Enhancing Exoplanet Detection Beyond TESS:

Insights from SPECULOOS on late M dwarf occurrence rates

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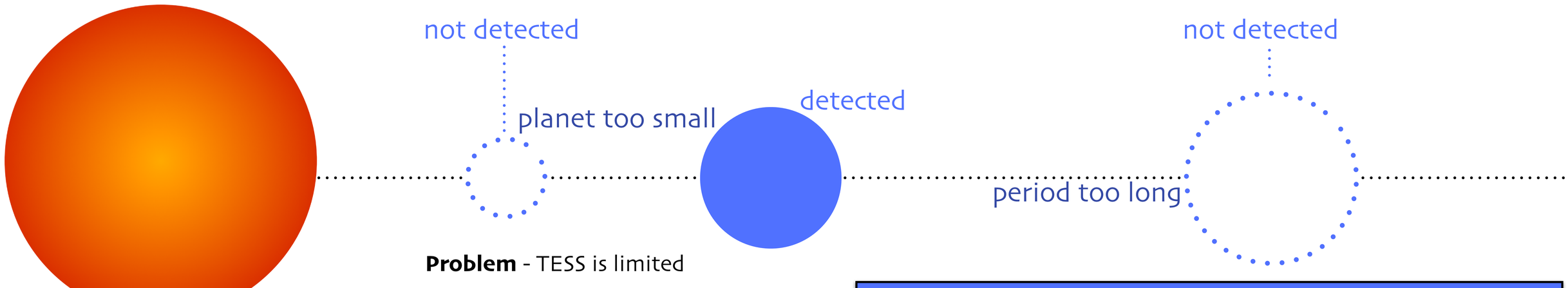


Problem - TESS is limited

planet detections require SNR $\gtrsim 7$, this becomes challenging for small and / or long period planets

Mission goal: search for additional planets in systems where one transiting planet has already been identified.

