

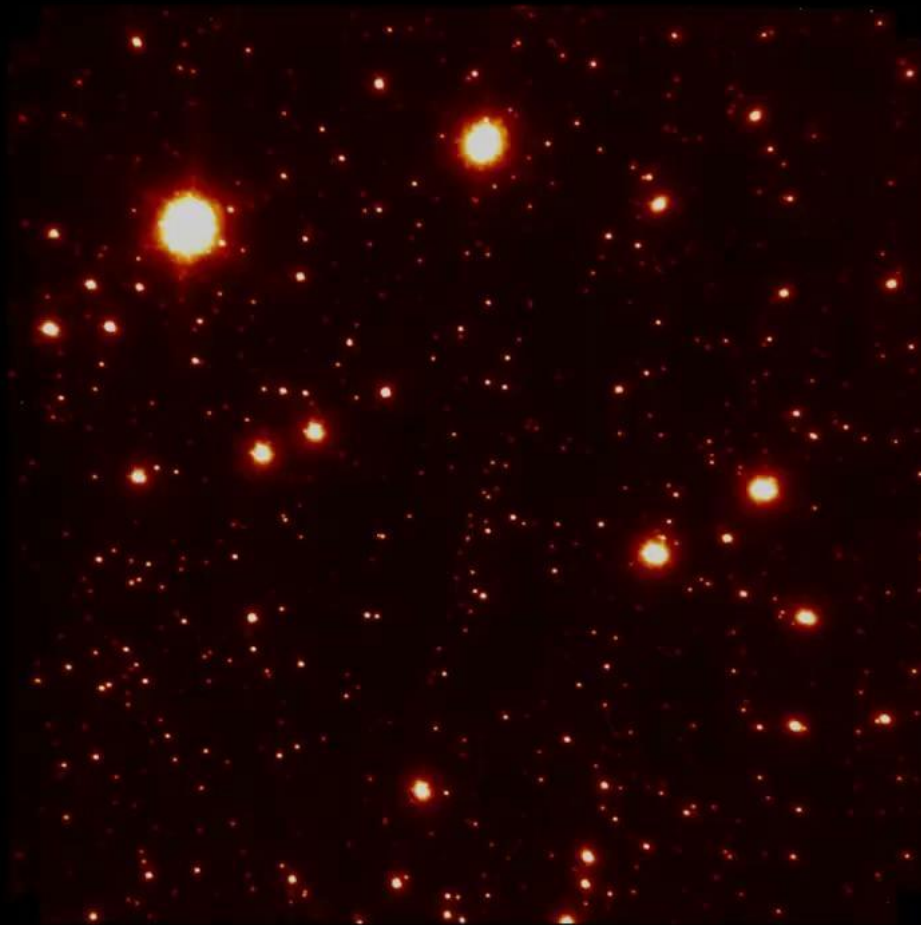
Resolving the Low-Mass Host Star for Super-Earth MOA-2007-BLG-192Lb

Sean Terry, JP Beaulieu, DP Bennett, E. Hamdorf, A. Bhattacharya, V.
Chaudhry, A. Cole, J. Anderson, E. Bachelet, J. Blackman, IA Bond, N.
Koshimoto, JR Lu, C. Ranc, N. Reksini, K. Sahu, A. Vanderou



