



TESS Stellar Variability Catalog (TESS-SVC)

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Visiting Assistant Professor

Collaborators: Joshua Pepper, Emilie Simpson, Stephen R. Kane, Teo Močnik, John Edward English, Victoria Antoci, Daniel Huber, Jon M. Jenkins, Keivan Stassun, Joshua D. Twicken, Roland Vanderspek, Joshua N. Winn

TESS-SVC is Available as a HLSP

- <https://archive.stsci.edu/hlsp/tess-svc>

The TESS Stellar Variability Catalog (TESS-SVC)

Primary Investigator: Tara Fetherolf

HLSP Authors: Tara Fetherolf, Joshua Pepper, Emilie Simpson, Stephen R. Kane, Teo Mocnik, John Edward English, Victoria Antoci, Daniel Huber, Jon M. Jenkins, Keivan Stassun, Joseph D. Twicken, Roland Vanderspek, Joshua N. Winn

Released: 2023-08-15

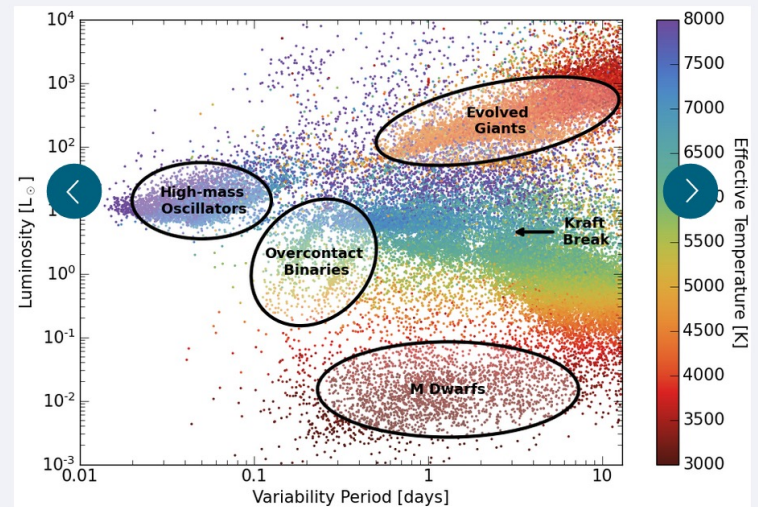
Updated: 2023-08-15

Primary Reference(s): [Fetherolf et al. 2023](#) ↗

DOI: [10.17909/f8pz-vj63](https://doi.org/10.17909/f8pz-vj63) ↗

Citations: [See ADS statistics](#) ↗

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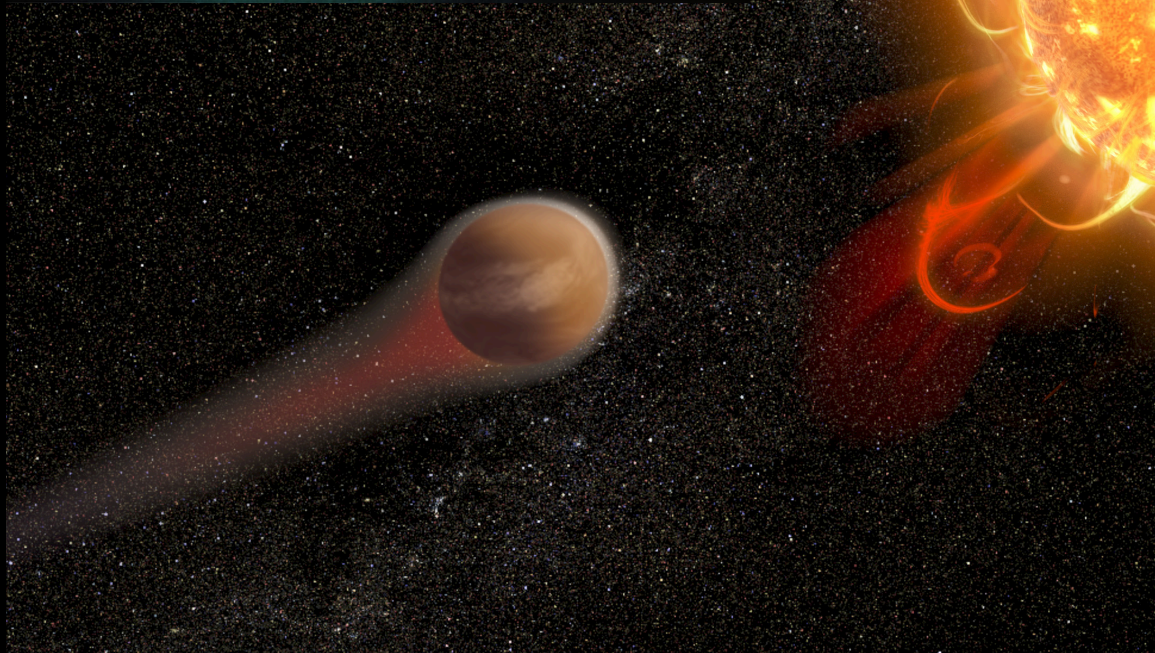
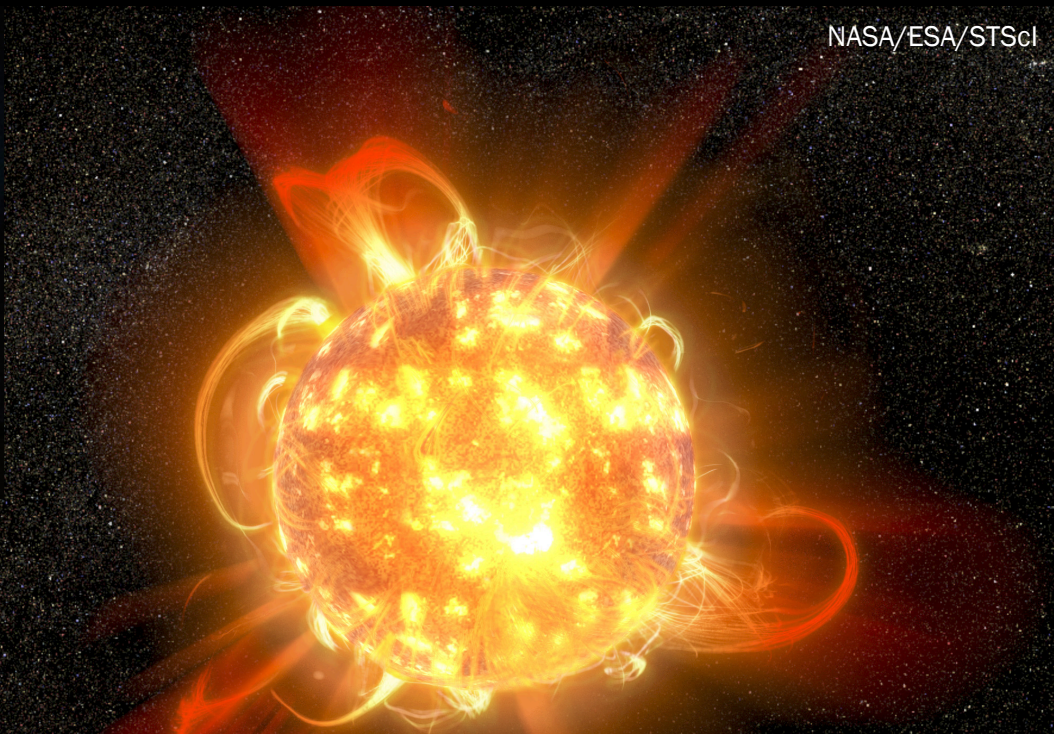


Luminosity Versus Variability Period

Calculated stellar luminosities versus the measured variability periods of stars that are identified as significantly variable, and thus are included in TESS-SVC. The points are colored by the effective temperatures reported by the TESS Input Catalog (TIC; Stassun et al. 2018; Stassun et al. 2019), and luminosities are calculated from the effective temperatures and stellar radii available in the TIC (Stassun et al. 2018; Stassun et al. 2019). Several known astrophysical relationships are highlighted and labeled with faded ellipses.