SPECULOOS-2

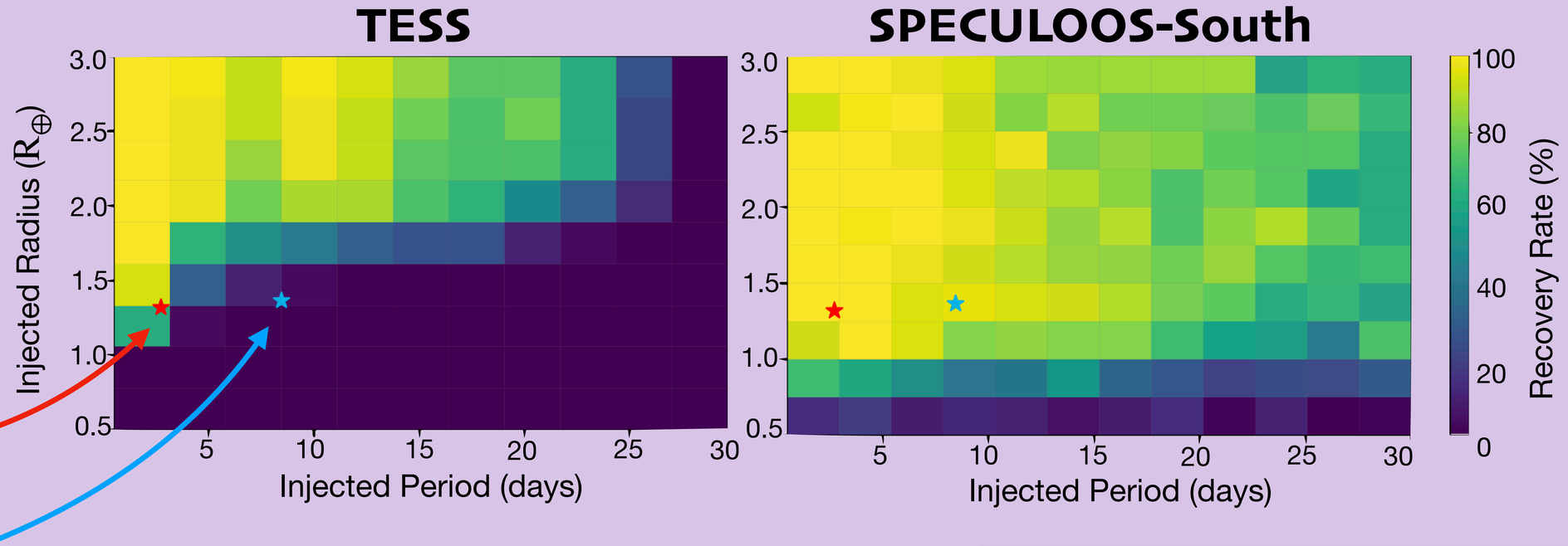
a proof of concept

$R_\star = 0.1556 \pm 0.0086\, R_\odot$
$M_\star = 0.118 \pm 0.002\, M_\odot$
$T_{eff} = 2850 \pm 75\, K$

$R_{P_1} = 1.320^{+0.053}_{-0.027}\, R_\oplus$
$Per_{P_1} = 2.73\, d$
$S_{P_1} = 4.09 \pm 0.12\, S_\oplus$

$R_{P_2} = 1.367^{+0.055}_{-0.039}\, R_\oplus$
$Per_{P_2} = 8.46\, d$
$S_{P_2} = 0.906 \pm 0.026\, S_\oplus$

Delrez et al. 2022



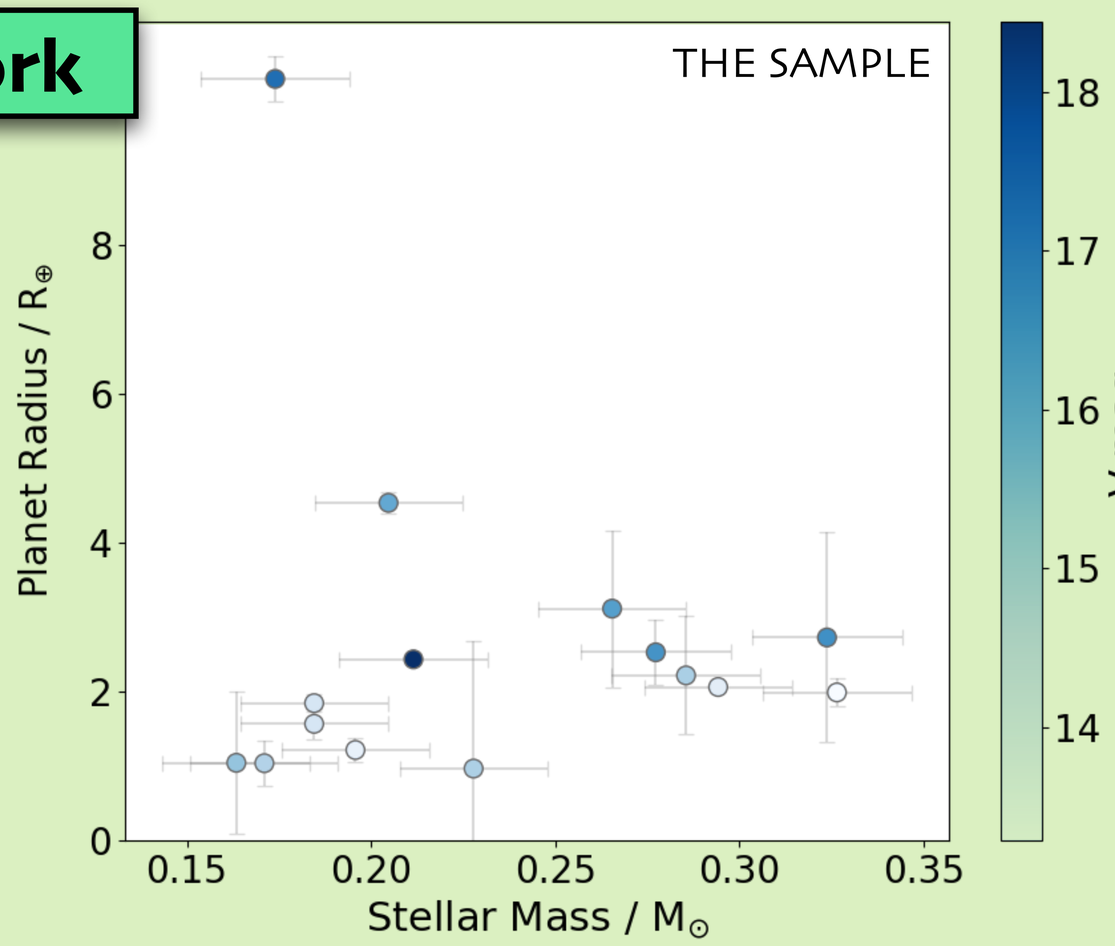
Injection-recovery tests performed using the python package `tkmatrix` (Dévora-Pajares & Pozuelos 2022) on the **SPECULOOS-2 system**, for both TESS and SPECULOOS data.