Lens Flux Analysis Review

Lens Flux Analysis Review



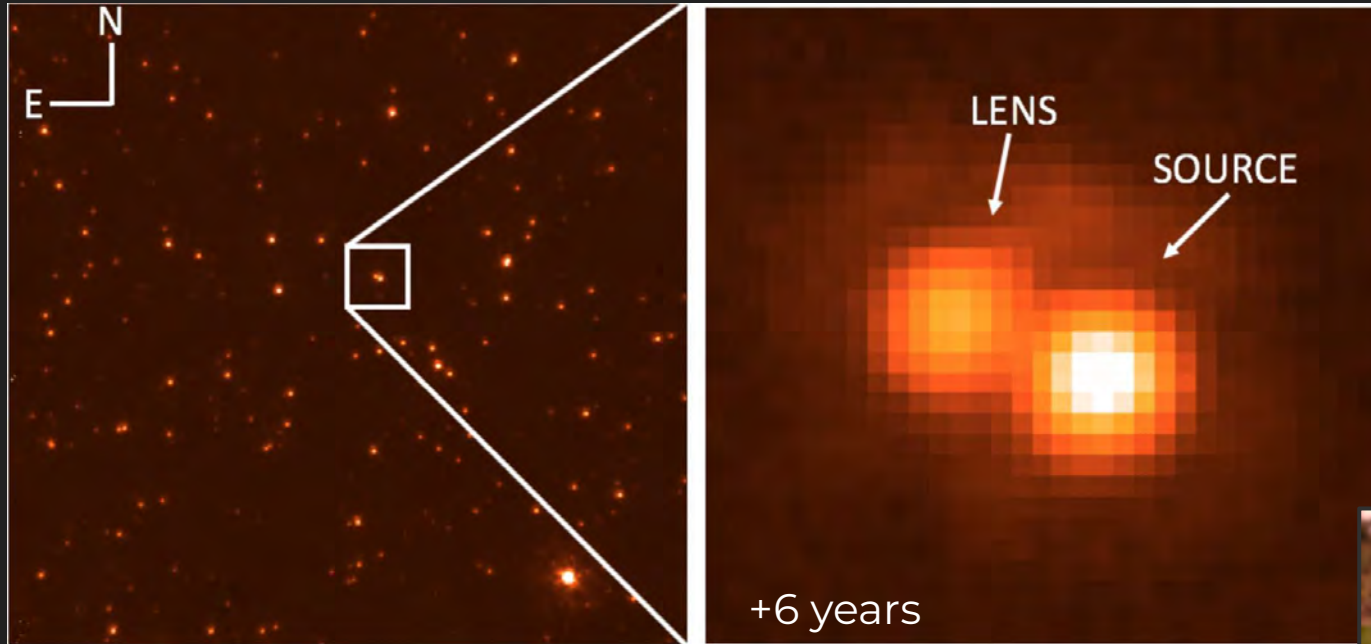
Lens Flux Analysis Review

Fully resolved scenario

Lens Flux Analysis Review

Fully resolved scenario

MOA-2013-BLG-220 (Vandorou+2020)

