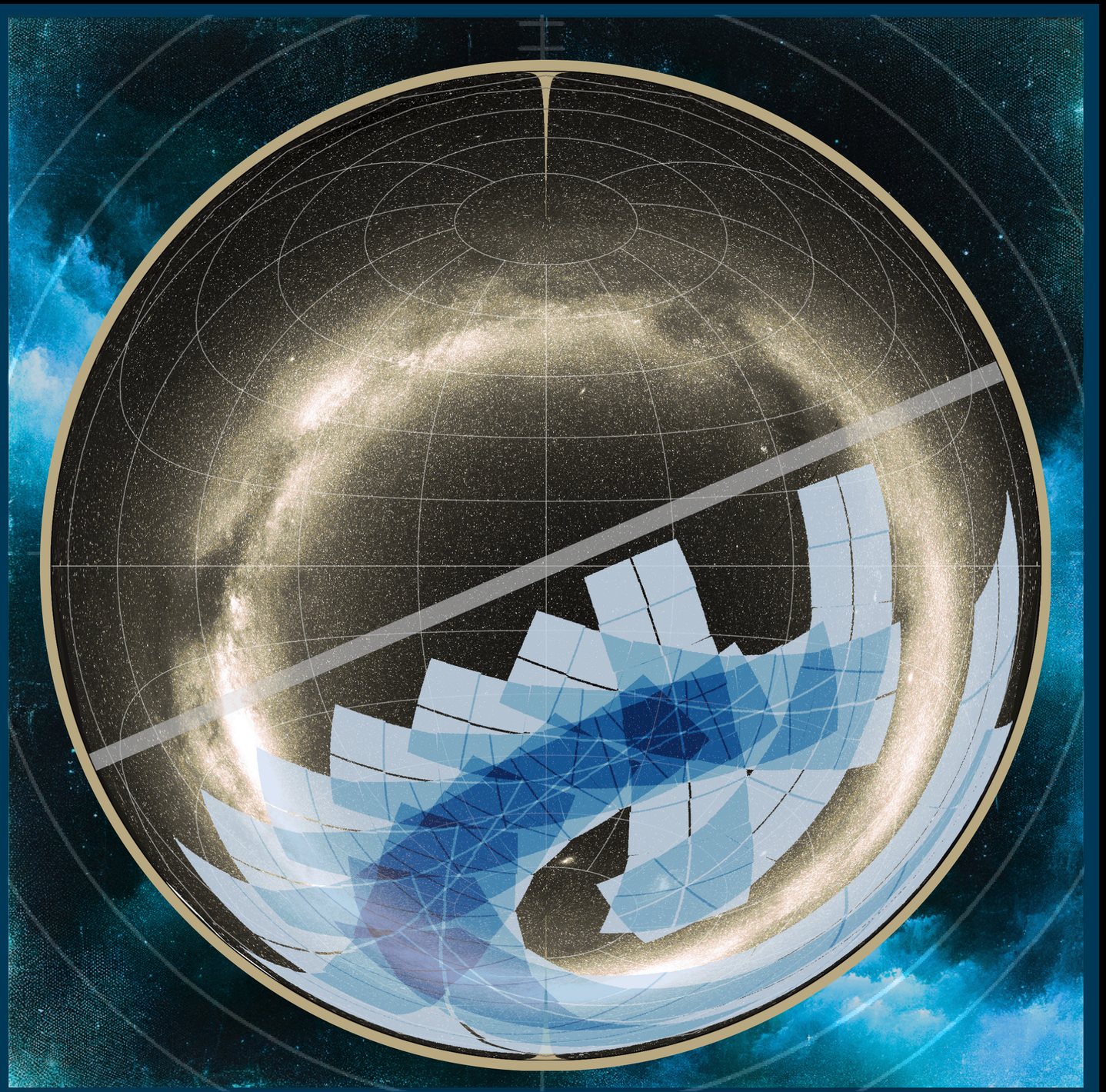


National Aeronautics and Space Administration

The Transiting Exoplanet Survey Satellite (TESS) is a NASA-sponsored Astrophysics Explorer-class mission that is performing a near all-sky survey in the optical. The TESS instrument has four cameras, each with a field-of-view of 24 x 24 degrees, arranged in a 4 x 1 array, creating a combined field-of-view of 96 x 24 degrees. The footprint for the Cycle 8 observing schedule, running from October 2025 to October 2026, is shown to the right. TESS data provides a cadence of 200 seconds, with a pixel scale of 21 arcseconds. TESS data is precise to 1% over 1 hour down to 16th magnitude.

