



University of
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The Occurrence of Planets around M dwarfs with TESS

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Cool Stars

Terrestrial Planets around Cool Stars:

- Cool stars are most common in galaxy
- Planets around them are commonly temperate
- Only opportunity to understand temperate atmospheres of rocky planets with current instruments

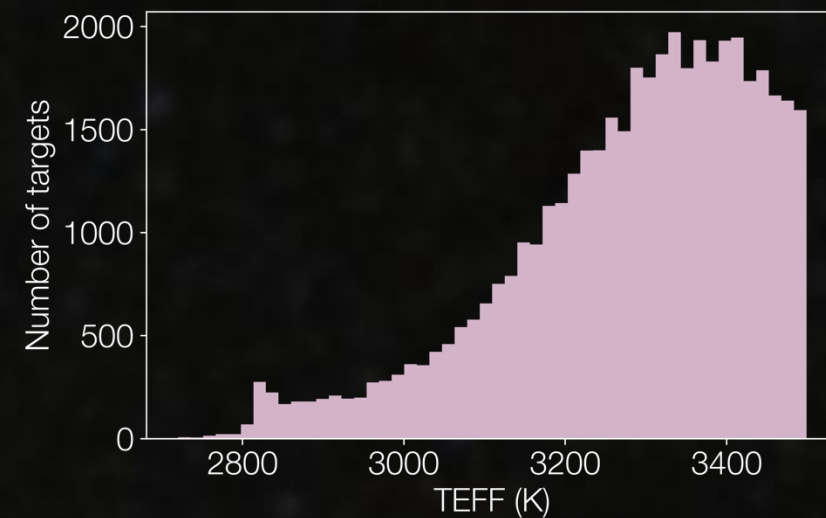
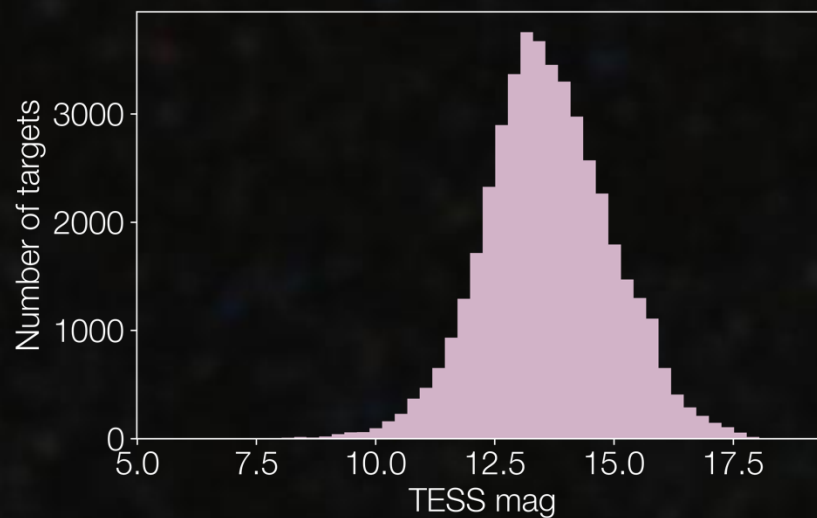
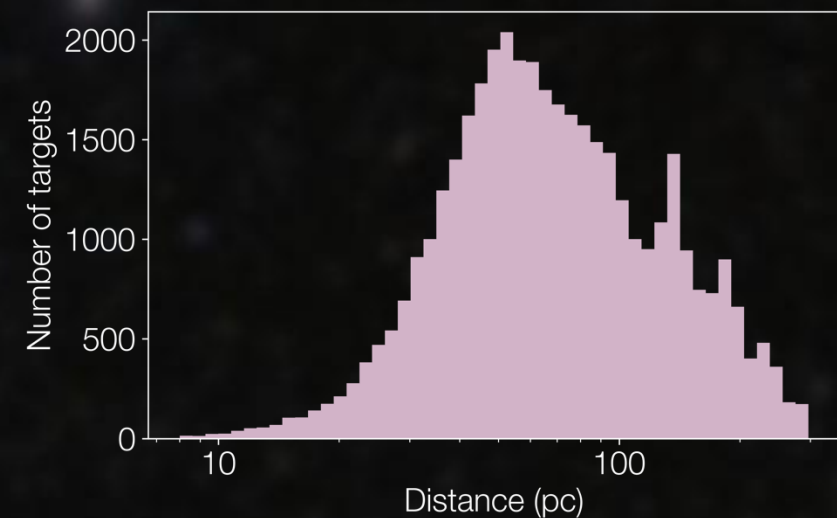
Planet Occurrence around M dwarfs