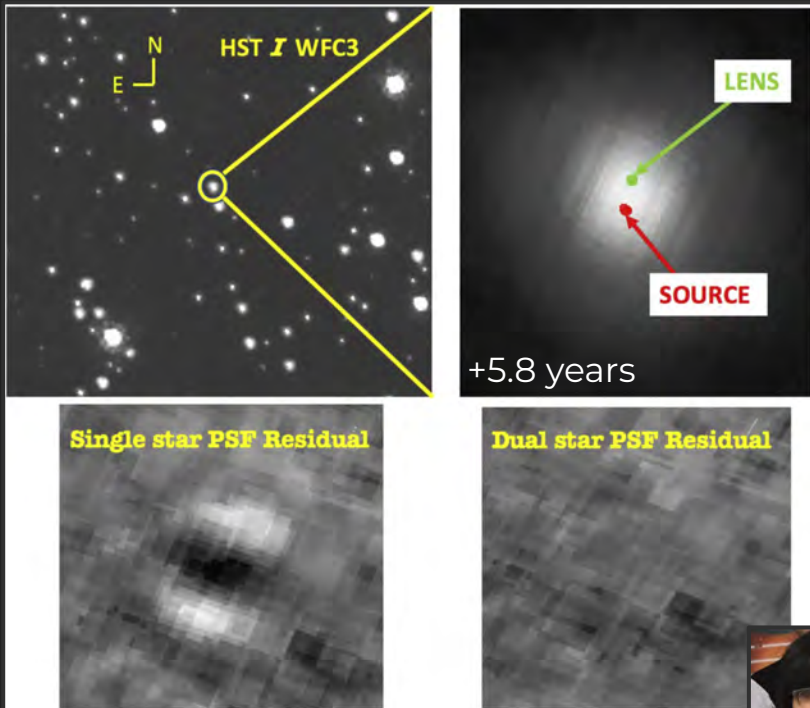


Lens Flux Analysis Review

Image elongation scenario

Lens Flux Analysis Review

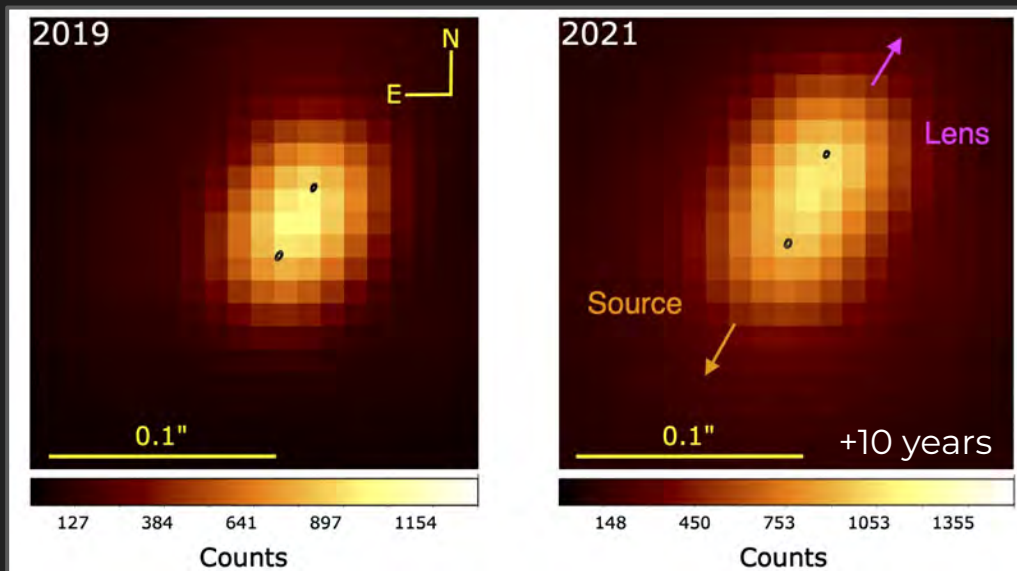
Image elongation scenario



OGLE-2012-BLG-0950
(Bhattacharya+2018)



OGLE-2011-BLG-0950 (Terry+2022)



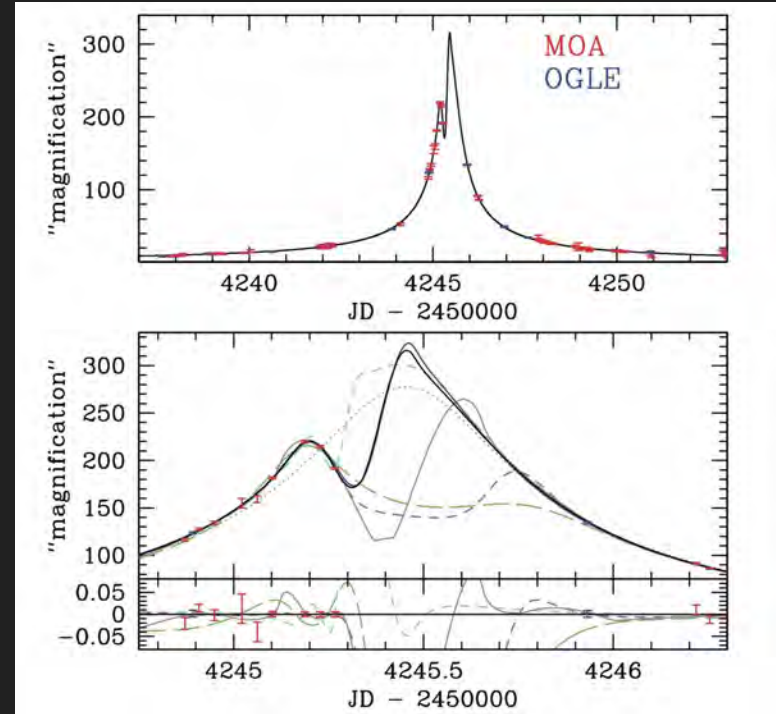
MOA-2007-BLG-192

MOA-2007-BLG-192

[Bennett et al. 2008](#) – planet with $q \sim 2 \times 10^{-4}$

- Conclude the host is either a **Brown Dwarf** or star at bottom of **Main Sequence**
- VLT/NACO imaging consistent with BD or very-low-mass star

