

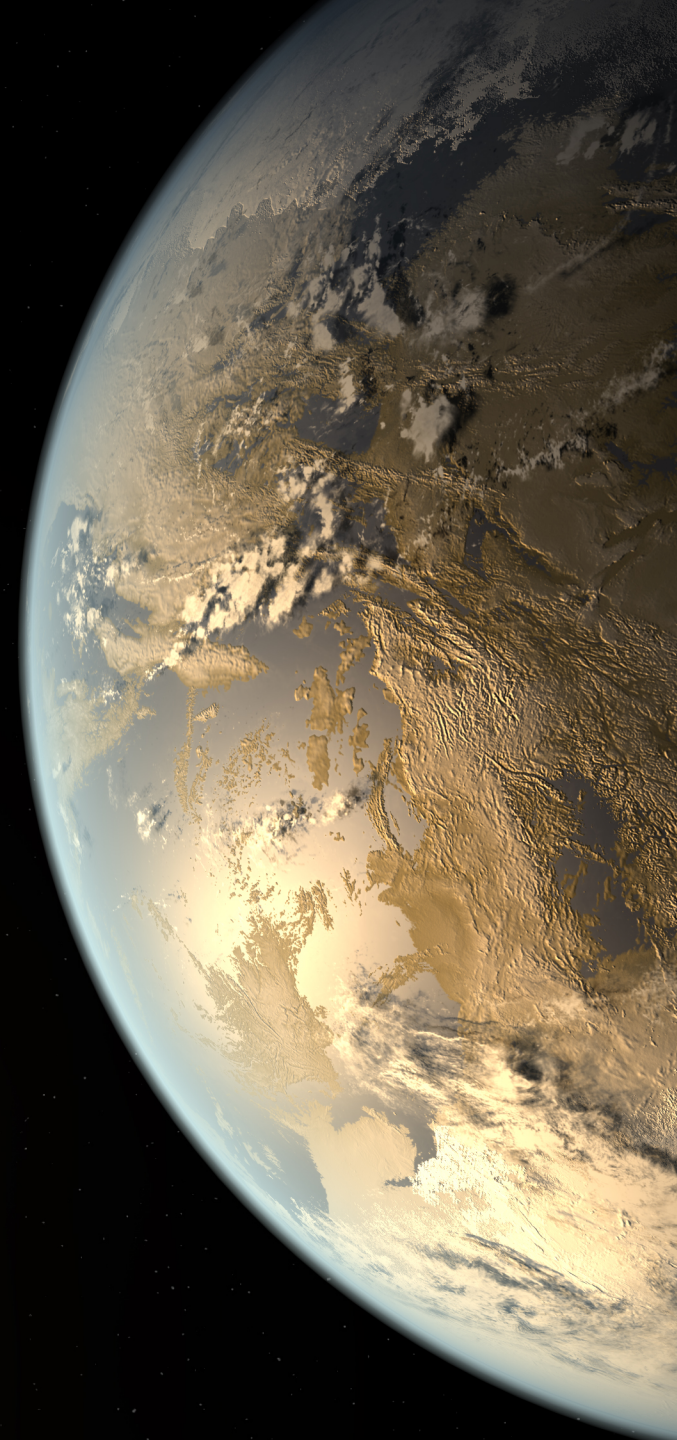
*The Last Tall Tent Pole:  
Measuring the Multiplicity of  
Kepler Stars*