Effects of Stellar Activity on Earth

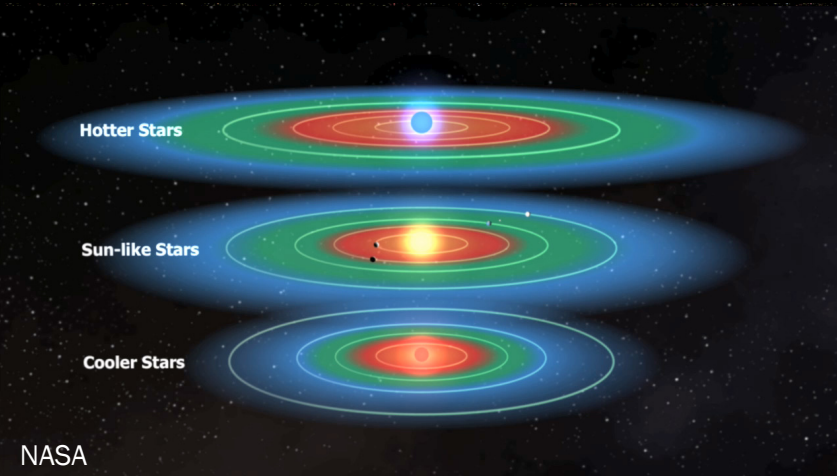
NASA/ESA/STScI



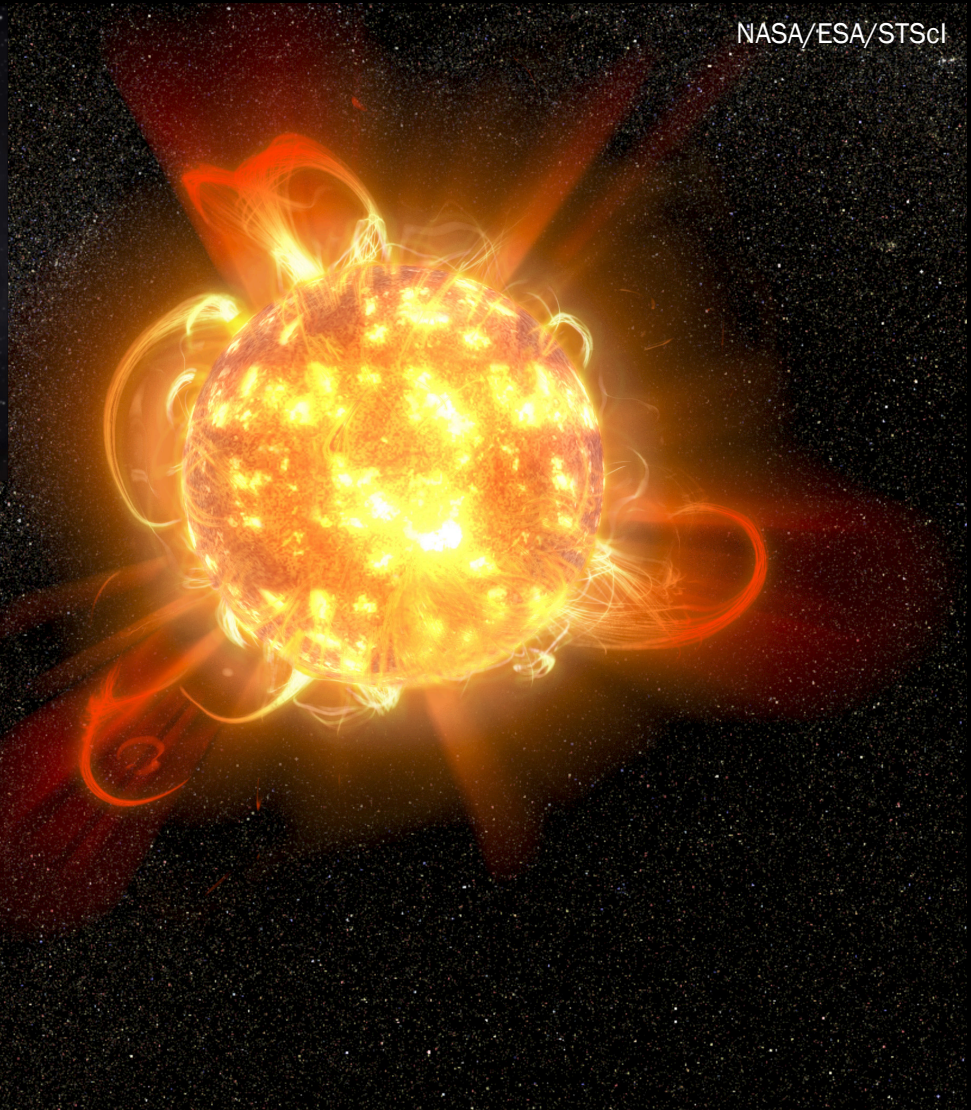
Eddie Irizarry (SAC)

Does Variability Affect Habitability?