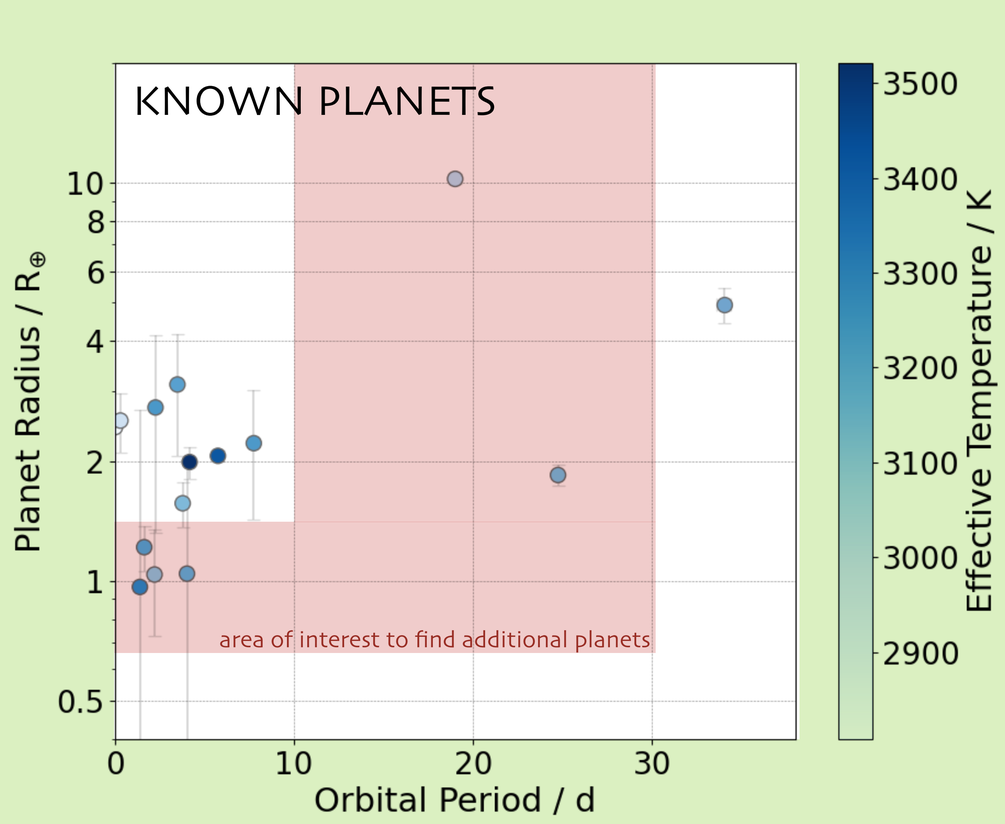
The system contains two **temperate super-Earths** transiting a **late-type, M-dwarf** star.

They find the **recovery rate** for the two planets to be **much higher** with **SPECULOOS** than with TESS, indicating **TESS' limitations** with detecting small planets.

This work

14 systems (one multiplanet)





For early-type M dwarfs, Dressing & Charbonneau (2015) find an **occurrence rate of** 2.5 ± 0.2 planets per system ($1 \leq R_p \leq 4\, R_\oplus$, $P < 200$ d) using Kepler data.

The aim of this new survey with SPECULOOS: **to measure the same for late-type M dwarfs**

Compared to instruments such as TESS, **SPECULOOS** is better at detecting **small planets** around **late-type M dwarfs** (T_{eff}<3300K) in **only** one transit.

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