#knowthystar, October 10 2017

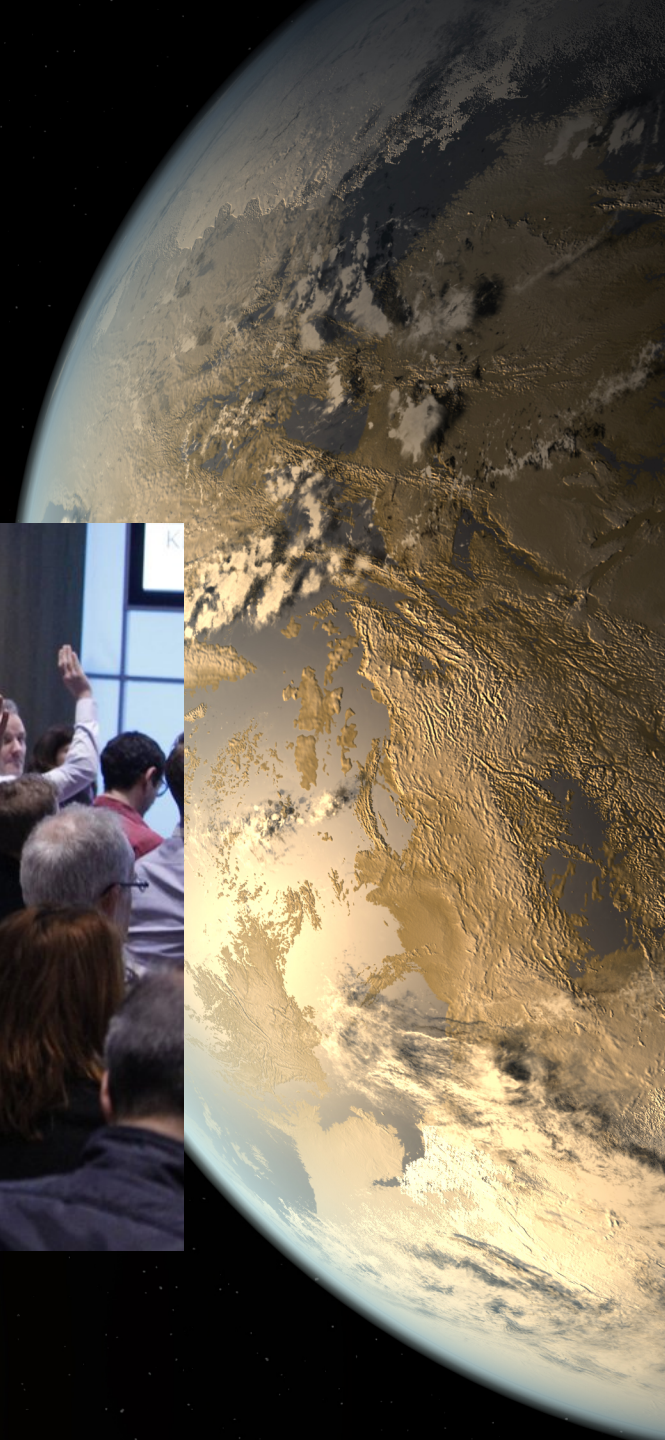
Jessie Christiansen

(with David Ciardi, Courtney Dressing)

Caltech/IPAC-NExSci



What about  
~~magnetic fields?~~  
stellar multiplicity?