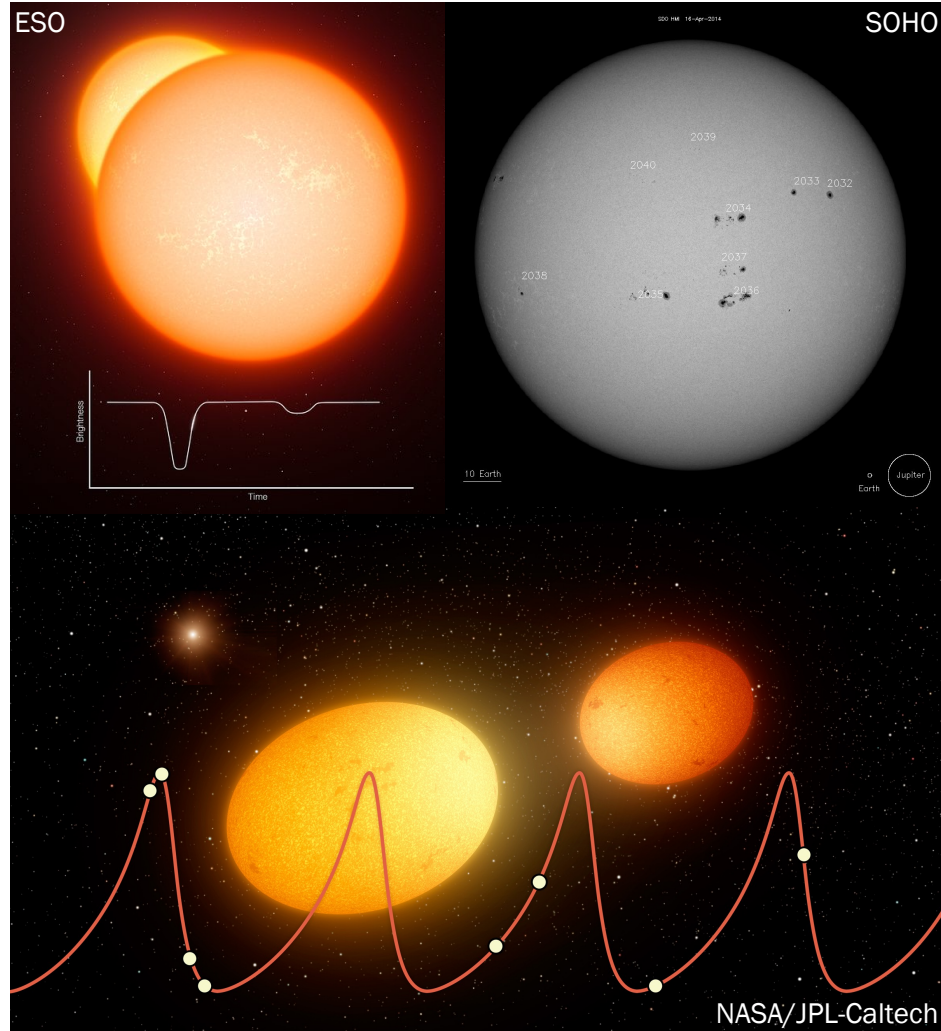
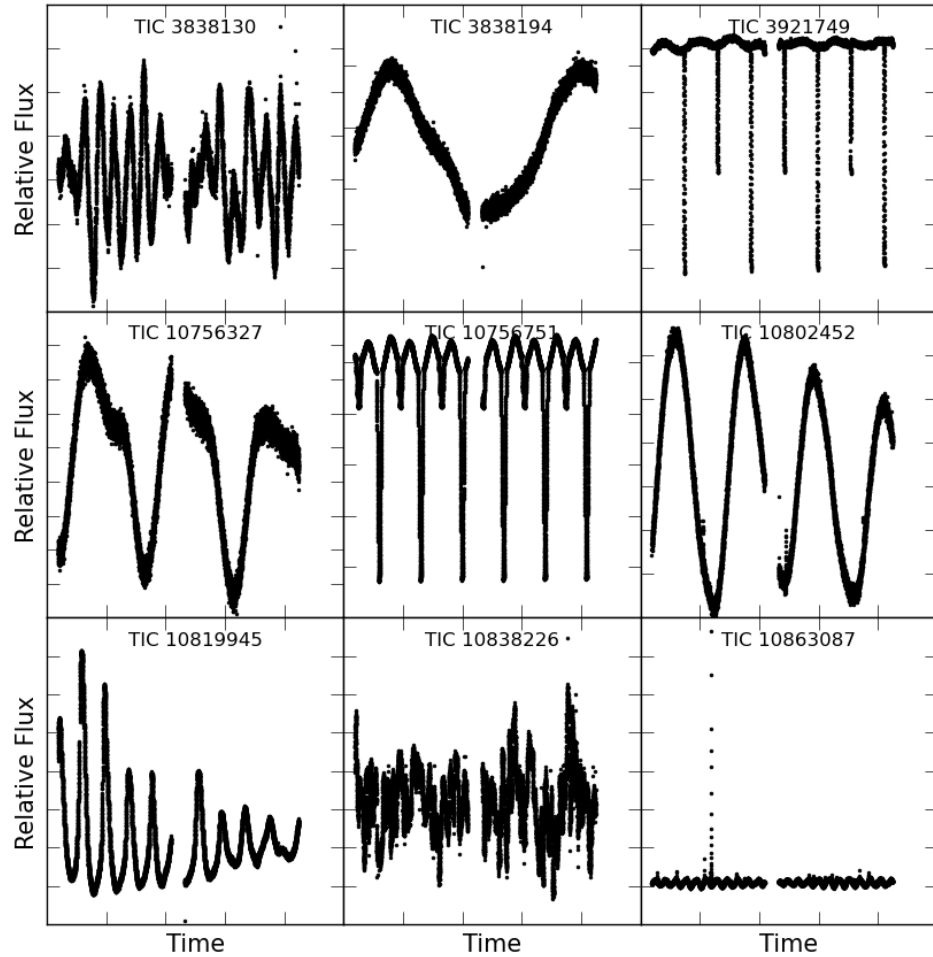
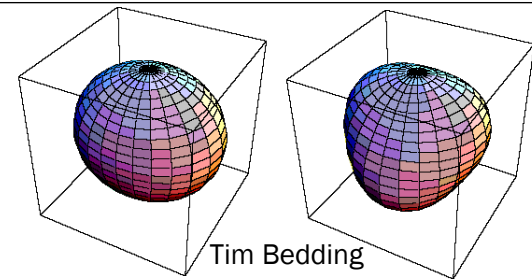
NASA/ESA/STScI



→ See Sadie Welter's Poster!

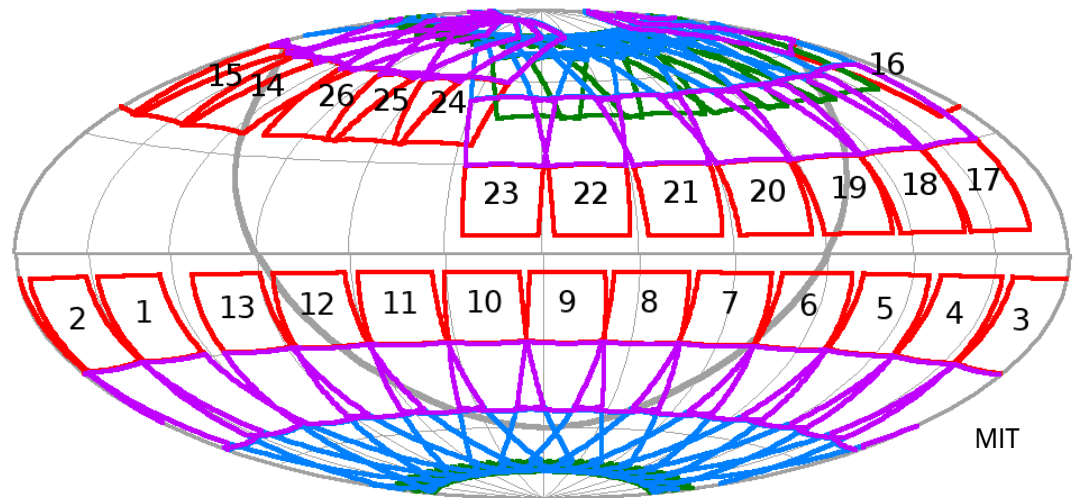
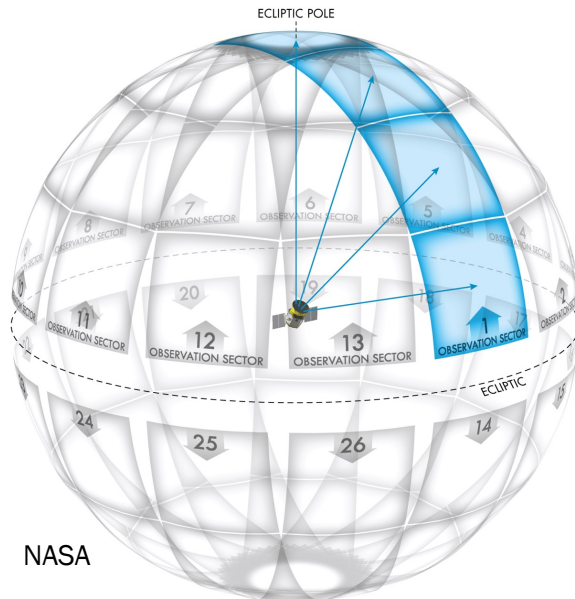


Stellar Variability



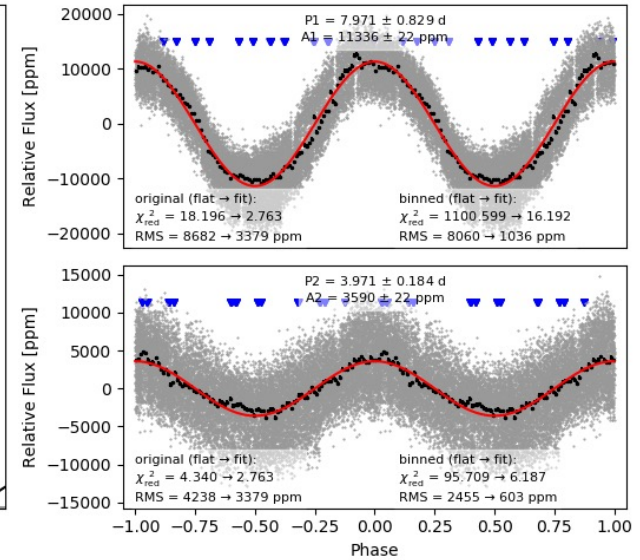
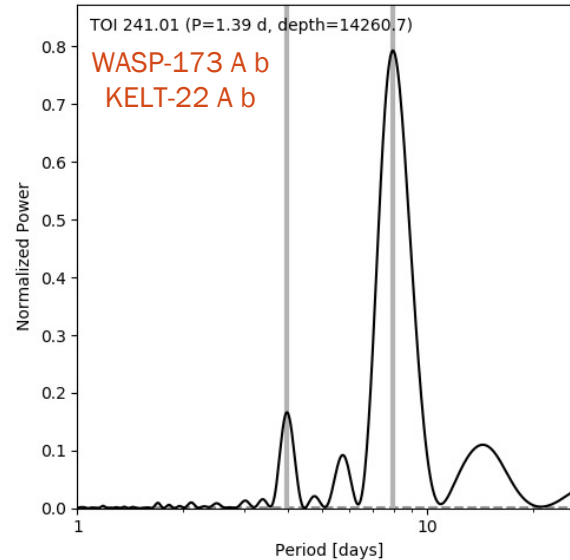
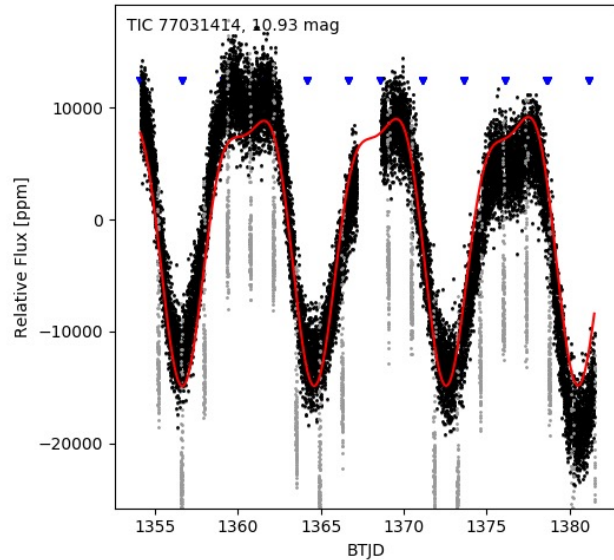
Transiting Exoplanet Survey Satellite

