Validation of TESS candidates orbiting Solar-analog stars

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Outline

Motivation: *TESS* is expected to find several false positives (FPs) among thousands of candidates detected, mainly due to the low spatial resolution of its cameras (≈21 "/pixel). Follow-up them all with high-resolution RV requires too much effort, therefore we need a quick, efficient statistical validation procedure to exclude FPs.

Aim: To validate *TESS* Objects of interest (TOIs) orbiting Solar-analog stars and get the best targets to be later confirmed through radial velocity (RV) follow-up.

PLATO will have a similar spatial resolution. Our validation procedure will therefore be essential and can be easily adapted to the future mission.

Methods

- VESPA code to perform fully automated probabilistic validation
- *Gaia* EDR3 photometry to predict possible contaminating stars and correct the photometry for stellar dilution

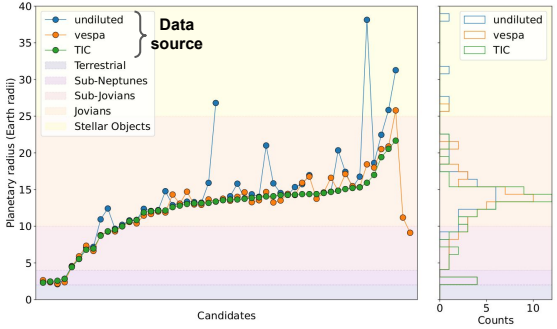
Results

Follow-up program of all TOIs orbiting Solar-analog stars:

- ❏ 328 selected, with no time-series or high-precision RV observations available
- ❏ **53 statistically validated**

Stellar neighbourhood analysis:

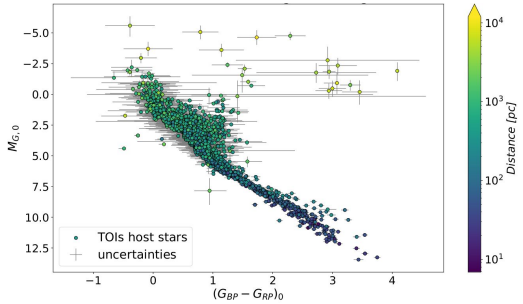
- ❏ **12 confirmed to orbit their host star**
- ❏ The others need further investigation, starting from on-off photometry
- ❏ After stellar dilution correction, 4 candidates could be of stellar nature



Planetary radius distribution (increasing order) for the 53 validated candidates

How did we select our sample?

Intrinsic color-magnitude diagram in the Gaia band



- Distance modulus, extinction and reddening correction
- Mamajek's table to extrapolate stars from F9V to G8V stellar classes

Further work

We won an observational proposal to collect multi-band REM images (INAF AOT44 call) and currently we are performing on-off photometry of our best targets, in order to confirm the source of their signal

References: VESPA (Morton 2012, Morton et al. 2016); Color-magnitude diagram (Bailer-Jones et al. 2018, Capitanio et al. 2017, Pecaut & Mamajek 2013); On-off photometry (Deeg et al. 2009); Figures (Mantovan et al. in prep)