A Systematic Search for Multiplanet Systems in TESS Full-Frame Images

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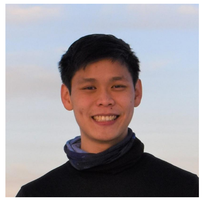

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Intro

- Multiplanet systems help us understand planetary system formation & evolution.
- Currently, no search has been conducted on the millions of existing Quick-Look Pipeline (QLP) Full Frame Image (FFI) light curves.[2]
- **We are conducting the first systematic search for multiplanet systems in FFI light curves.**
- 250k light curves processed so far -> a few new candidates from past sectors!
- Code added to QLP in S33.

Outline

1. **Generate** QLP LCs from TICA-calibrated FFIs (~14 M)
2. **List** stars with Threshold Crossing Events (~2.5 M)
   - Sectors 1 - 36
   - Tmag < 12.5
   - Signal-to-Pink Noise Ratio > 7
3. **Search** for multiplanet signals with iterative Box Least Squares (BLS) algorithm [1]
4. **Filter** results with neural-network model Astronet [3]
5. **Review** remaining candidates

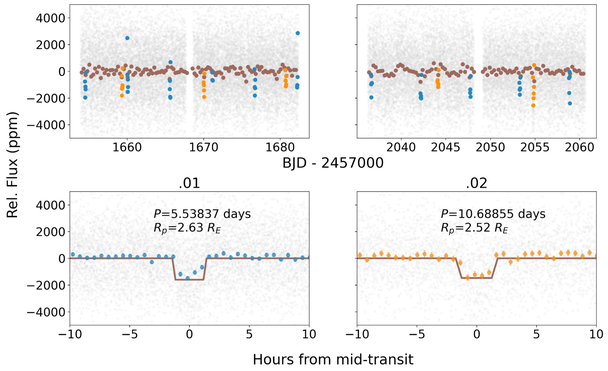
References

1. BLS (*Kovacs et al. 2002*)
2. QLP (*Huang et al. 2020*)
3. Astronet (*Moldovan et al. in prep*)

New Planet Candidates!

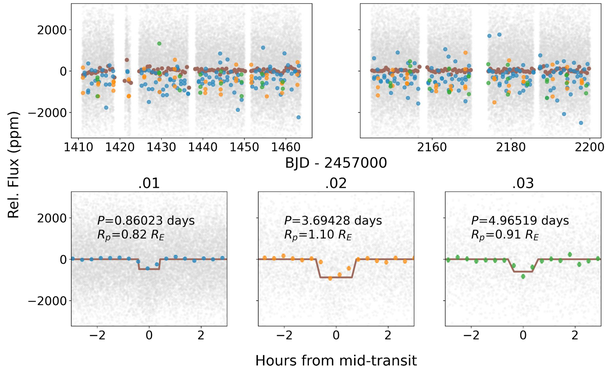
TIC ID 354944123 *(Tey et al. in prep)*

- M dwarf 2-planet system near 2:1 resonance

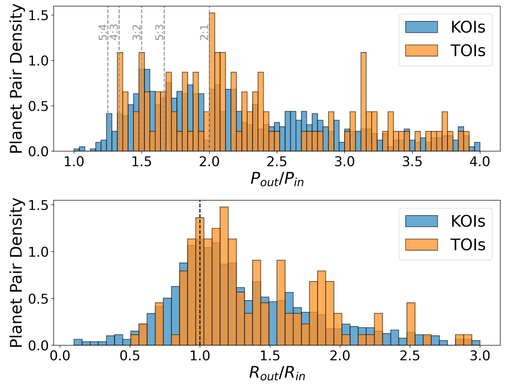


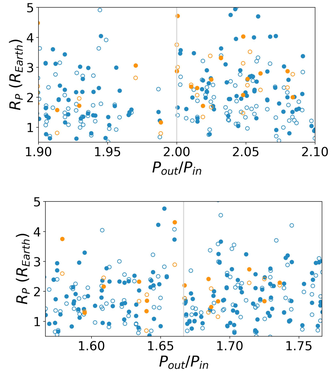
TOI 696.03 *(Silverstein et al. 2021, submitted)*

- Third candidate found near 4:3 resonance with 696.02



Updated Multiplanet TOI Demographics





Far left: Period & radius ratio comparisons between Kepler and TESS multiplanet systems.

Left: Scatter plots of period & radius ratio vs planet radii zoomed in around 2:1 and 5:4 period resonances

Right: Mosaic of all multiplanet TOI systems. Dot sizes are scaled by the planet radius. Dot colors reflect the host star's $T_{eff.}$ Arrow mark new candidates.