- TESS Prime Mission observed ~230,000 stars
- Nearly continuous observations over 27-day segments
- Produced high-precision space-based photometry



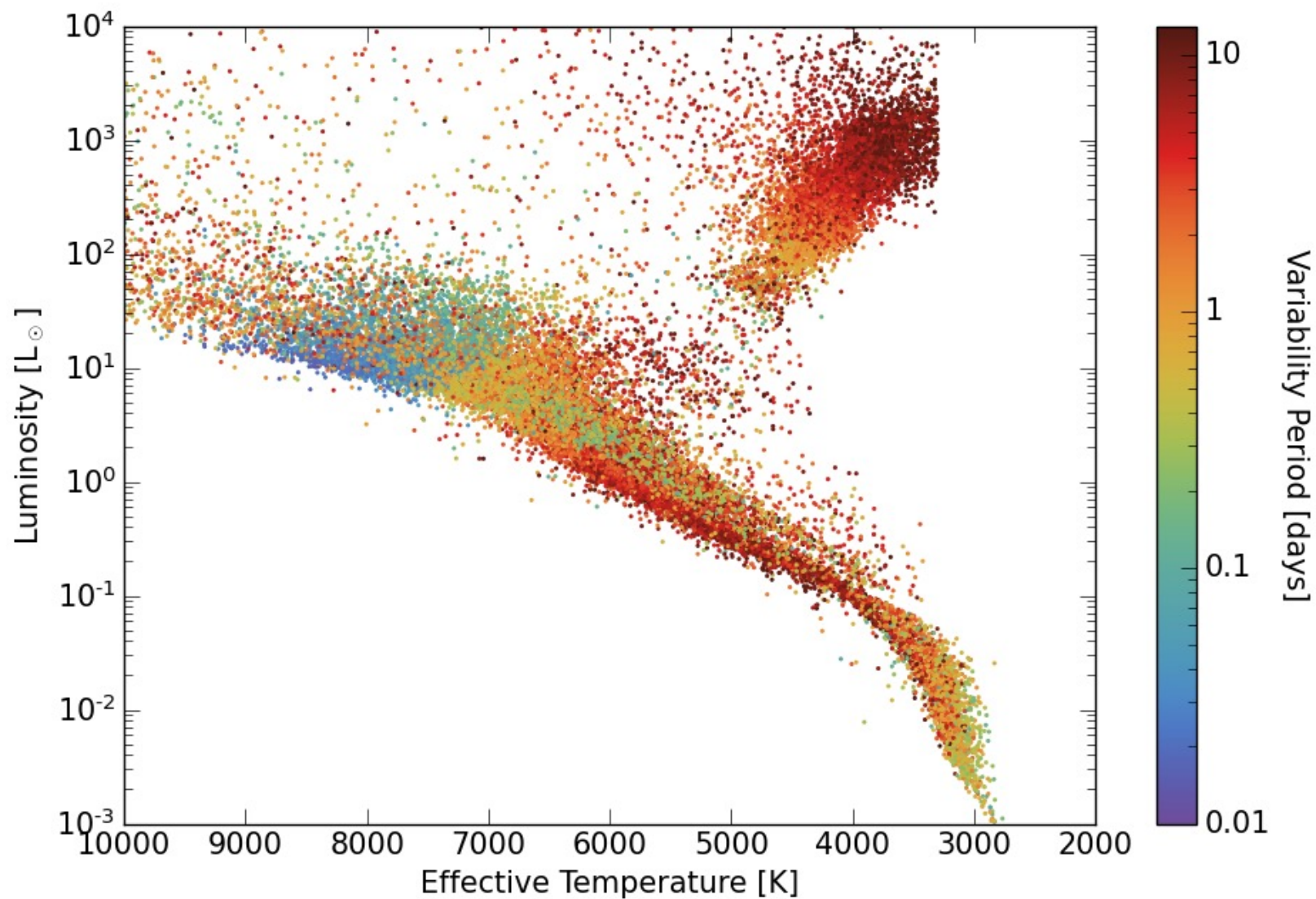
Periodic Variability Search

- All TESS Prime Mission 2-min light curves
- Periodogram searches: 0.01-1.5 days & 1-13 days
- Aimed to produce “high-purity” catalog:
 - Removed spacecraft systematic noise
 - Identified significant stellar variability