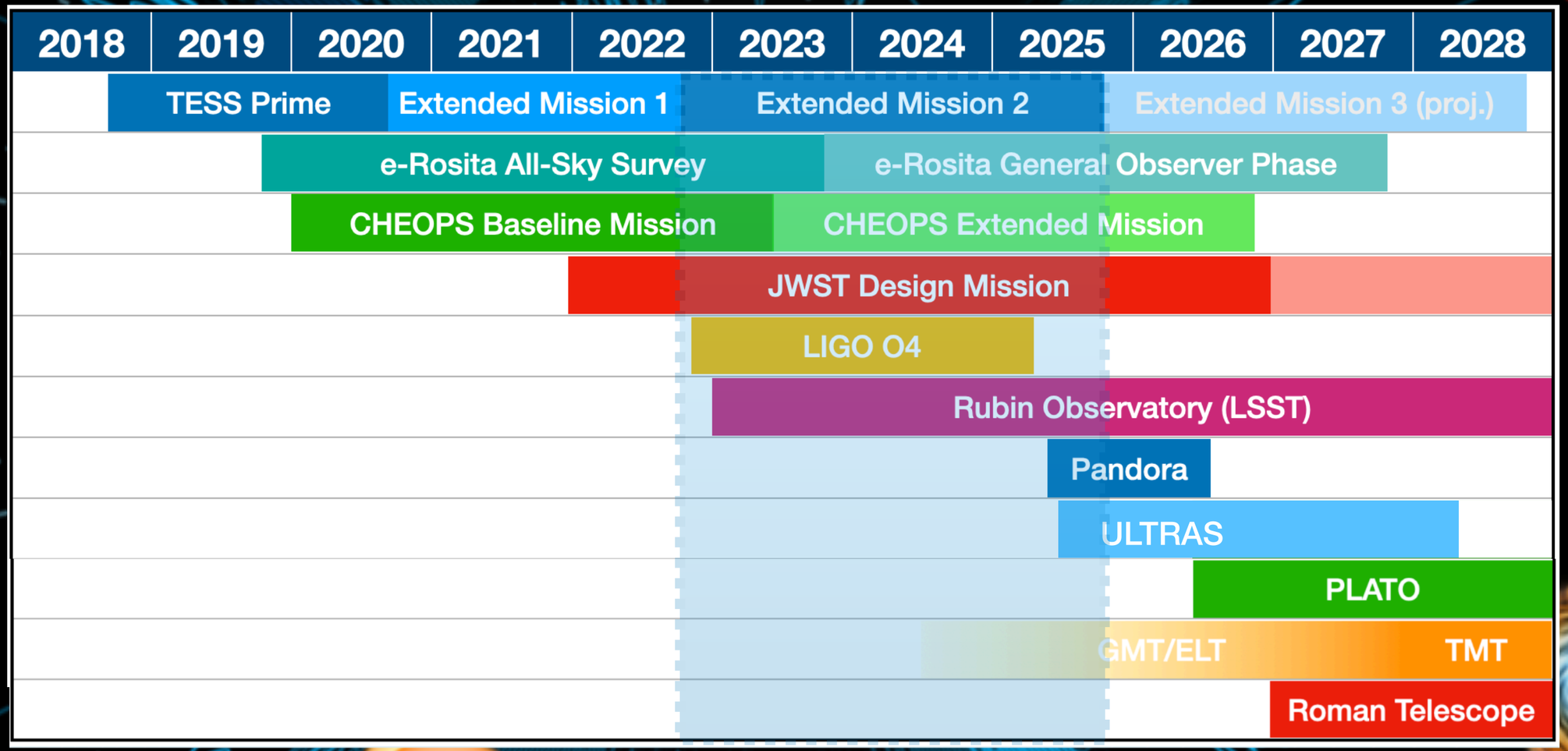
TESS Cycle 8 will focus on the Southern ecliptic pole, and include two Sectors with 54 day durations and nine Sectors with 28 day durations. TESS will introduce a new, rolled pointing strategy to increase overlap across Sectors at higher declinations. The NASA TESS General Investigator Proposal Call solicits proposals for research funding and pipeline processed data products.
Learn more at:
https://heasarc.gsfc.nasa.gov/docs/tess

NASA TESS CYCLE 8



THIS FIGURE SHOWS A MAP OF THE SKY IN EQUATORIAL COORDINATES WITH THE FOOTPRINT OF TESS CYCLE 8 OPERATIONS OVERLAYED. THE MAP IS IN A LAMBERT PROJECTION.