MB07192



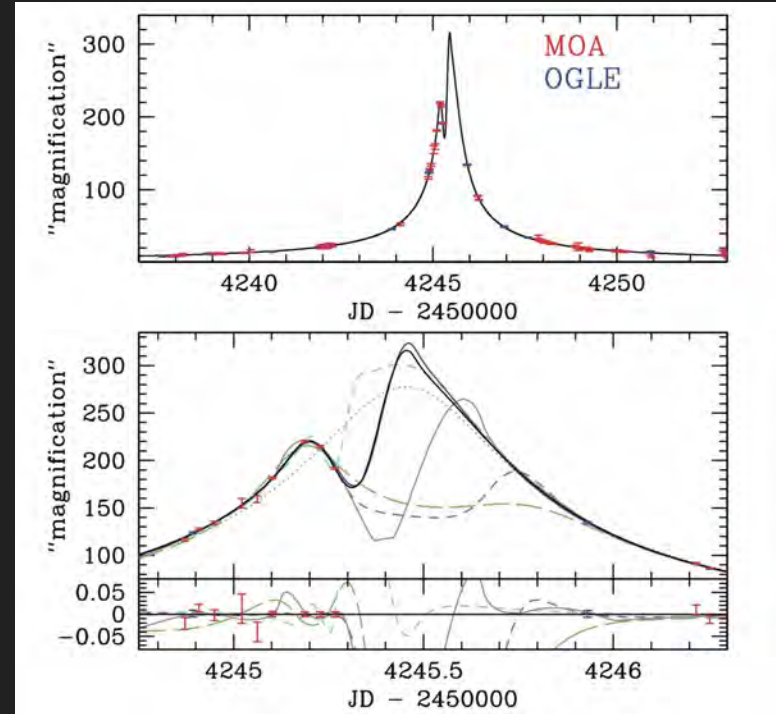
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MB07192



MOA-2007-BLG-192

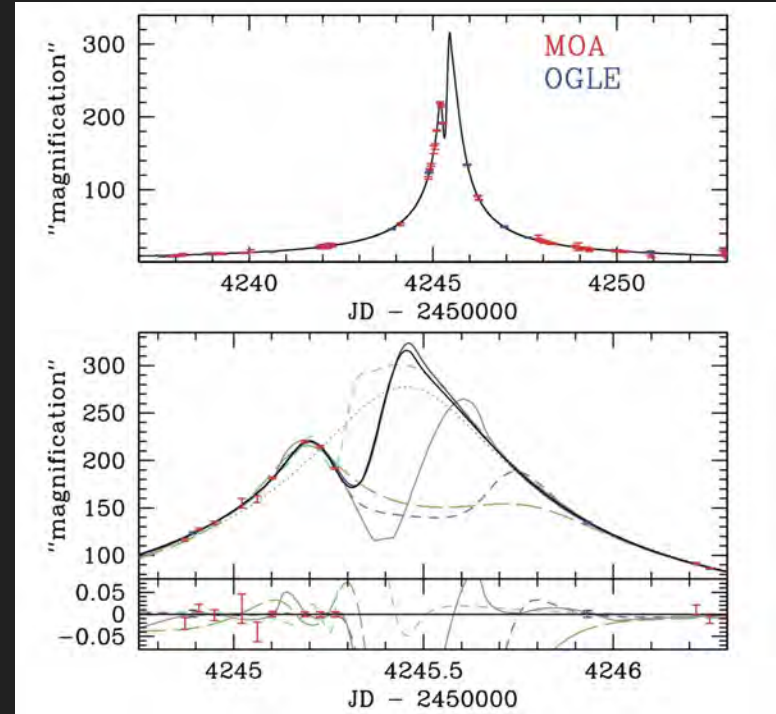
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[Kubas et al. 2012](#) revisited with VLT/NACO and **excess flux rules out BD solutions**

MB07192



Revisiting the System (again)

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Why revisit again?

- Still a lot of ambiguity, **8+ possible solutions for lens system**
- MB07192 is in Suzuki+2016 statistical study:
 - We measure the **observed mass-ratio (q) function**, but **what is the true planet mass function?**
- Directly **detect the lens** after n years
 - Apply high-res imaging **constraints on (re-)modeling lightcurve**

HST & Keck Campaigns

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Obtained several epochs of high resolution imaging:

HST & Keck Campaigns

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- HST 2012 [V, I, J, H]
- HST 2014 [V, I, J, H]
- Keck 2018 [K]
- HST 2023 [I]