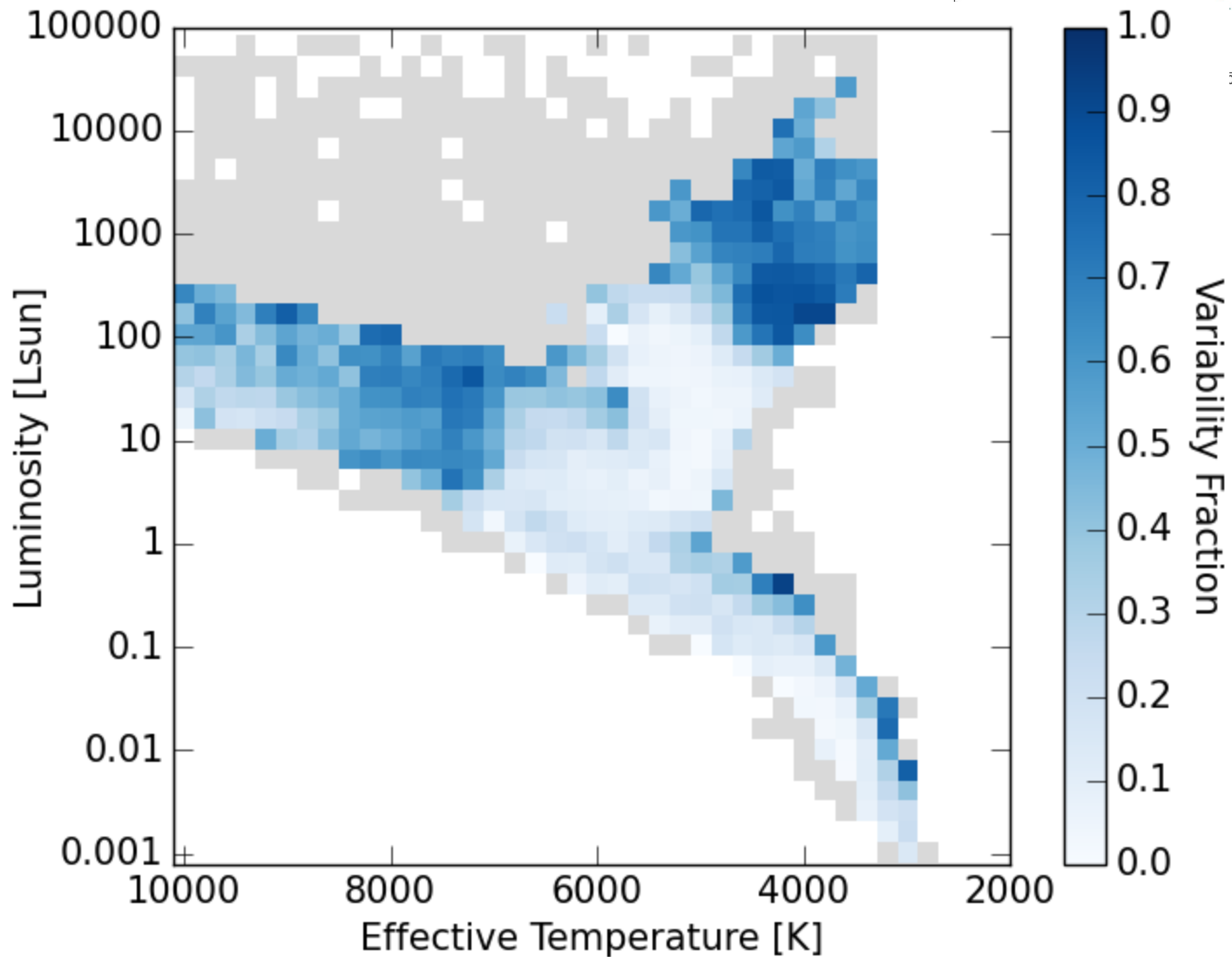


→ Consistent with Hellier et al. (2019) and Labadie-Bartz et al. (2019)