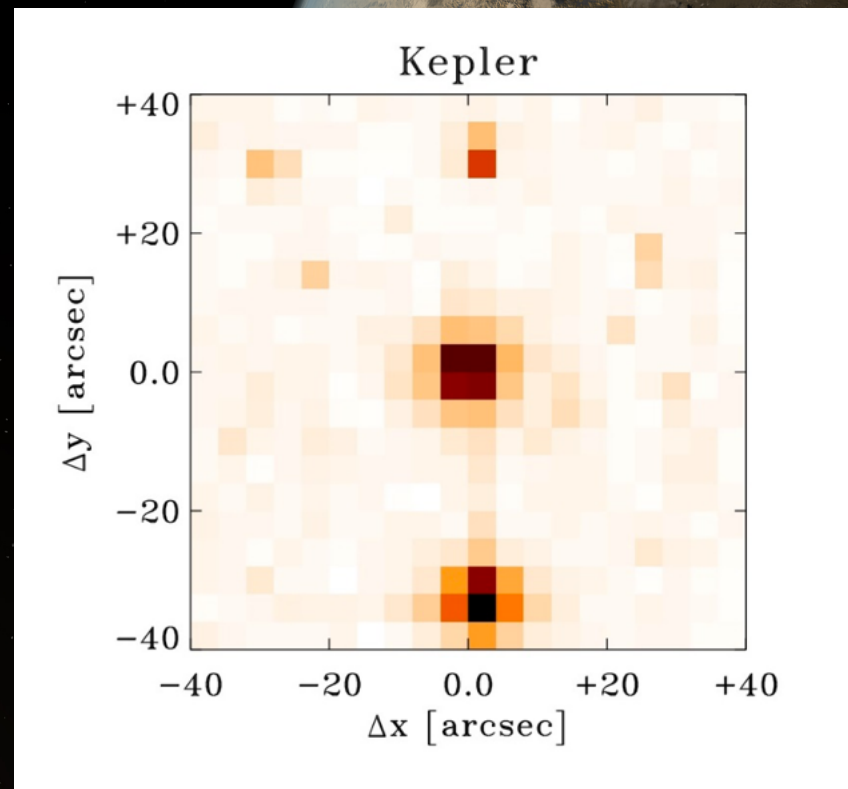


# Why do we care about stellar multiplicity?

Only 56% of nearby (<25pc) solar-type stars are single (Raghavan+2010)

The Kepler Input Catalog (KIC; Brown+2011) assumed that unresolved flux sources (typically 1-2" resolution) were single stars

The most recent Kepler stellar properties catalogue (Mathur+2017) still uses KIC values for 73% of stars

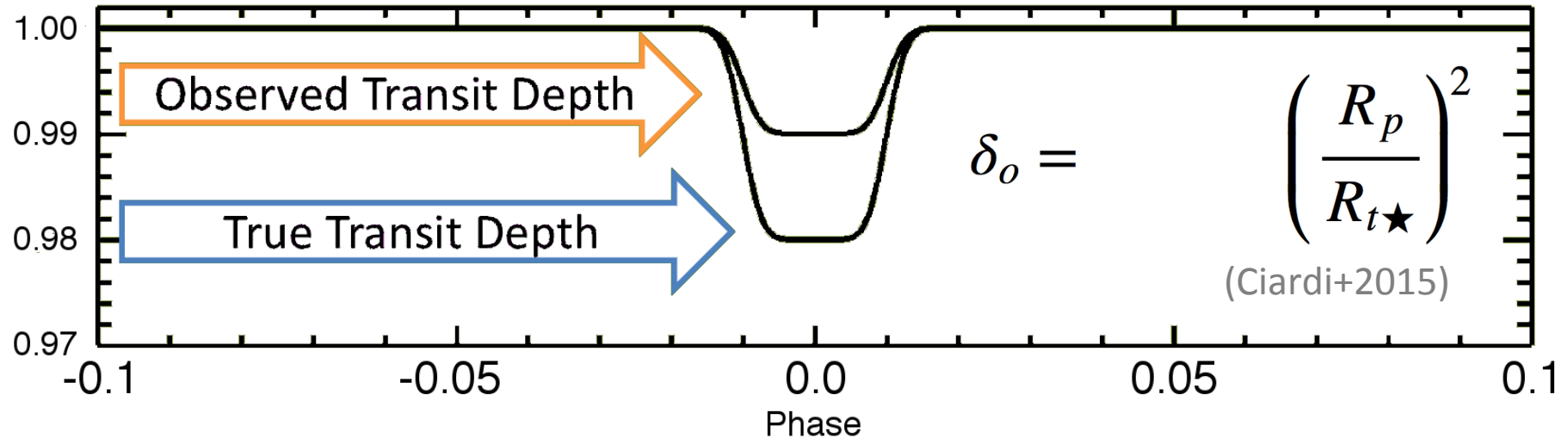
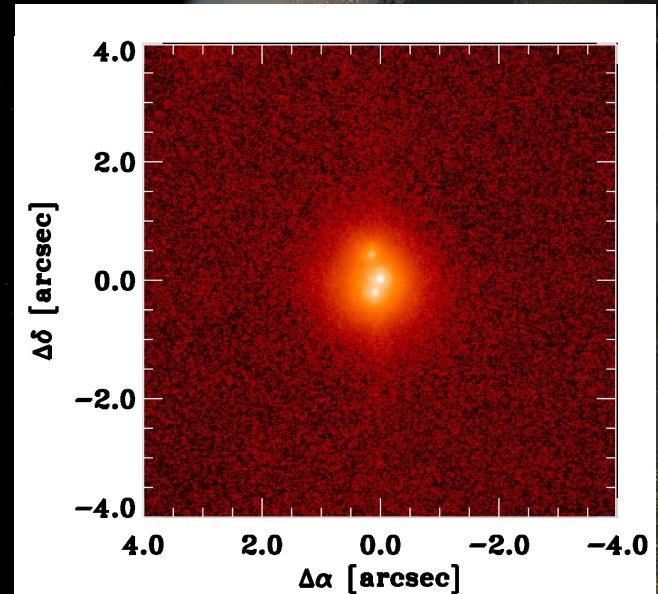