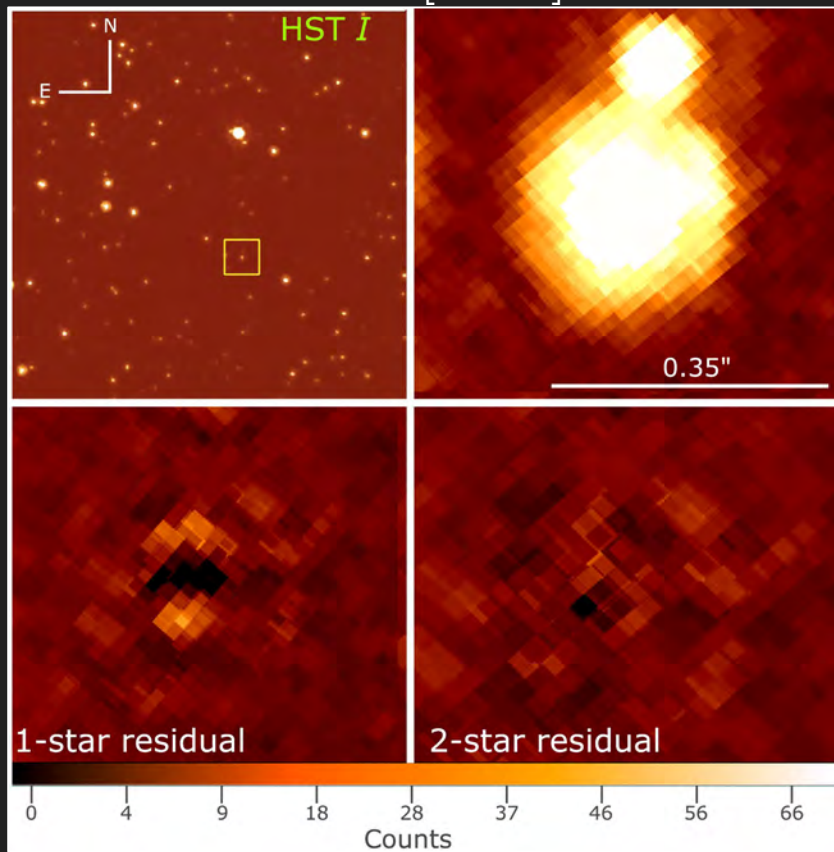
Imaging Results

Imaging Results

HST 2014 [I band]

Imaging Results

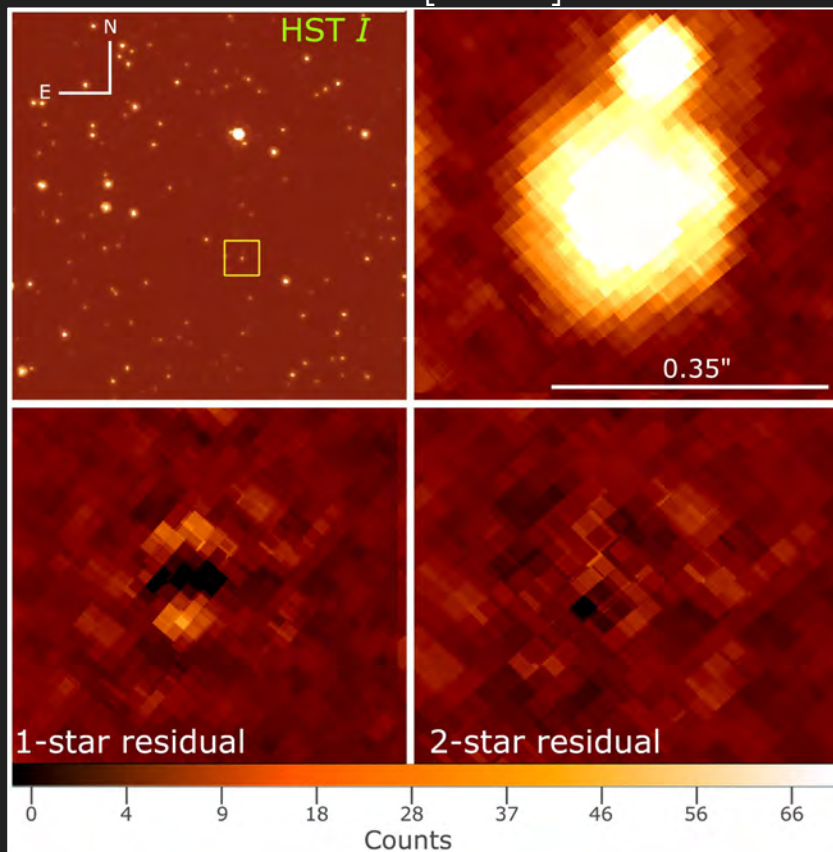
HST 2014 [I band]