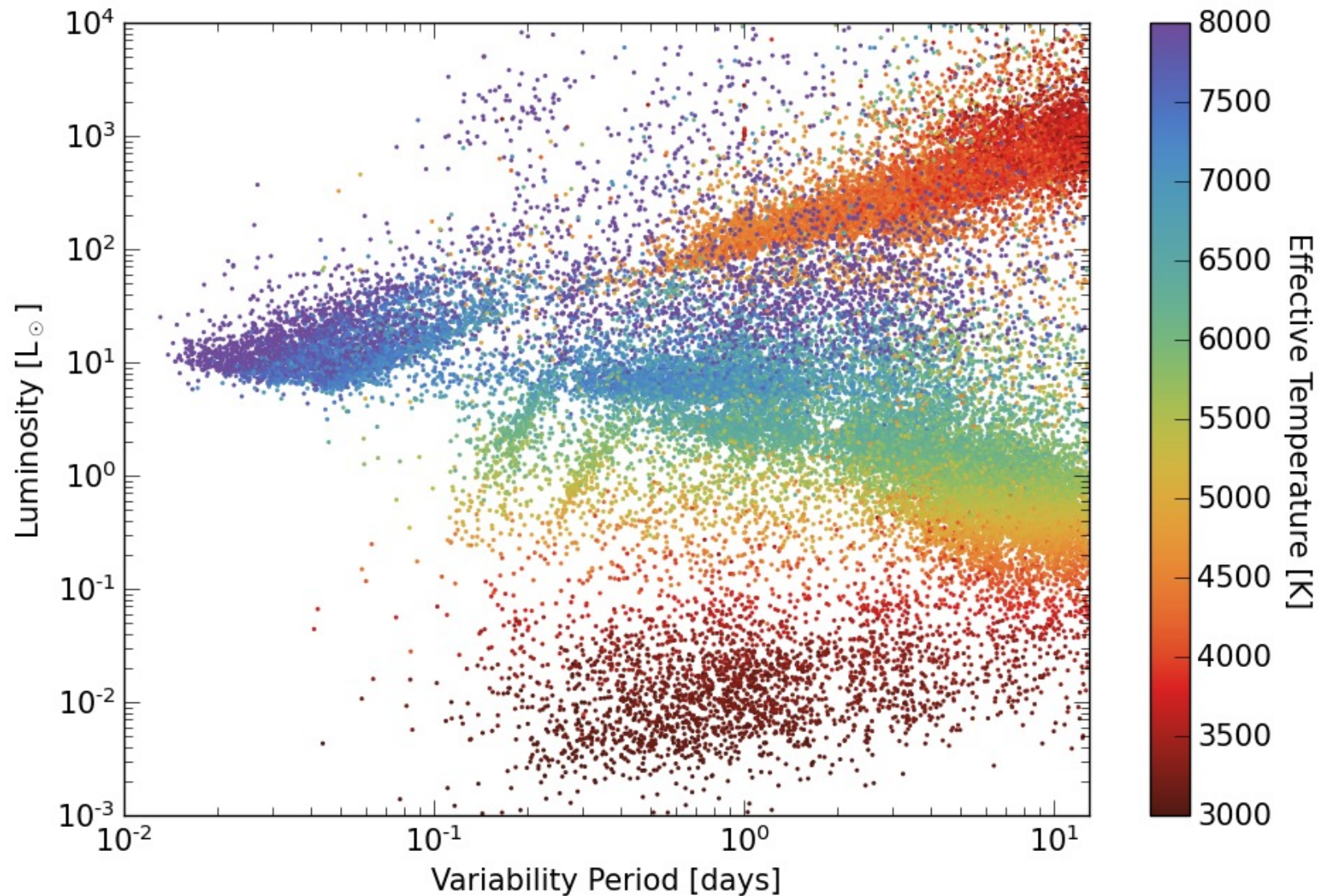
HR Diagram



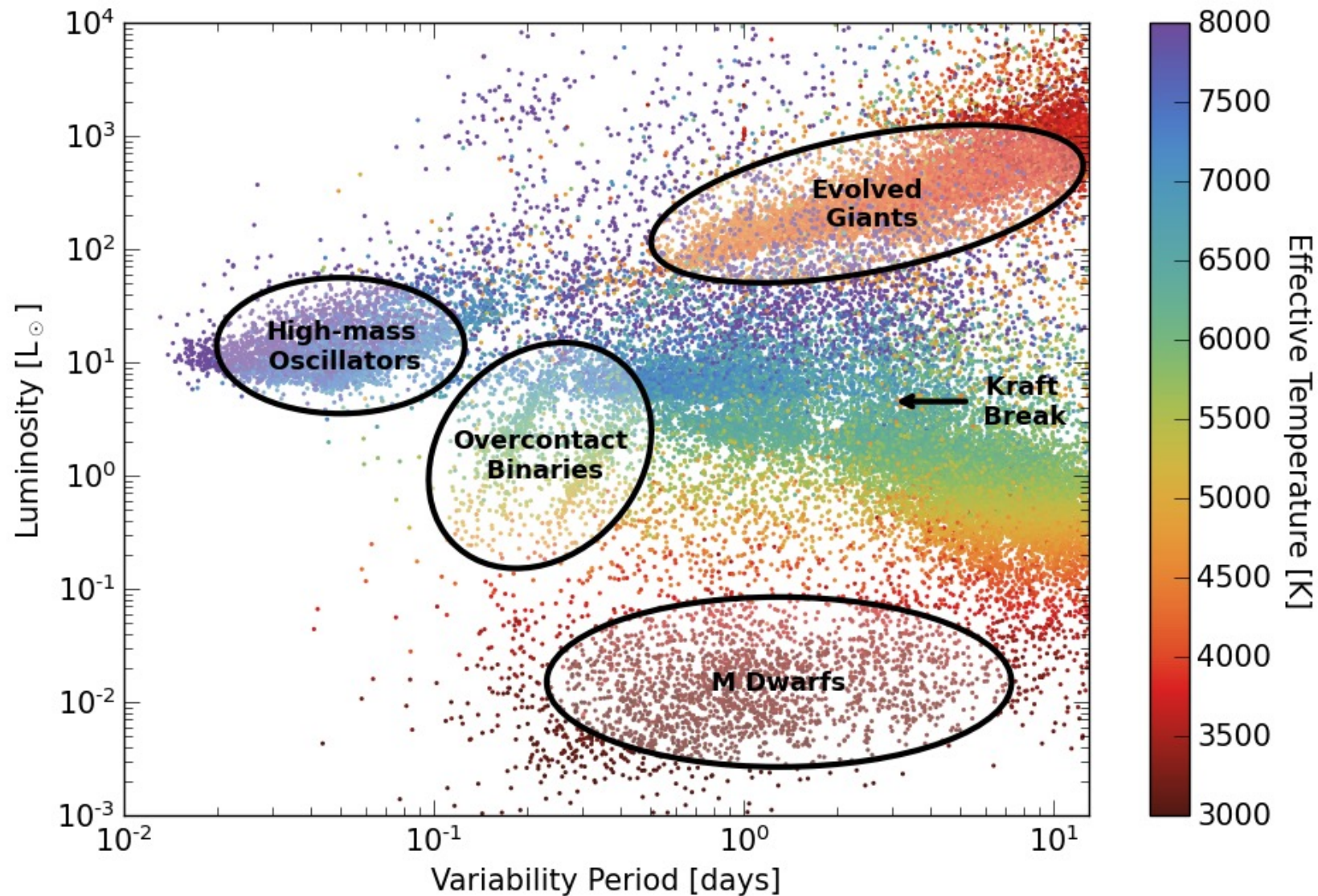
Variability Fraction



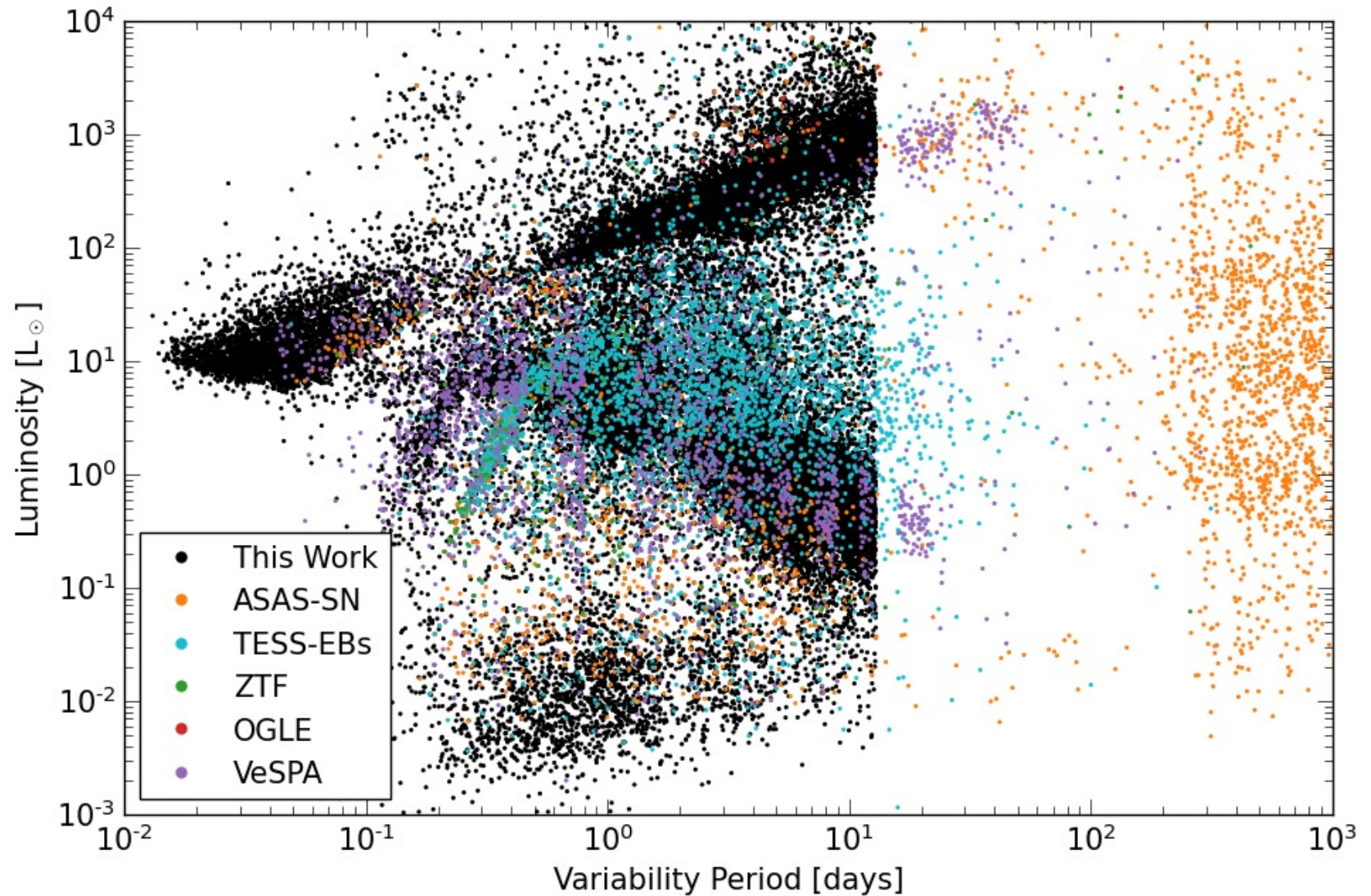
Period vs. Luminosity



Period vs. Luminosity

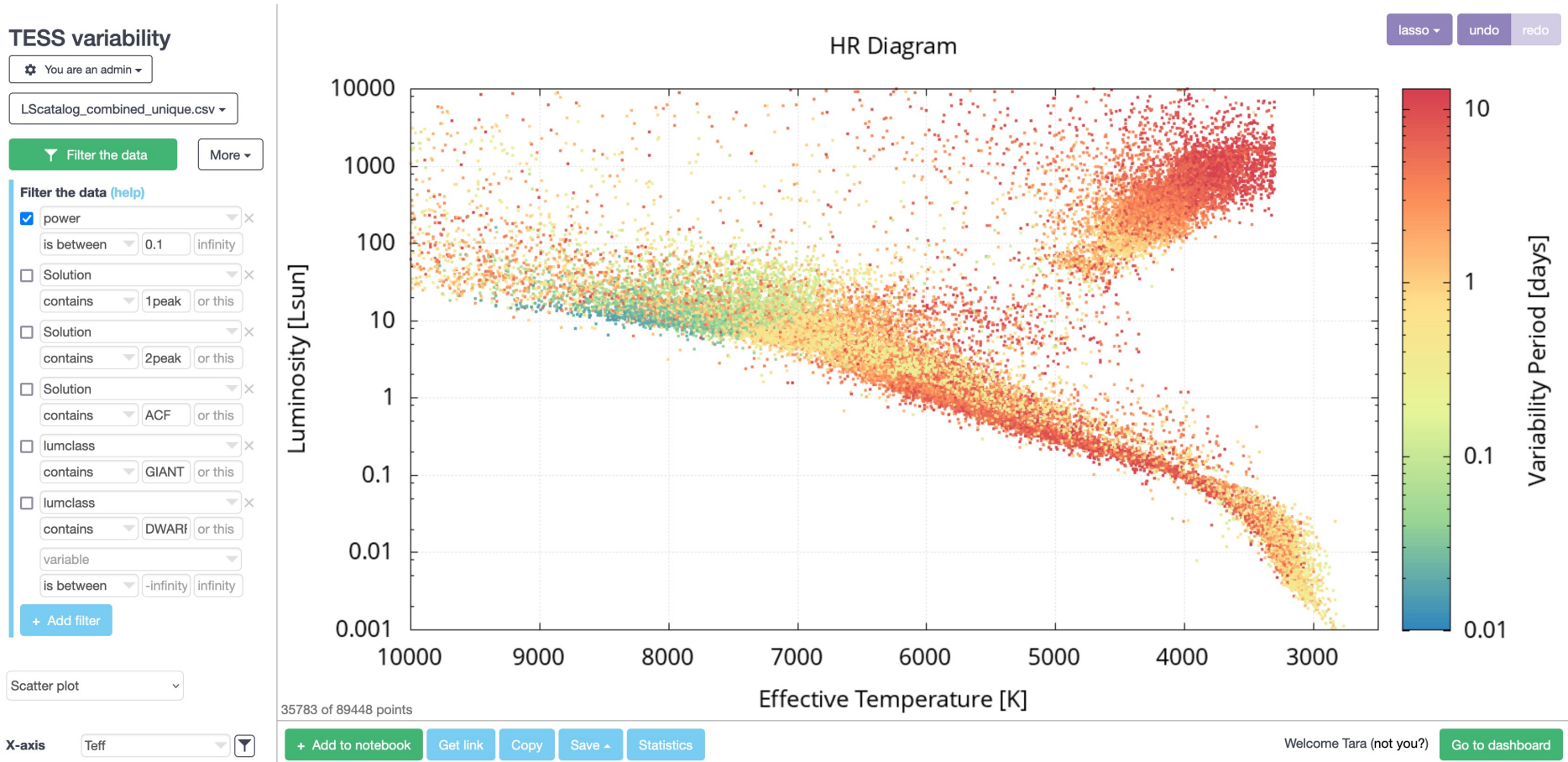


Comparing Variability Catalogs



FilterGraph Showcase

- <https://filtergraph.com/tessvariability>



FilterGraph Showcase

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TESS variability

LScatalog_combined_unique.csv

Filter the data

More

Filter the data (help)

power

is between 0.1 infinity

Solution

contains 1peak or this

Solution

contains 2peak or this

Solution

contains ACF or this

lumclass