- Kepler provided great FGK occurrence rates and results for early M dwarfs
(e.g. Dressing & Charbonneau 2013, 2015)
- TESS provides a reasonably volume complete sample of mid M dwarfs
(e.g. Ment & Charbonneau 2023)
- Ice lines are accessible with transits at $>10d$ periods
 - Are there compositional or atmospheric trends beyond the ice line?

Our Sample

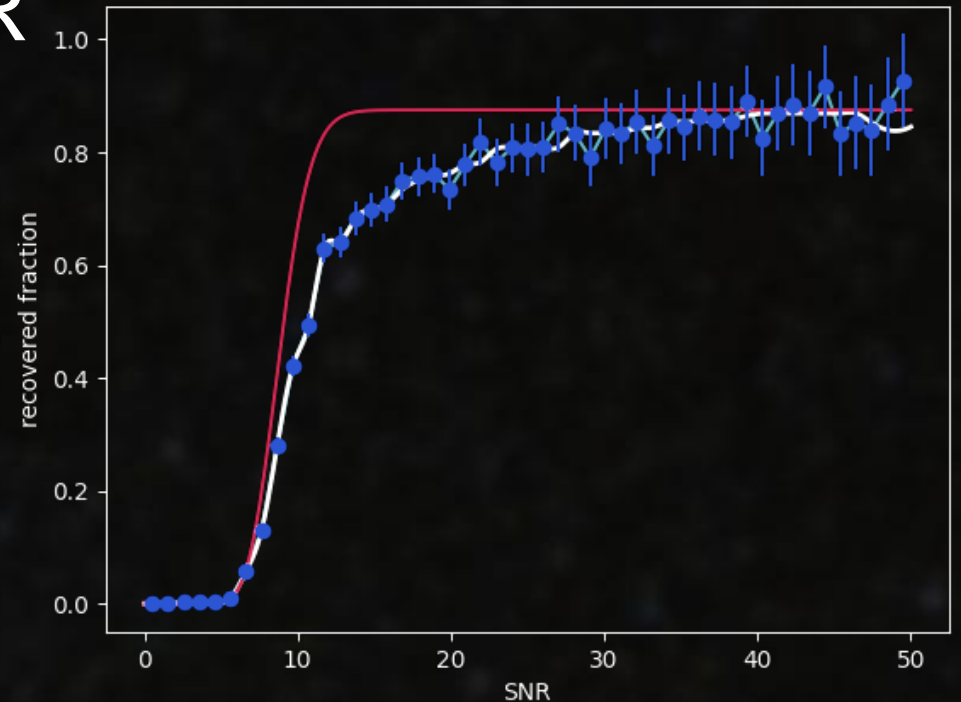
- 44309 M dwarfs < 3500 K with TESS 2 minute cadence
- From TESS Cool dwarf catalog (Muirhead et. al. 2018)