Imaging Results

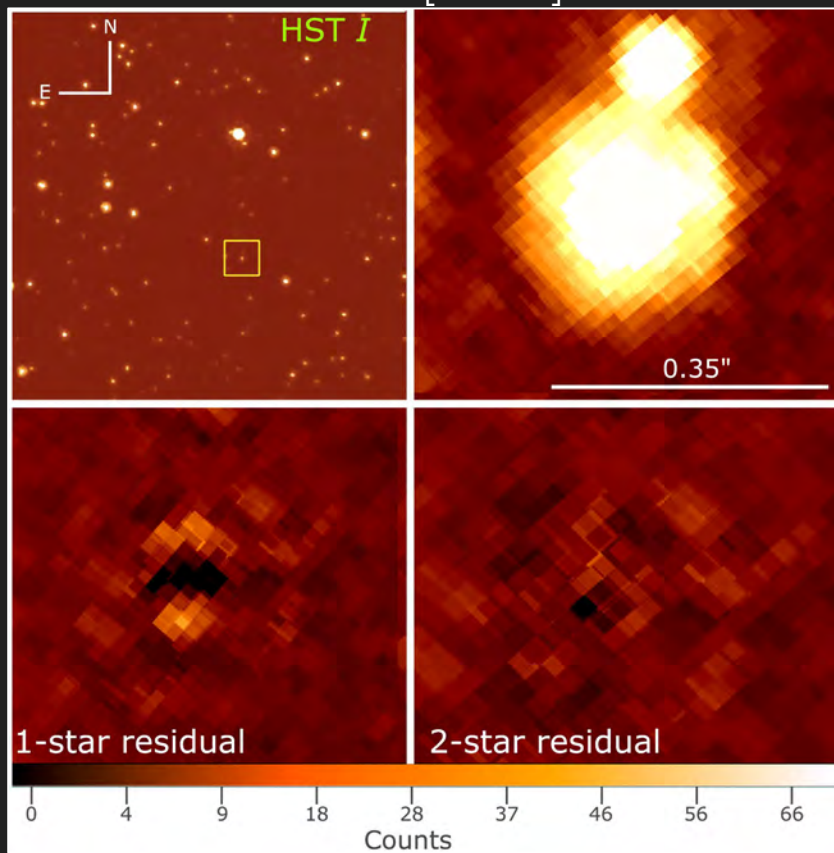
HST 2014 [I band]

Keck 2018 [K band]