contains GIANT or this

lumclass

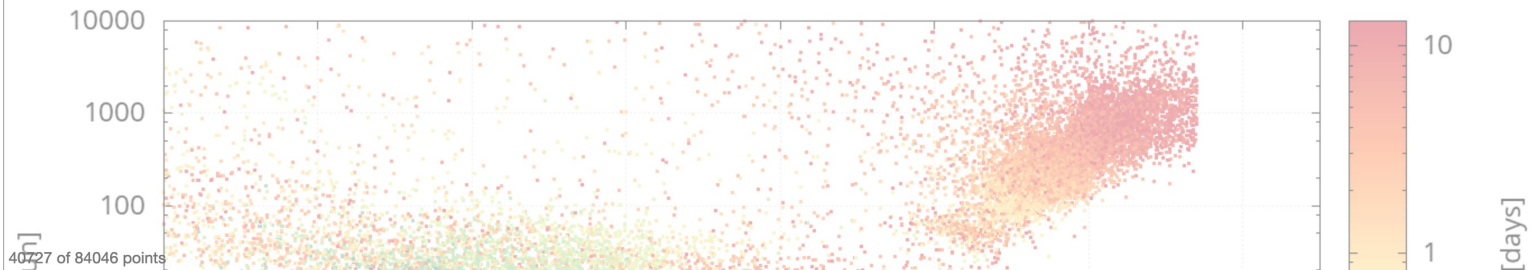
contains DWARF or this

variable

is between -infinity infinity

+ Add filter

HR Diagram



+ Add to notebook

Get link

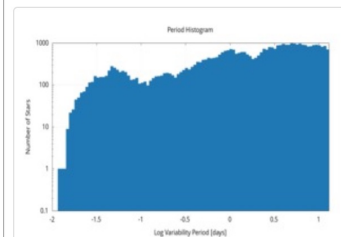
Copy

Save

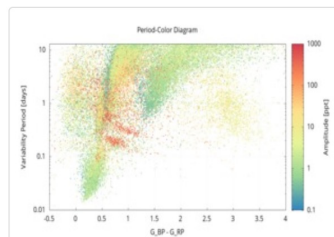
Statistics

Sign Up for Filtergraph

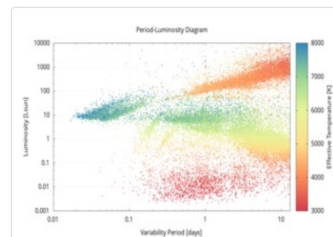
Sign In



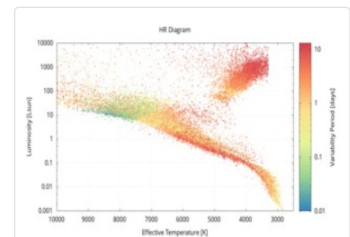
Tara Fetherolf published this notebook entry.
Histogram



Tara Fetherolf published this notebook entry.
Period-Color Diagram



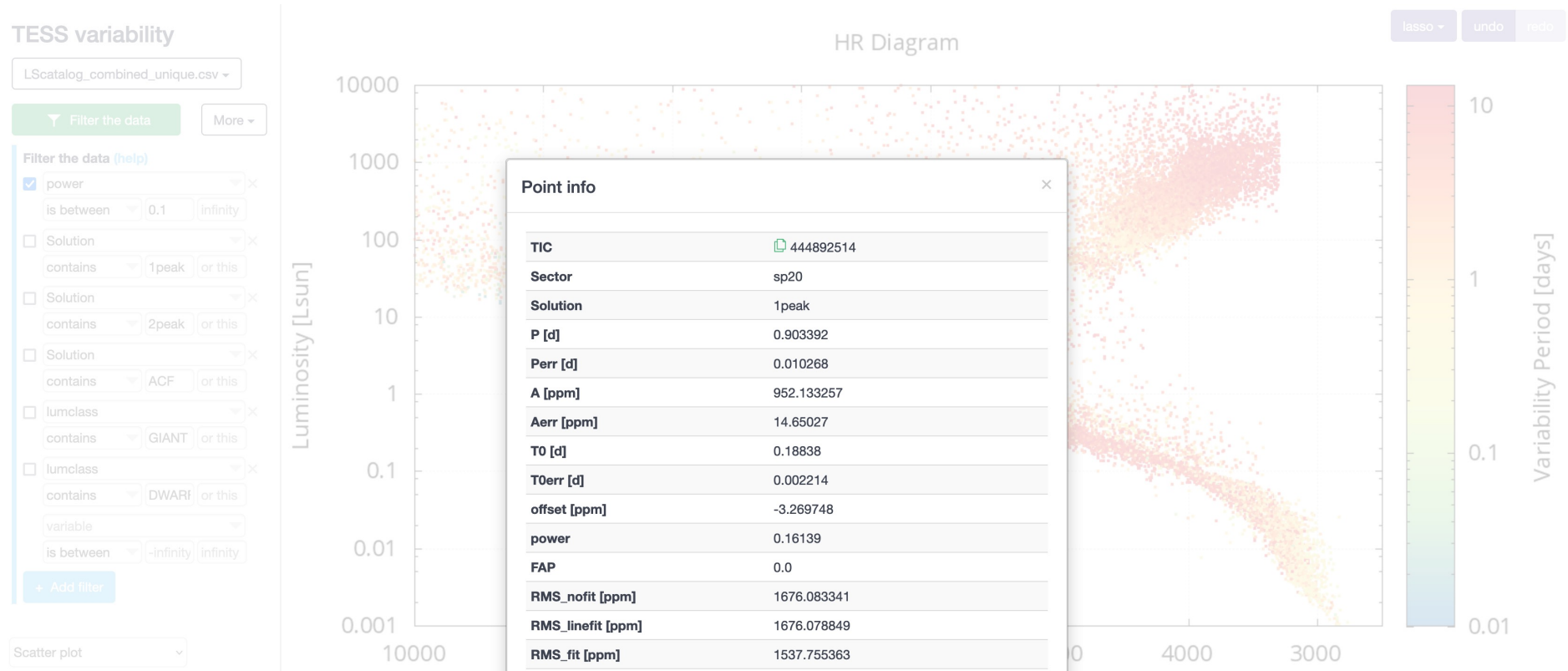
Tara Fetherolf published this notebook entry.
Period-Luminosity Diagram