TESS M-dwarf Catalog

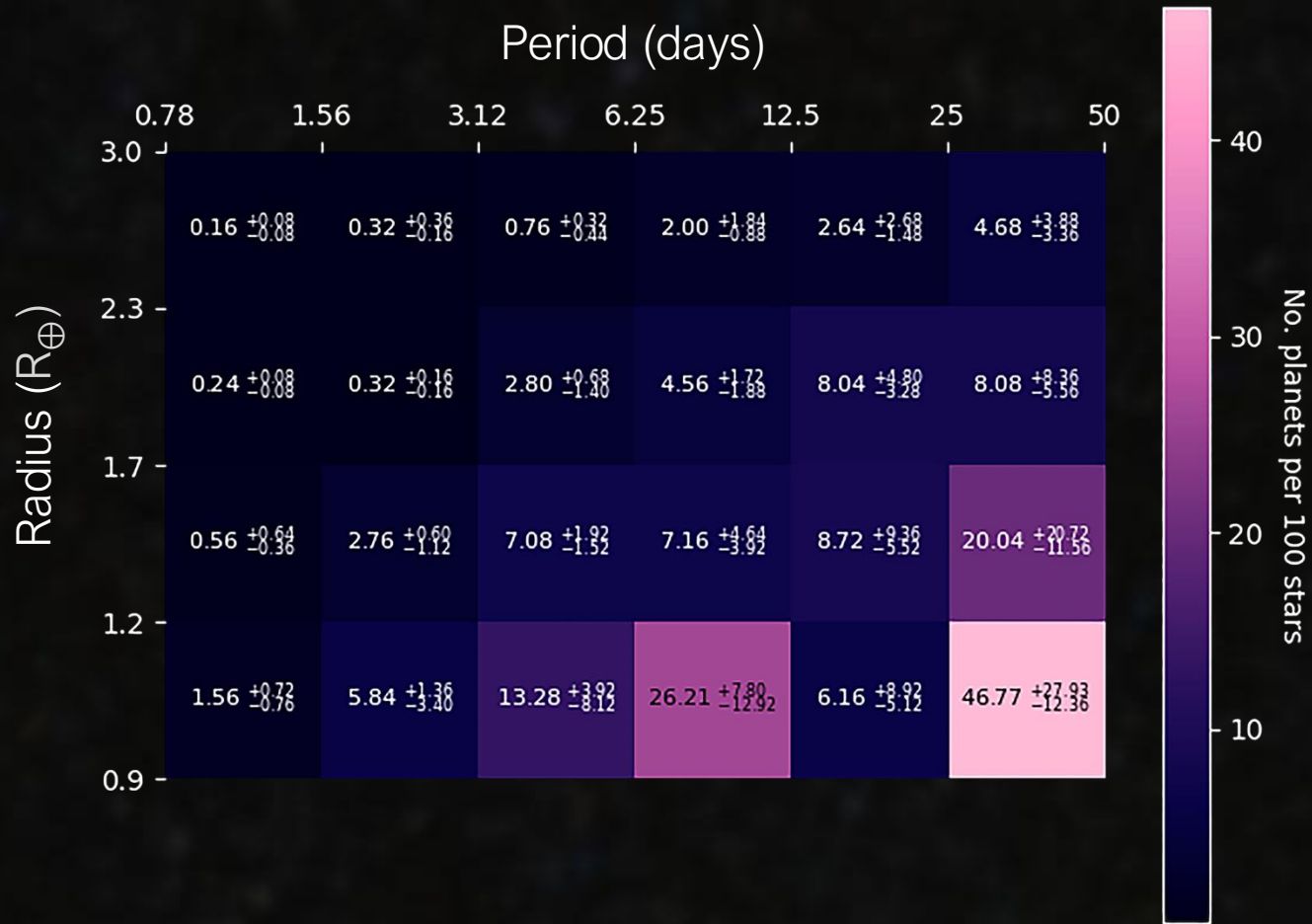


Injection & Recovery

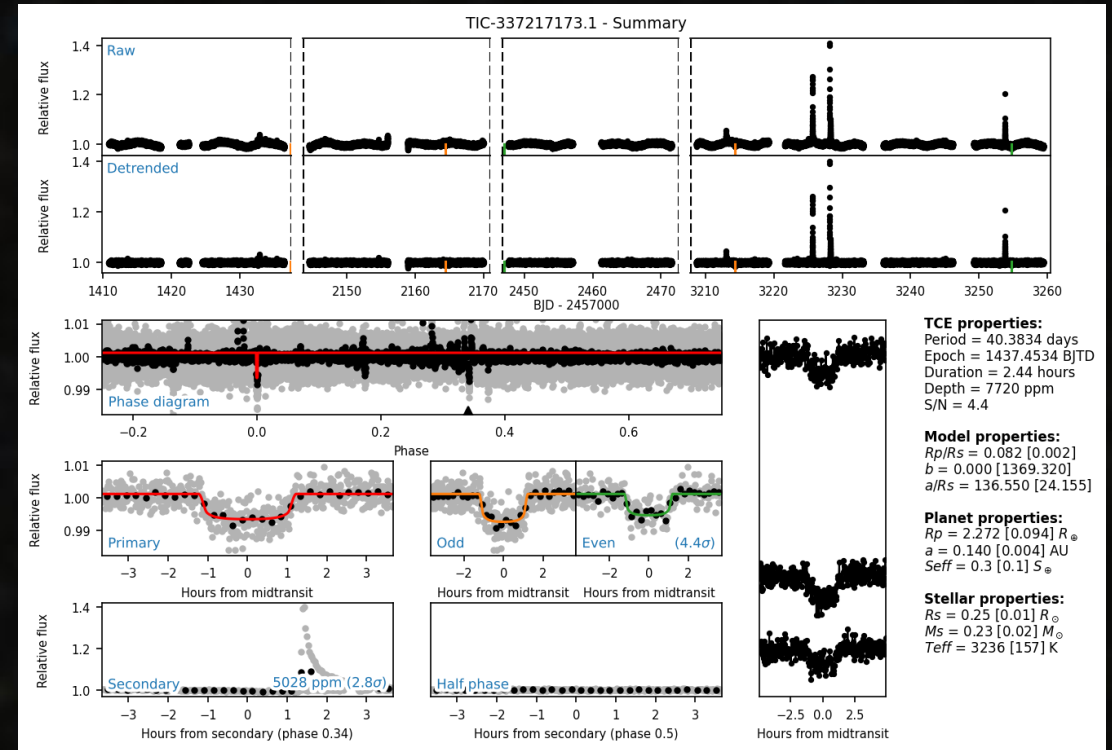
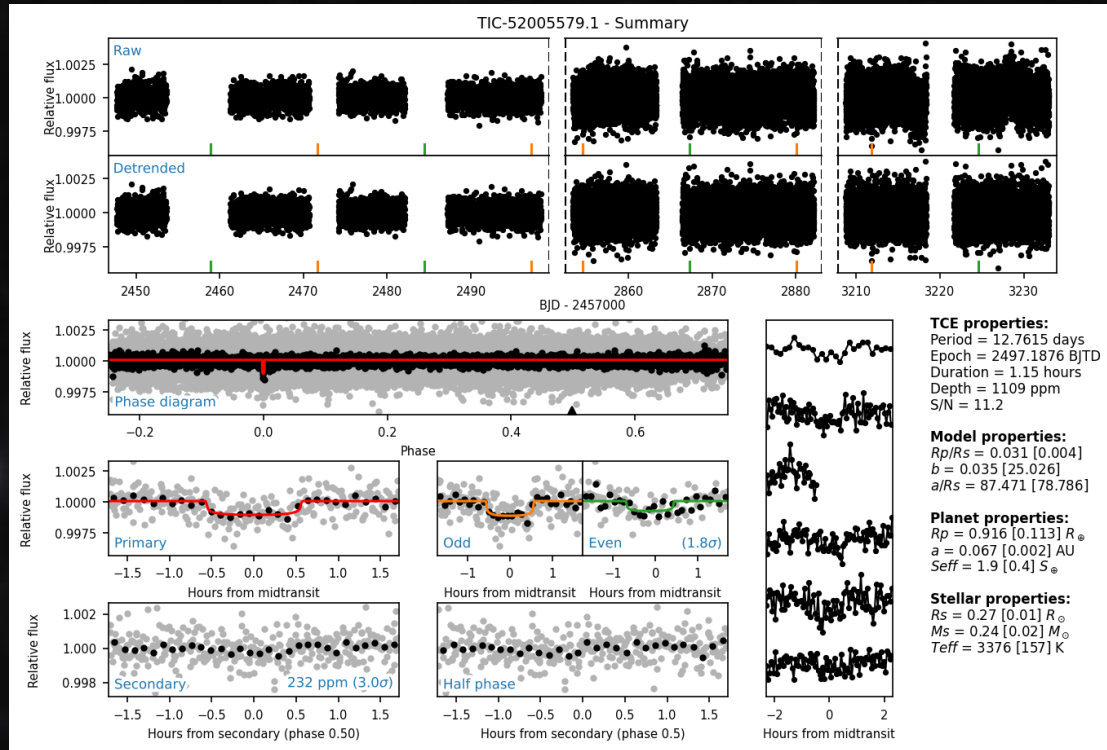
- 50000 injections and recoveries on a subsample of TICs
- Bin the recovered fraction by SNR
- Apply completeness corrections