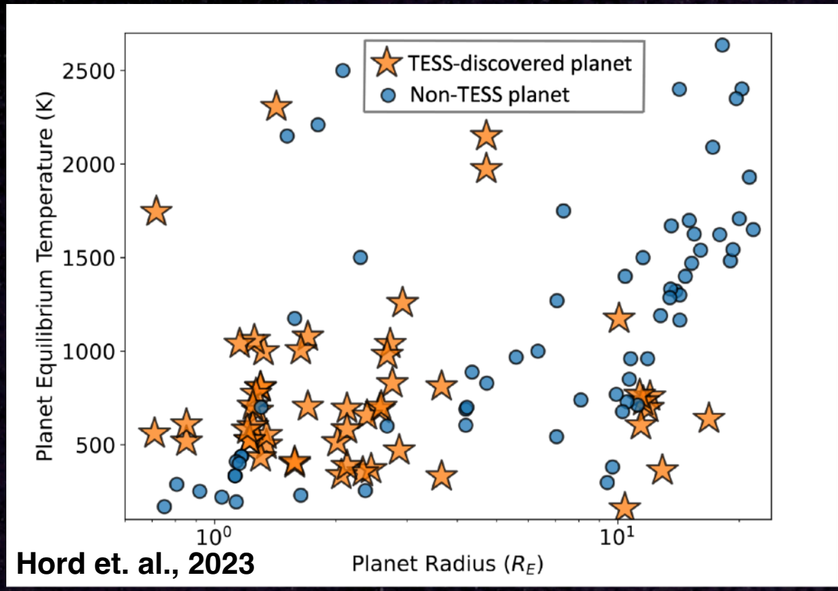
Synergies Timeline



HST-Chandra-NICER-Swift-Fermi-XMM

Image credit: George Ricker

TESS + JWST



Hord et. al., 2023

TESS General Investigators greatly enhance JWST observations of transiting exoplanets. Additional opportunities exist for TESS photometry to aid in the interpretation of future JWST observations of transients like supernovae, gamma-ray bursts, and active galactic nuclei during the second extension of the mission.

TESS + LIGO/VIRGO + Rubin

LIGO + VIRGO

Designed to detect gravitational waves. LIGO is the biggest GW observatory, but it is not the only one. Virgo is another facility located in Italy. Neither can pinpoint the exact location of where the GW is coming from - multiple detectors are needed. TESS can detect the brightest optical counterparts of gravitational-wave sources.