Tara Fetherolf published this notebook entry.
HR Diagram

FilterGraph Showcase

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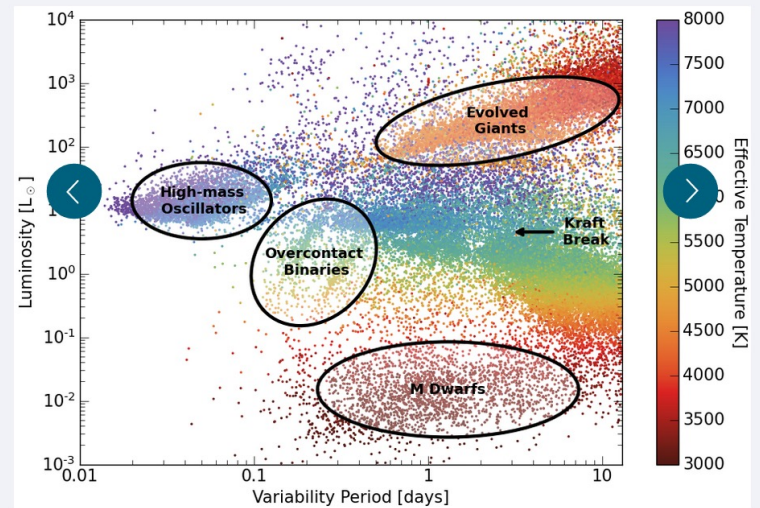
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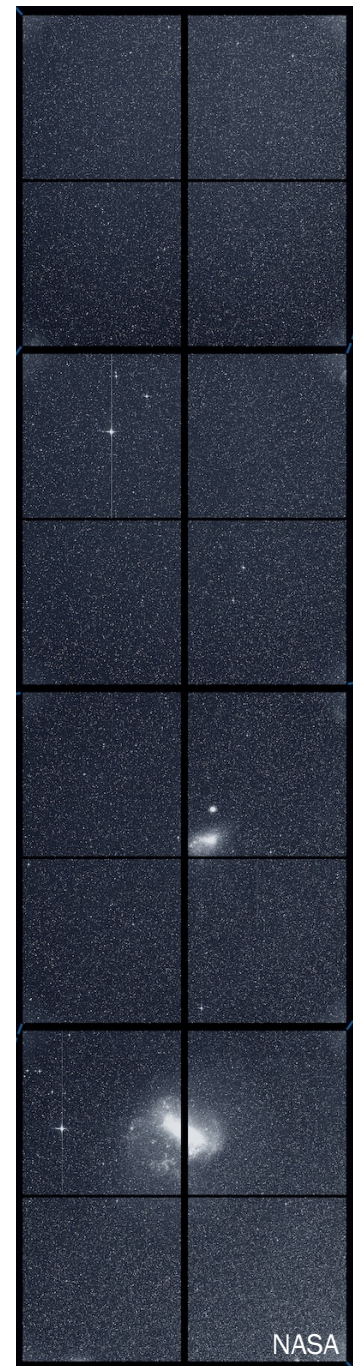
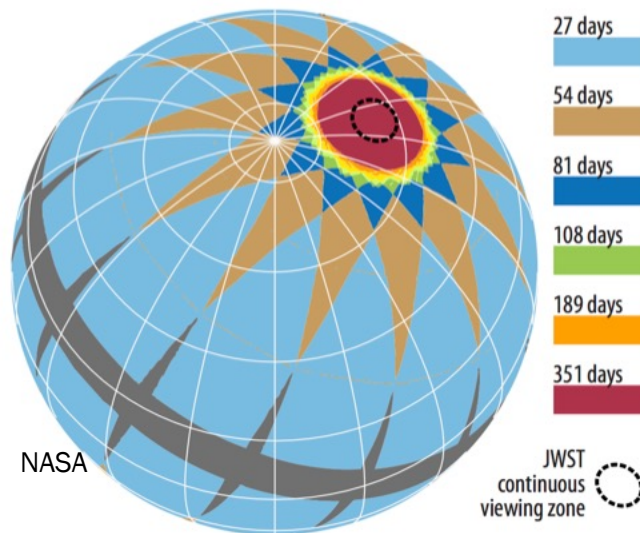


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Next Steps

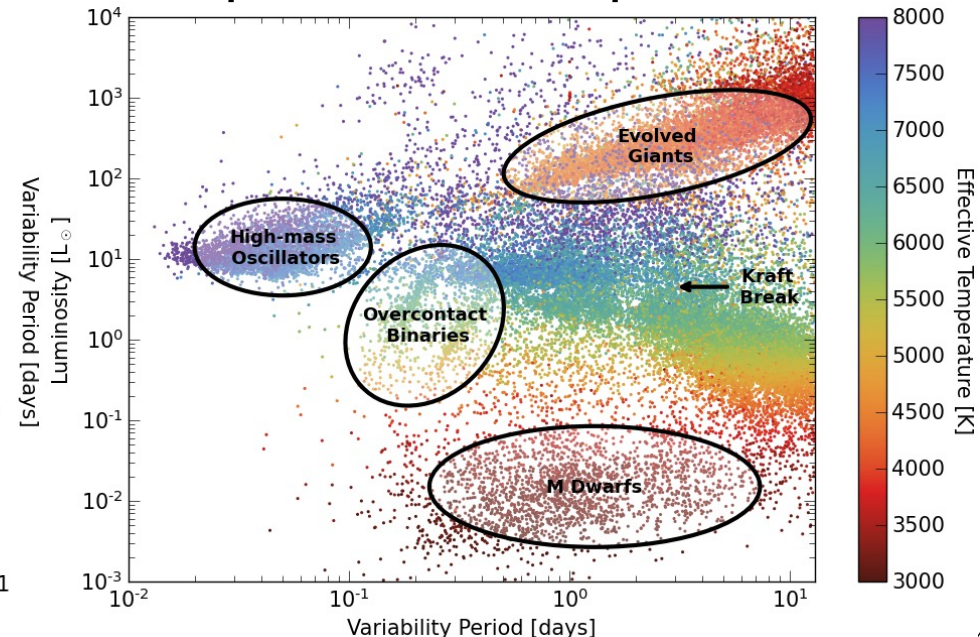
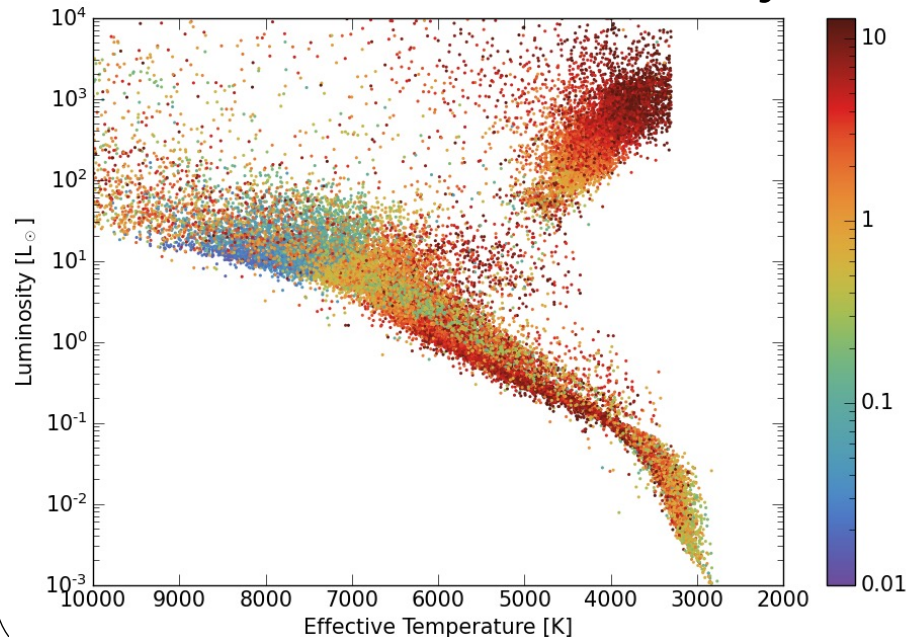
- Analyze TESS Extended Mission data
- Extend periodogram search to longer baselines: 13+ days
- Incorporate other stellar activity indicators
- Measure stellar activity cycles



Summary



- TESS-SVC contains ~84,000 stars that are significantly variable on timescales of 0.01-13 days
- TESS-SVC probes multiple realms of stellar astrophysics
- Future work includes updating catalog and investigating how stellar activity effects exoplanet atmospheres



Thank You!