The Occurrence: A Preliminary Look



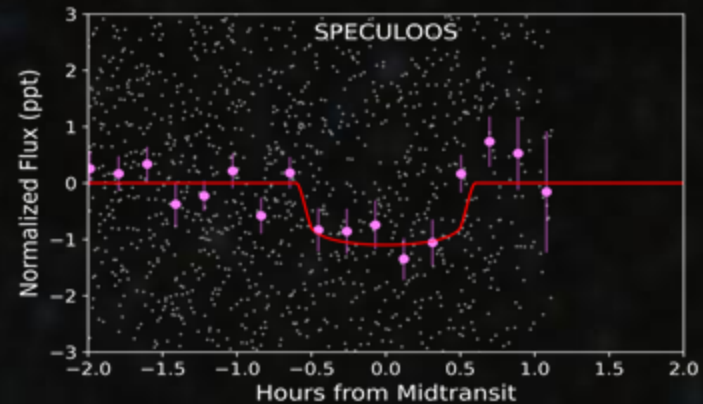
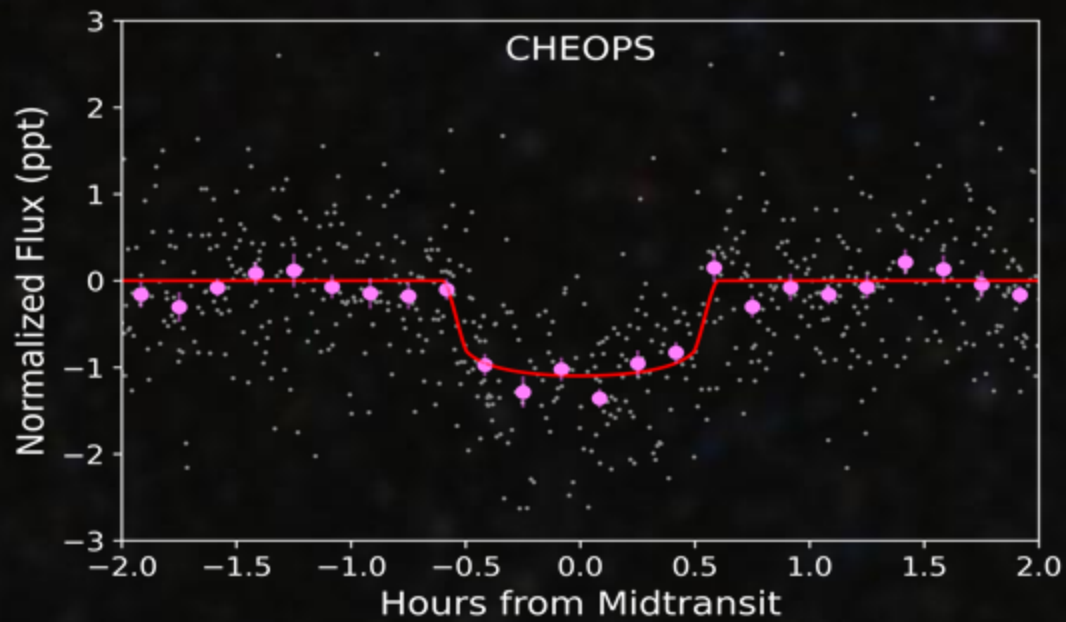
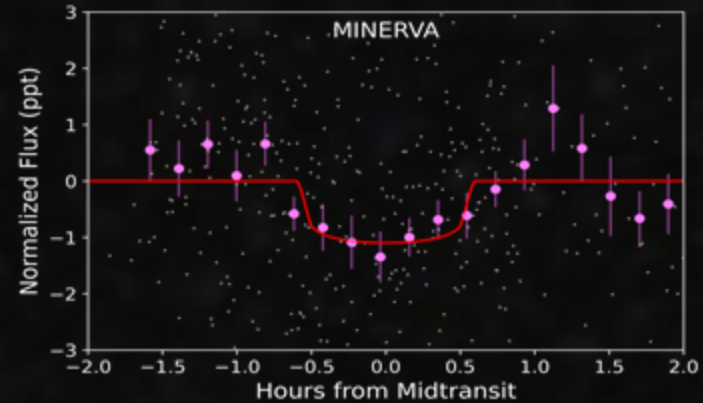
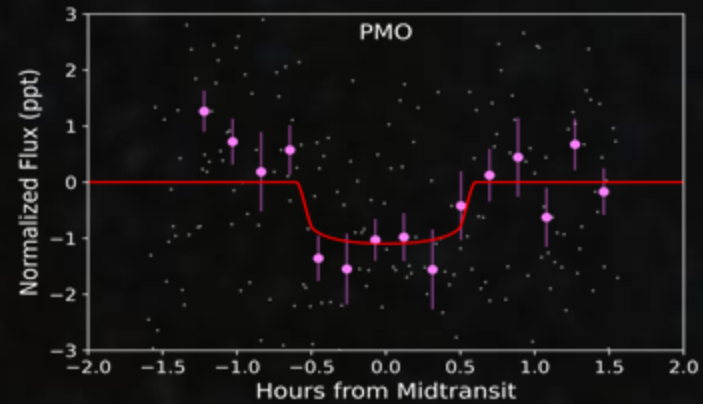
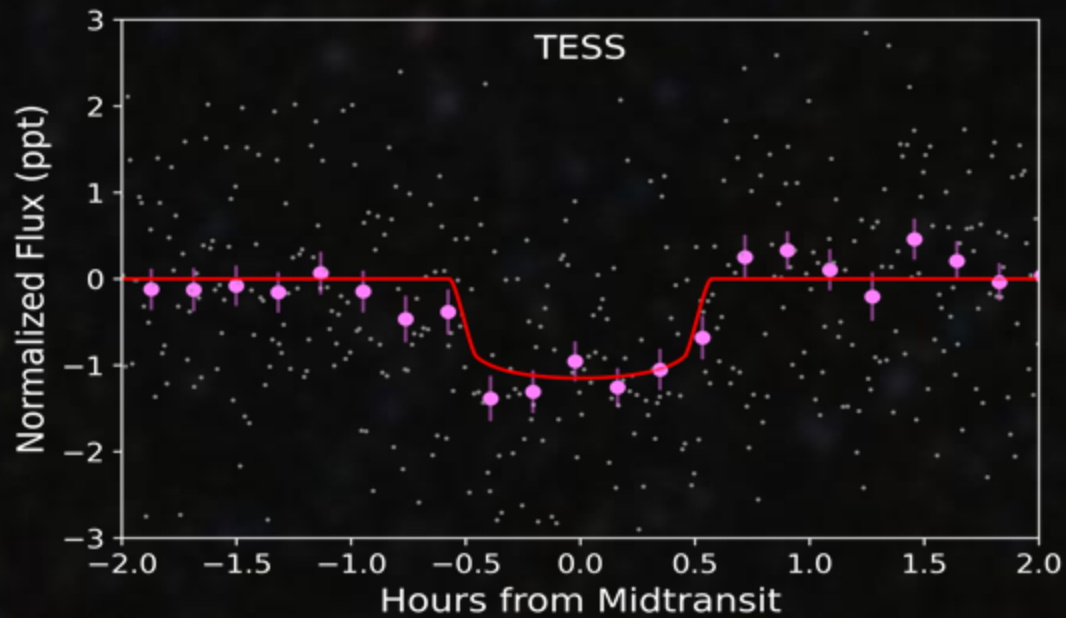
Noteworthy Recoveries



Gliese 12 b

- Published in Dholakia, Palethorpe et. al. 2024 and Kuzuhara, Akihiko et. al. 2024
- 12 pc away
- Radius: $1.0 \pm 0.1 R_{\oplus}$
- Period: 12.7614 d
- T_{eq} : $287 \pm 5 \text{ K}$
- Insolation: $1.6 S_{\oplus}$
- a : 0.066 AU