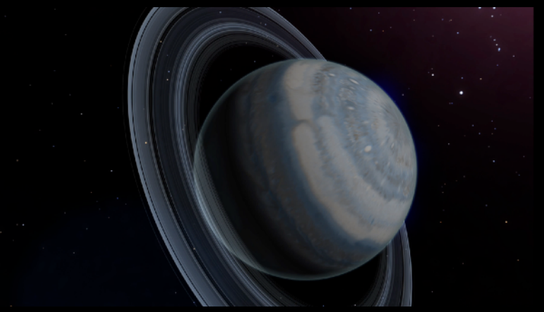
Rubin

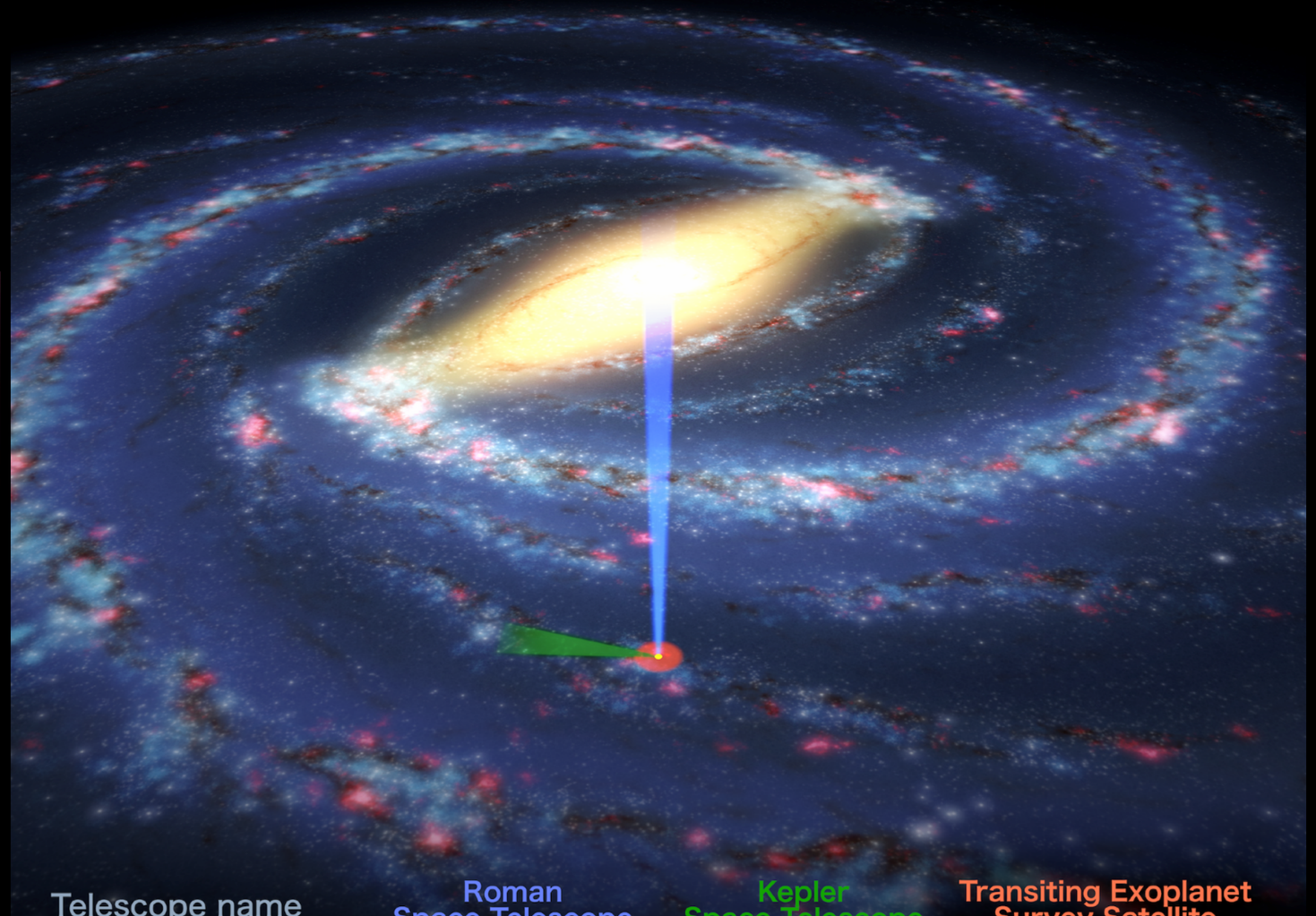
The goal of the Vera C. Rubin Observatory project is to conduct the 10-year Legacy Survey of Space and Time (LSST). It will probe dark energy and dark matter, take inventory of the solar system, explore the transient optical sky, and map the Milky Way. It will observe the sky in u, g, r, i, z & y. TESS can observe bright-sources with a rapid-cadence which complements the Rubin Observatory.

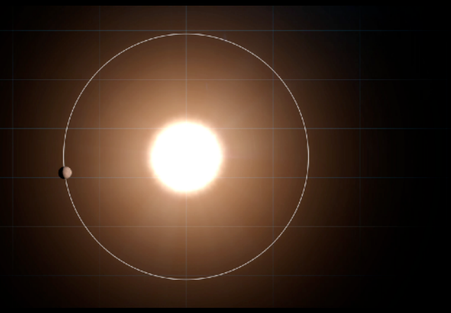
NANCY GRACE ROMAN SPACE TELESCOPE

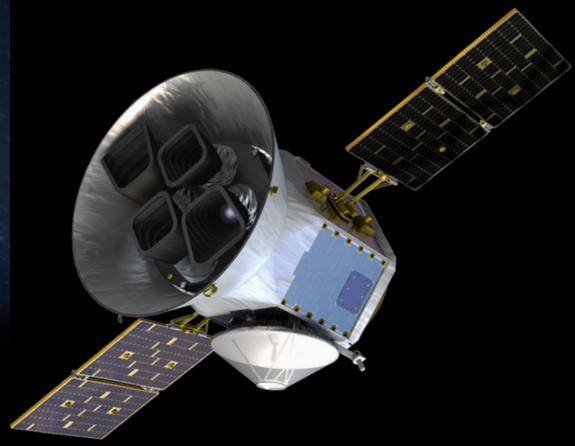
Looking for Exoplanet Transits in the

MILKY WAY









Telescope name	Roman Space Telescope (Upcoming)	Kepler Space Telescope (Prime Mission)	Transiting Exoplanet Survey Satellite (TESS)
Viewing range	1.6-degree cone	12-degree cone	360-degree sphere
Average planet detection distance	25,000 light-years	2,000 light-years	150 light-years

To answer the big questions we need synergy

The high-cadence, precise photometry, long baseline, and near all-sky coverage of TESS means that it provides valuable data for current and future missions, enabling key insight into some of the biggest questions in astronomy and astrophysics.