Small, numerous and close-in:
Occurrence rates of planets around low-mass M dwarf stars

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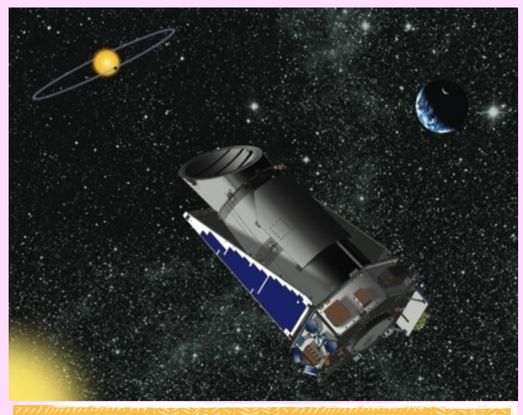
This is the first in a series of papers with the **broader goals** of establishing **scaling laws** for **planet formation** as function of **stellar mass**, to predict the population of unseen planets and hard to observe planet properties, and to aid future missions aimed at characterizing exoplanet atmospheres.

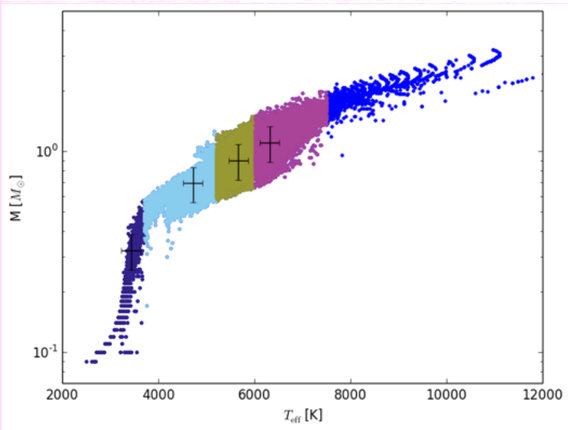
Planet occurrence rates

Kepler Objects of Interest (KOIs) from Burke et al. 2014
Stars from Huber et al. 2014
Simulate transit detection efficiency based on predicted S/N



Thanks to the Kepler team for providing such great data!

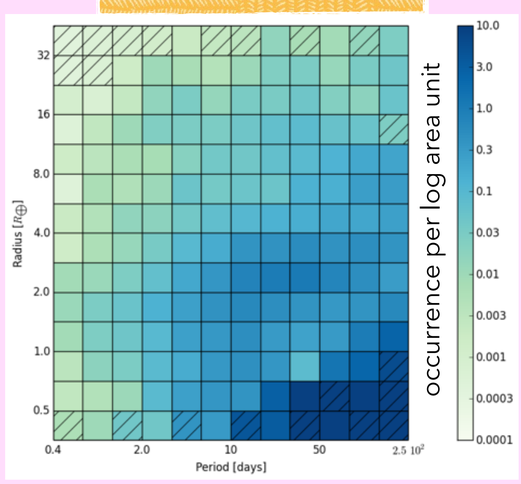
Stellar bins from spectral type



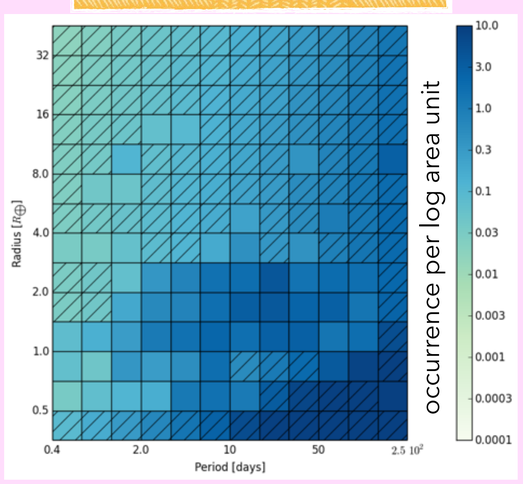
Trace underlying distribution of stellar mass

We derive, for the first time, occurrence rates based on planet radius, distance from the star, **and** stellar properties