Gliese 12 b: Atmosphere

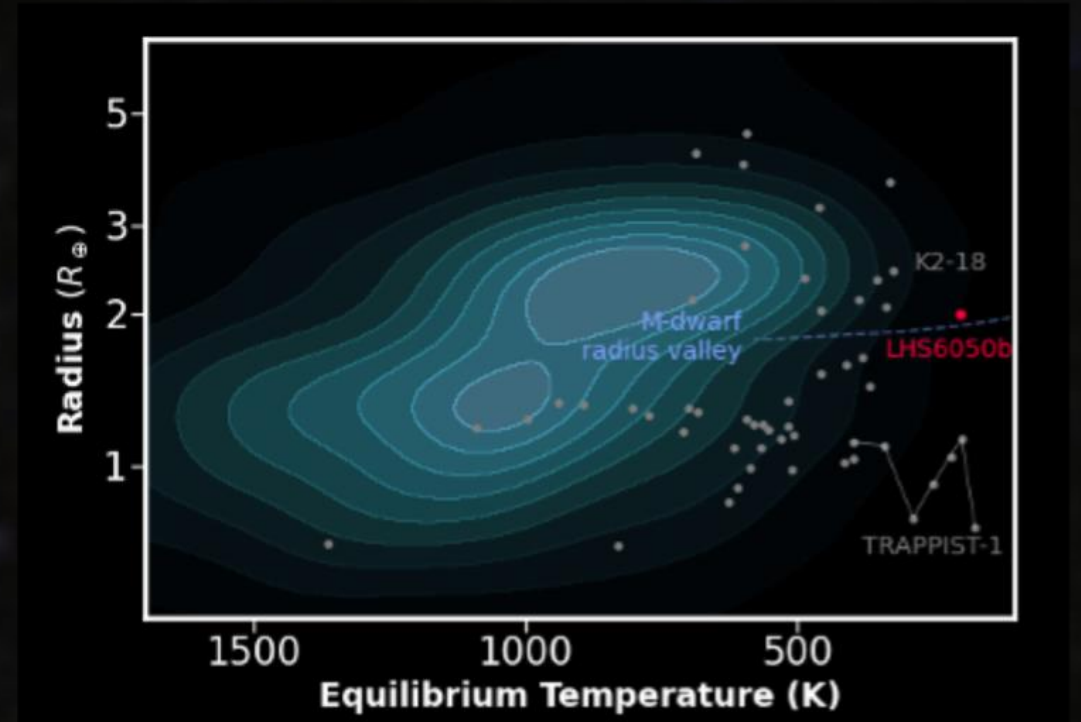
- A highly amenable temperate, terrestrial planet for atmospheric study with JWST

- HST Program 17600 (PI: Vissapragada) to study atmospheric escape with HST in Lyman α