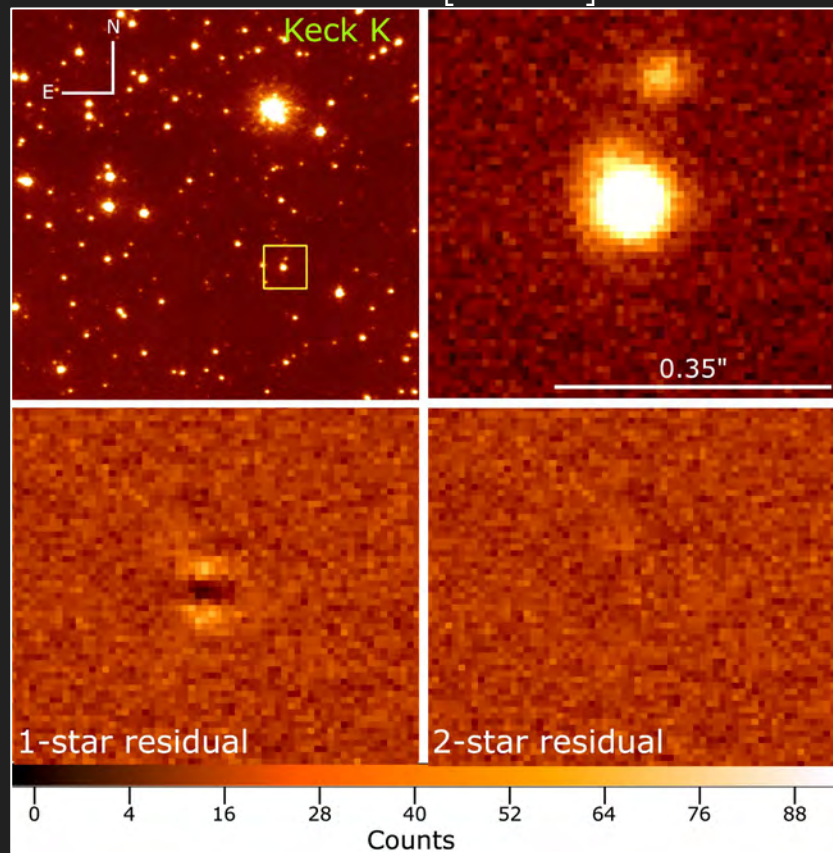


Imaging Results

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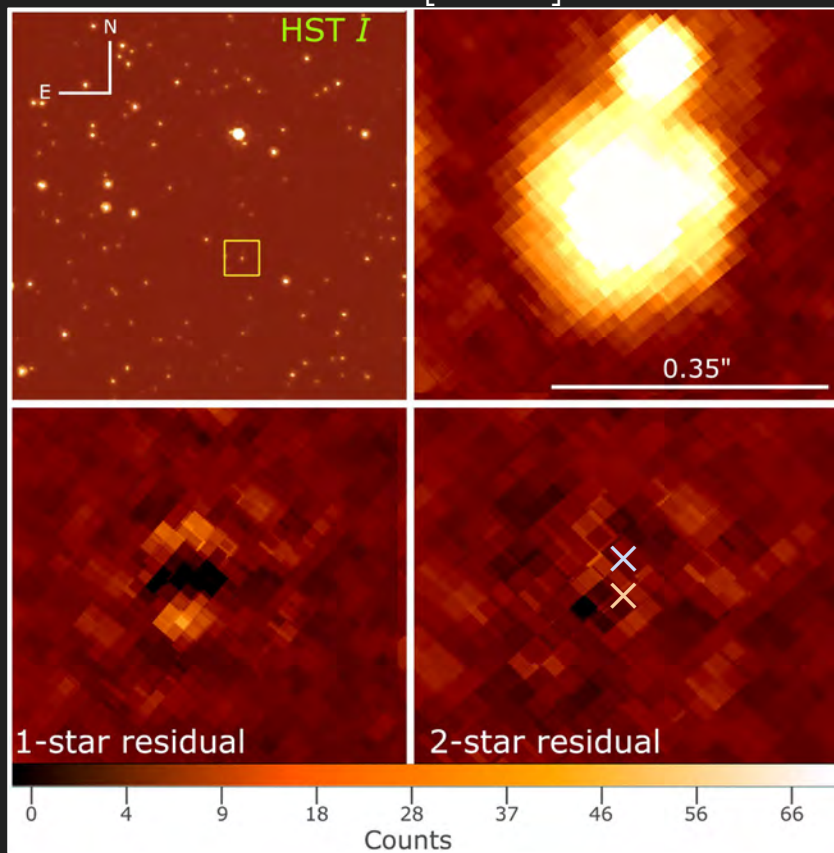


Keck 2018 [K band]