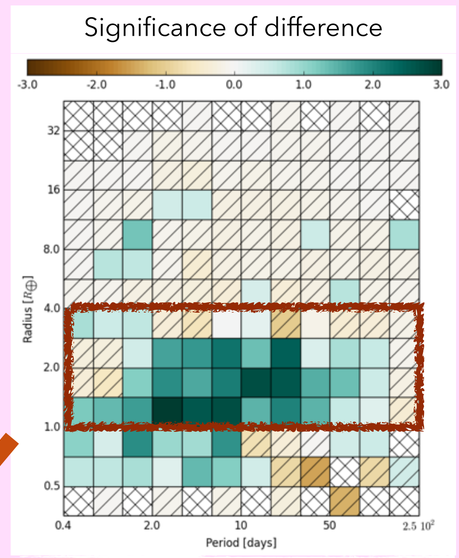
all KOIs (Q1-Q8)



Cool stars (T<4000 K)

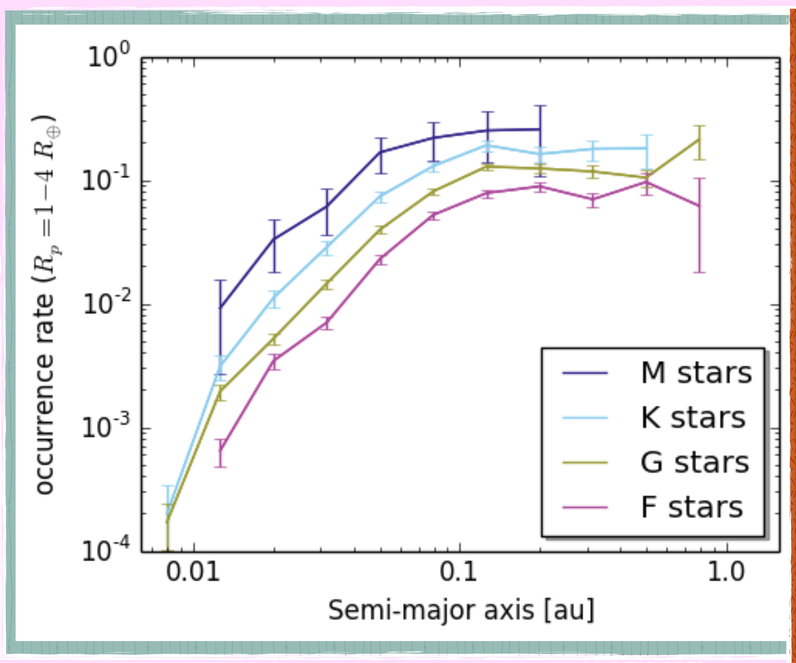


Significance of difference



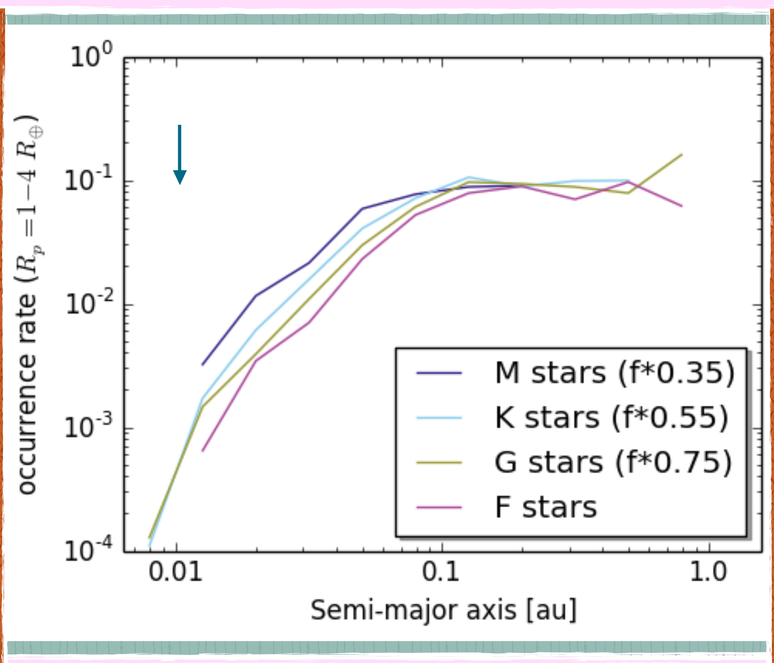
We compare occurrence rates in the region where differences are most significant (1-4 Earth Radii)

Occurrence rates around cooler stars are systematically higher!