Revelio!

# Impact on occurrence rates

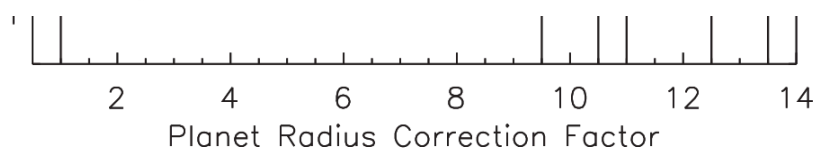
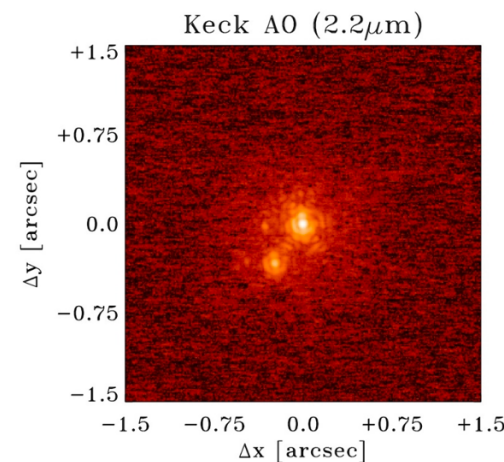
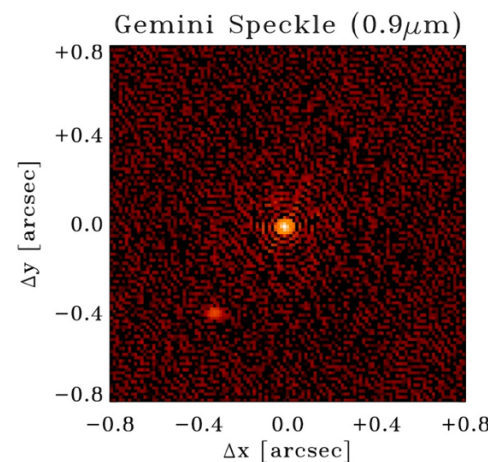
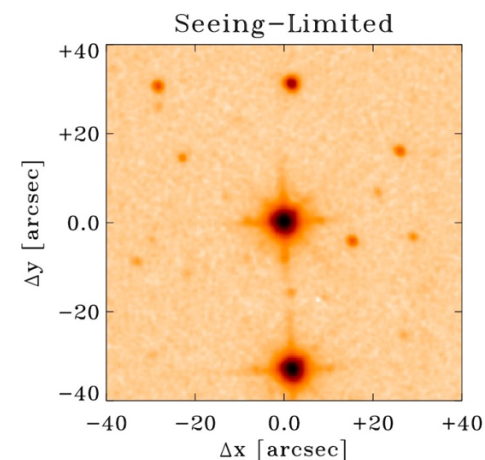
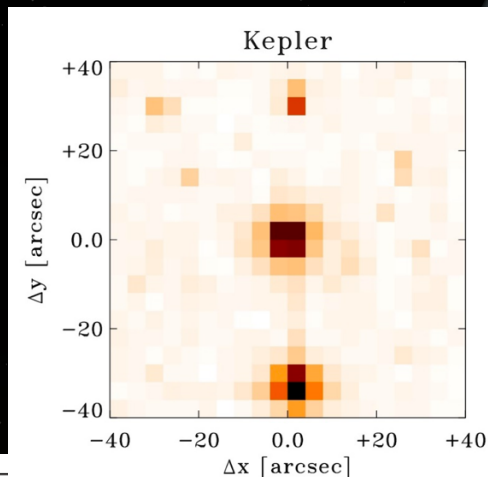
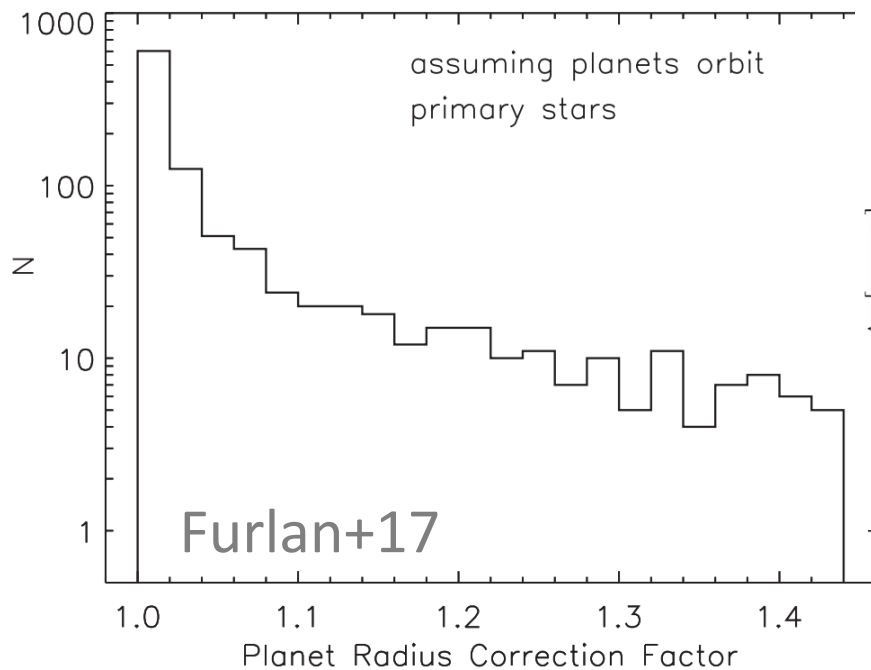
$$\eta_{EARTH} = \frac{\cancel{N}_{measured}}{N_{detectable}}$$

