Populating the brown dwarf and stellar boundary: *Five stars with transiting companions near the hydrogen-burning mass limit*

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BACKGROUND:

- Brown dwarf companions, ~13-80 M_{Jup} are relatively rare, e.g., the brown dwarf desert
- brown dwarf / stellar boundary important - small changes in mass can cause very different lives:
  - **M-dwarfs** may burn hydrogen for up to **trillions of years**
  - **brown dwarfs** have short-lived deuterium burning stage of **less than a billion years** before cooling and shrinking
- The exact mass of the stellar boundary is uncertain and varies for each individual system depending on an object's chemical composition, initial radius, and efficiency of convection

SYSTEMS

TOI-148, TOI-587, TOI-681, TOI-746, TOI-1213

- 4.8 - 27.2 day orbits; 77 - 98 M_{Jup}; 0.81 - 1.66 R_{Jup}

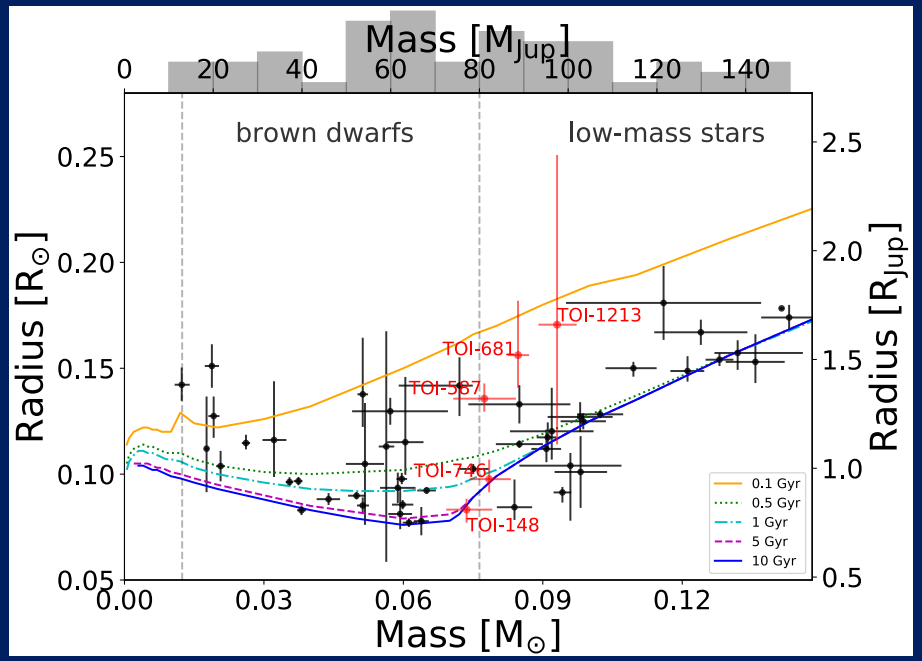
RESULTS

- TOI-587 and TOI- 681 young with large radii; TOI-148 and TOI-746 old with small radii-148
- TOI-587 hottest main-sequence star (Teff = 9800 K) known to host transiting 13-150 MJup companion
- Evidence of spin-orbit synchronization for TOI-148 and TOI-746, tidal circularization for TOI-148
- transiting brown dwarfs and low-mass stars eccentricity and metallicity distributions still possibly consistent with two separate populations for lower and higher mass brown dwarfs.

Brown dwarfs or stars?

radii of companions near the hydrogen-burning mass limit likely related to their age, but

their identity is unclear

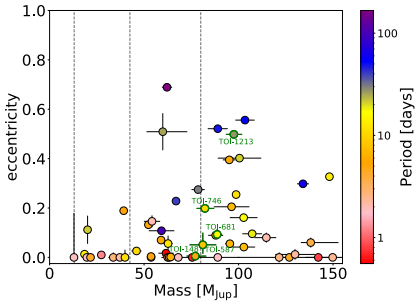


Mass-Radius diagram for known 13-150 M_{Jup} transiting companions. We find relatively *younger ages* for TOI-587 and TOI-681 with relatively *larger radii*, but relatively *older ages* and *smaller radii* for TOI-148 and TOI-746

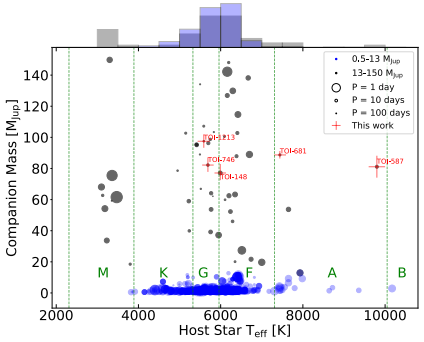
arXiv | ADS

See poster by Angelica Psaridi for 3 new transiting brown dwarfs!

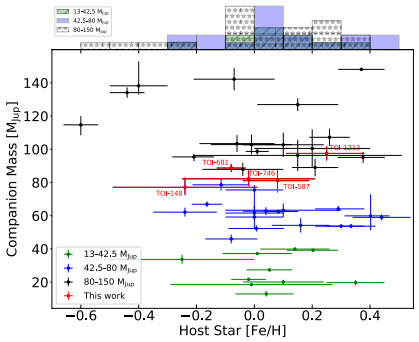
Properties of known 13-150 M_{Jup} transiting companions



Mass-eccentricity-period relationship



Host star effective temperature distribution



Host star metallicity distribution

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