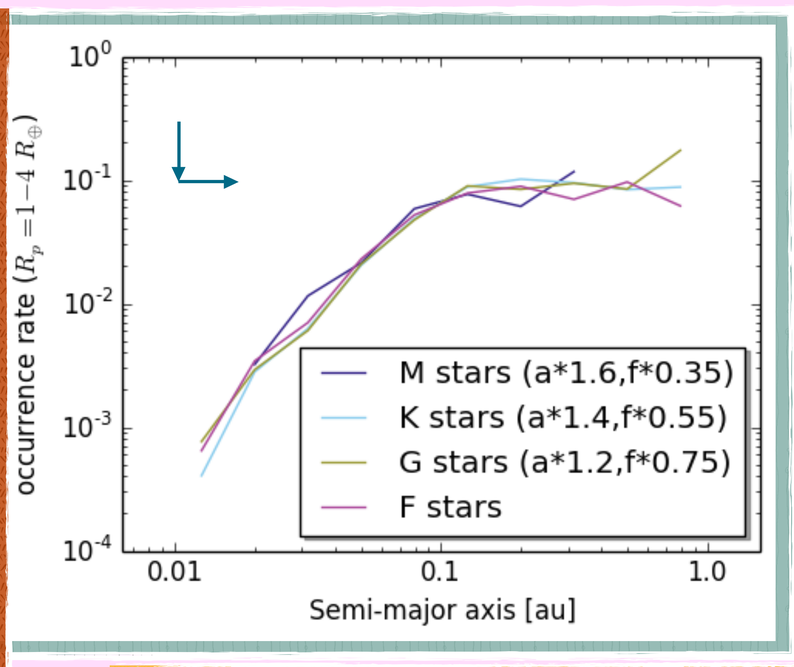
Systematic trend of increasing occurrence with decreasing stellar mass

Higher occurrence rate around lower mass stars



Plateaus match together by scaling overall occurrence rate (f)

Cutoff closer in around lower mass stars



Shift semi-major axis (a) to match cut-off

Planet formation is more efficient around lower-mass stars.

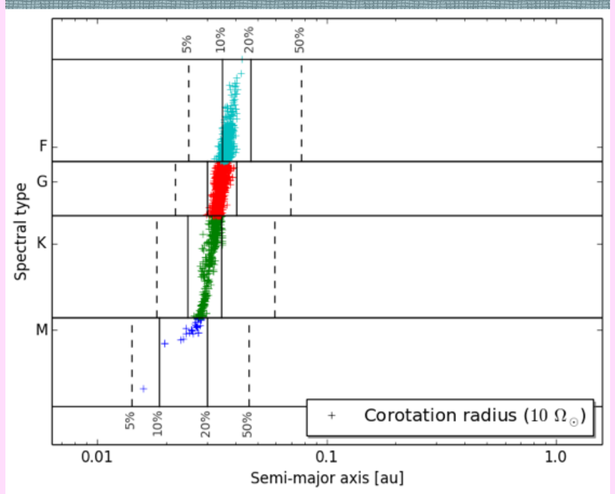
...or...

Lower-mass stars form smaller, but more numerous planets.

Ask me about this!

Lower-mass stars probe a different population, but:
Differences in stellar composition cannot explain this trend

Planet traps at gas disk co-rotation radius?



- Simple scaling law: a ~ M^(1/3)
- Matches planet population to protoplanetary disk properties

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http://arxiv.org/abs/1406.7356