1. We do not measure the right number of Earth-size planets!



# High-resolution imaging to the rescue!

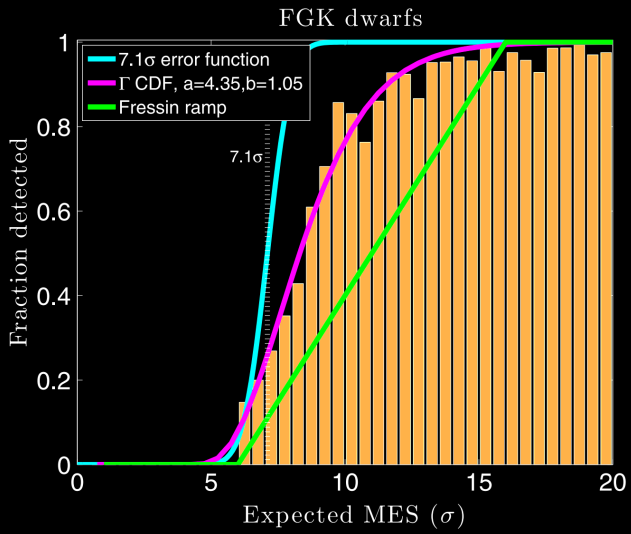
Furlan+2017 (see Elise's talk tomorrow!) compile high-resolution imaging of 3183 Kepler planet candidate host stars