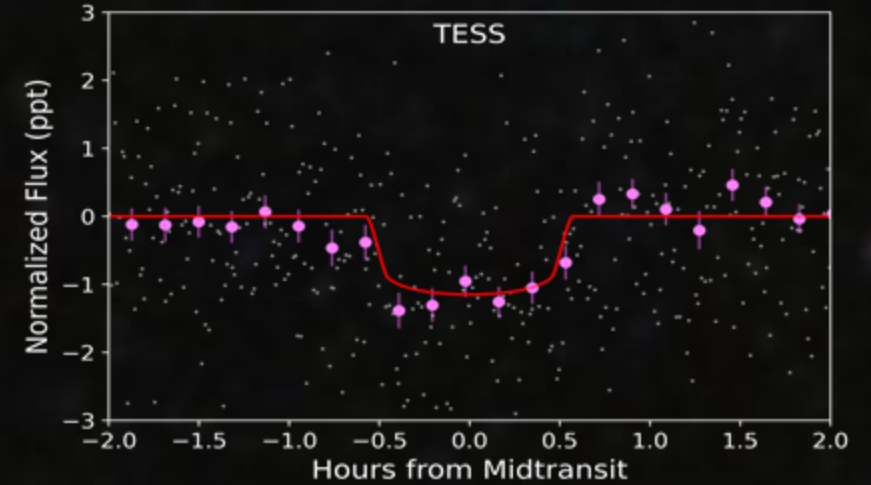
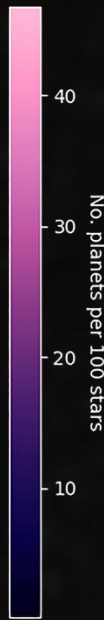
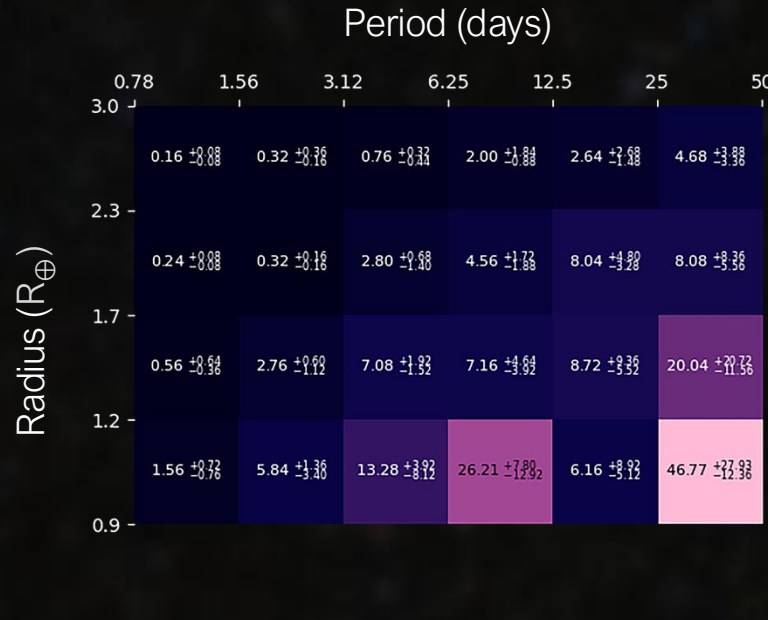
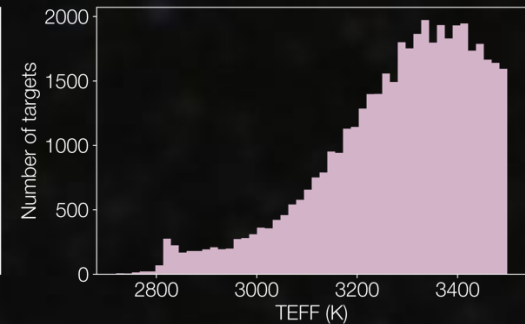
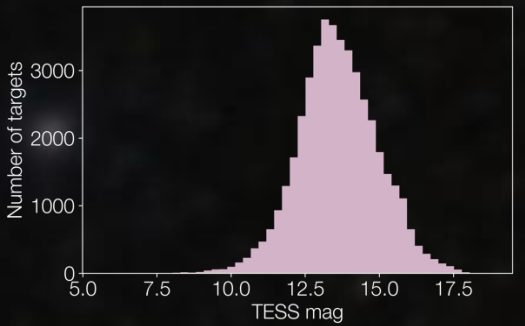
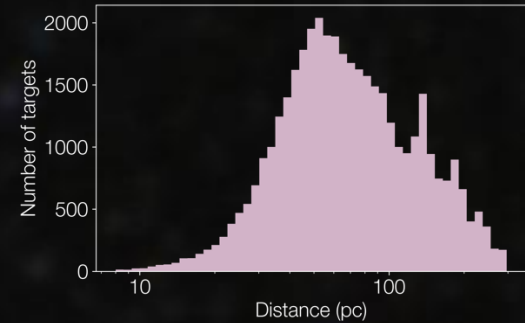


LHS 6050 b

- $2.0 R_{\oplus}$ super-Earth
- $200\text{K } T_{\text{eq}}$
- 40 day orbital period
- Host is an M4V star ($G=12.86$)
- 20 pc away
- ESPRESSO program (PI: Zhou) to obtain mass
- A cool water world near the M dwarf radius valley



Summary



Stay tuned for the upcoming paper
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