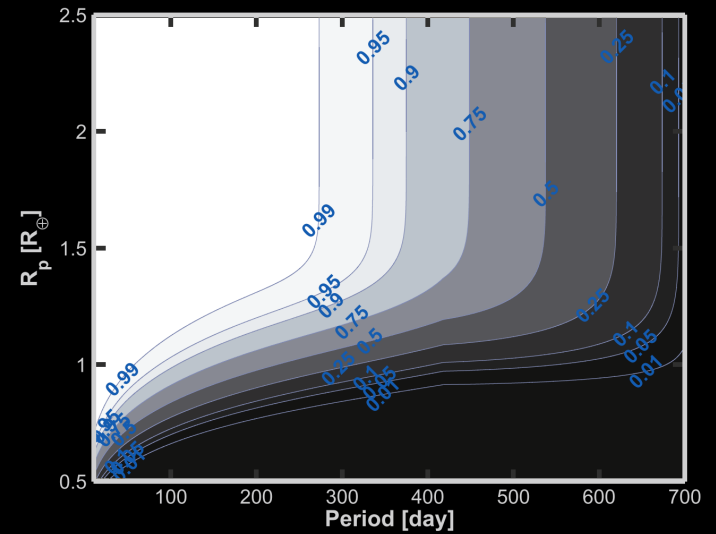
# Impact on occurrence rates

$$\eta_{EARTH} = \frac{\cancel{N_{measured}}}{\cancel{N_{detectable}}}$$

2. We do not measure the right detection limits on the non-host stars!



SNR=



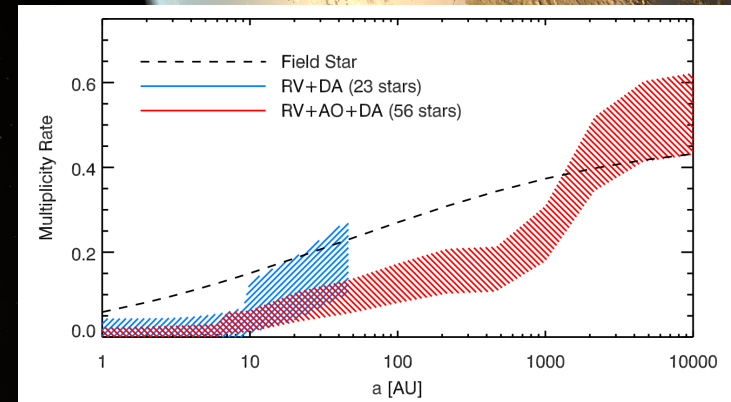
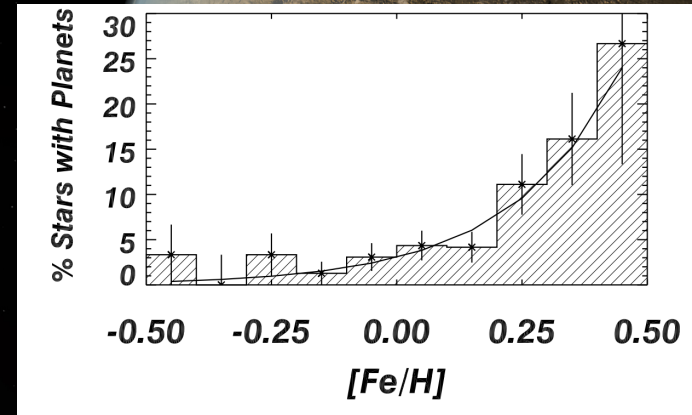
# Don't we have the answer?

Why can't we apply the multiplicity rates for the planet candidate hosts to the non-hosts?

Well-known examples in the literature of differences in stellar properties of exoplanet hosts and non-hosts

Also evidence that stellar multiplicity could suppress some kinds of planet formation (Wang et al. 2014a,b) or lead to high rates of ejection of formed planets (Kaib et al. 2013).

Fischer & Valenti 2005



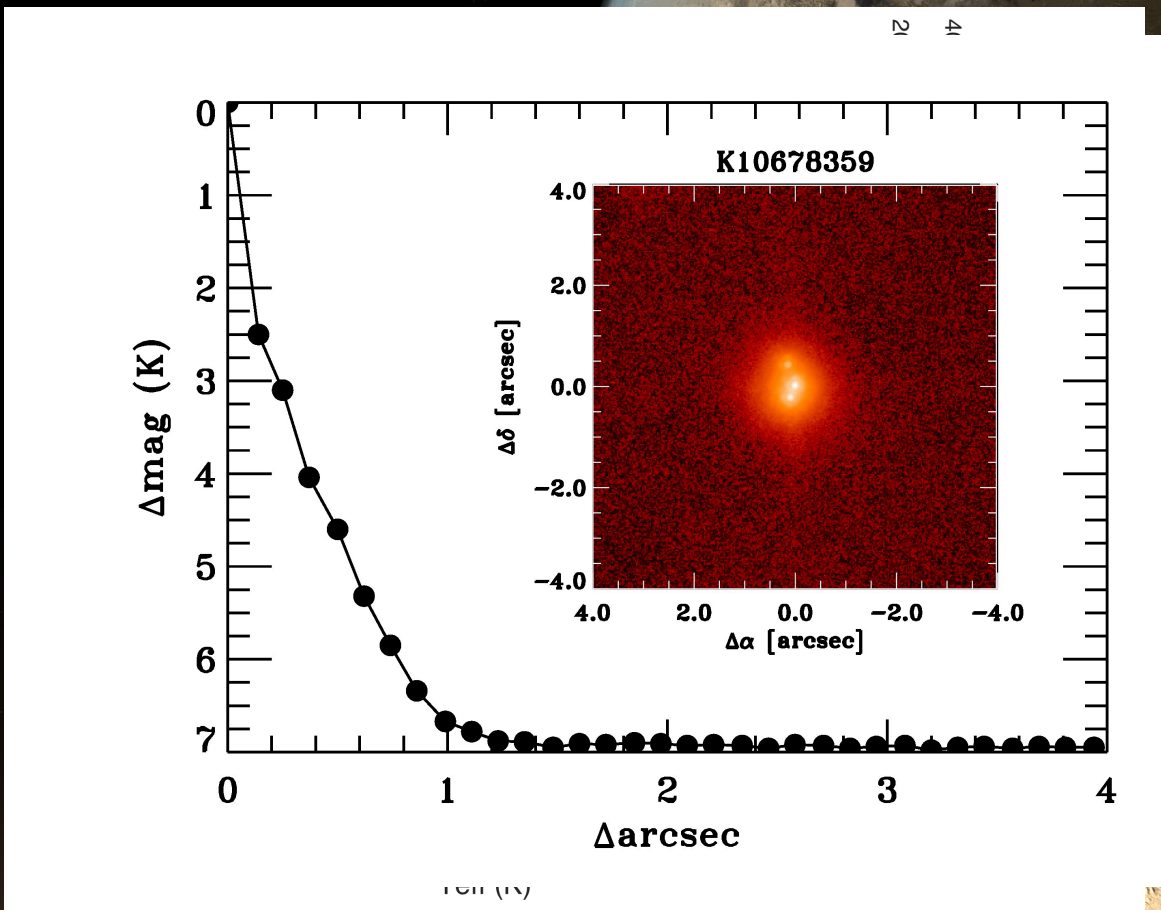
Wang+2014

# So what *\*is\** the answer?

Perform a high-resolution survey of Kepler non-host stars with Palomar and Keck

Using the Mathur+17 stellar properties, 2135 targets where rocky, temperature planets would be detectable

Randomly draw 200 targets to form a control sample...



Preliminary results – 40% multiples!



# Conclusions