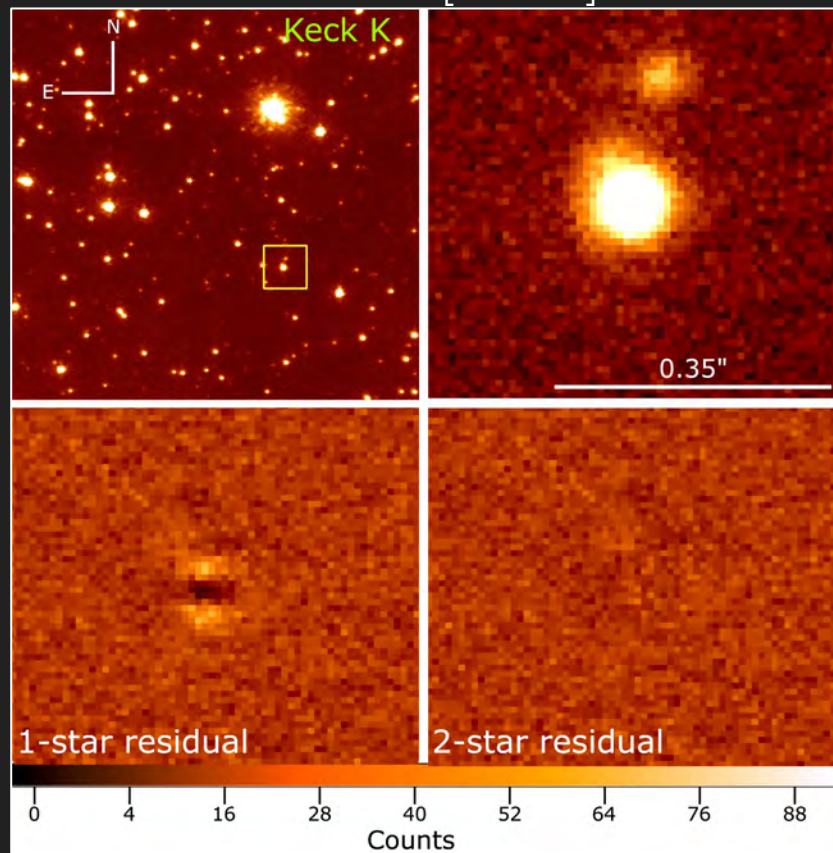


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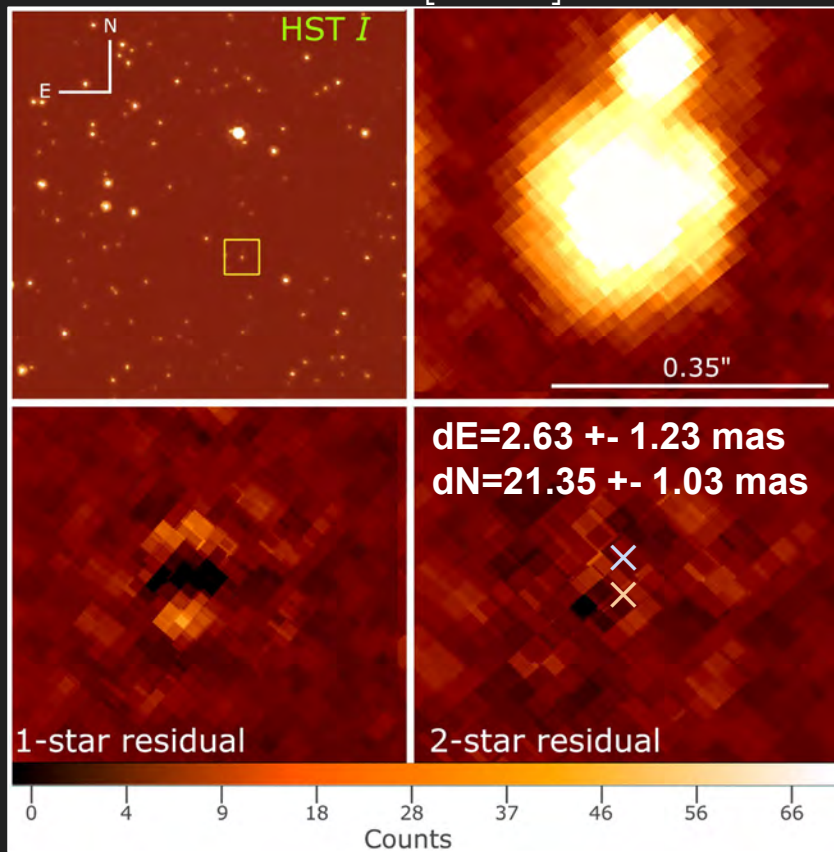


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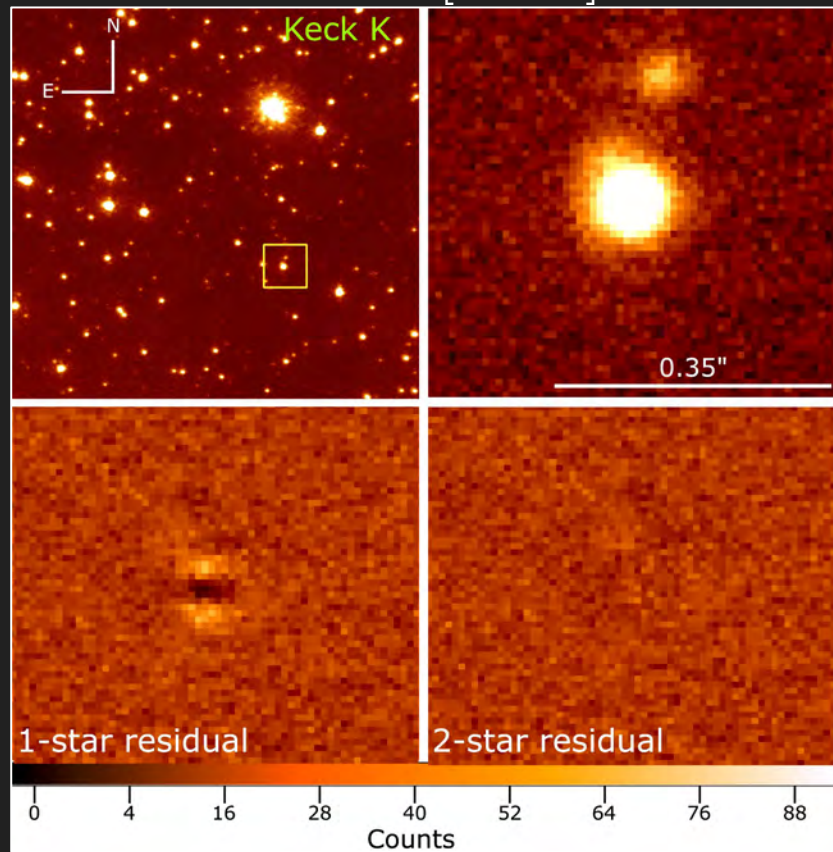


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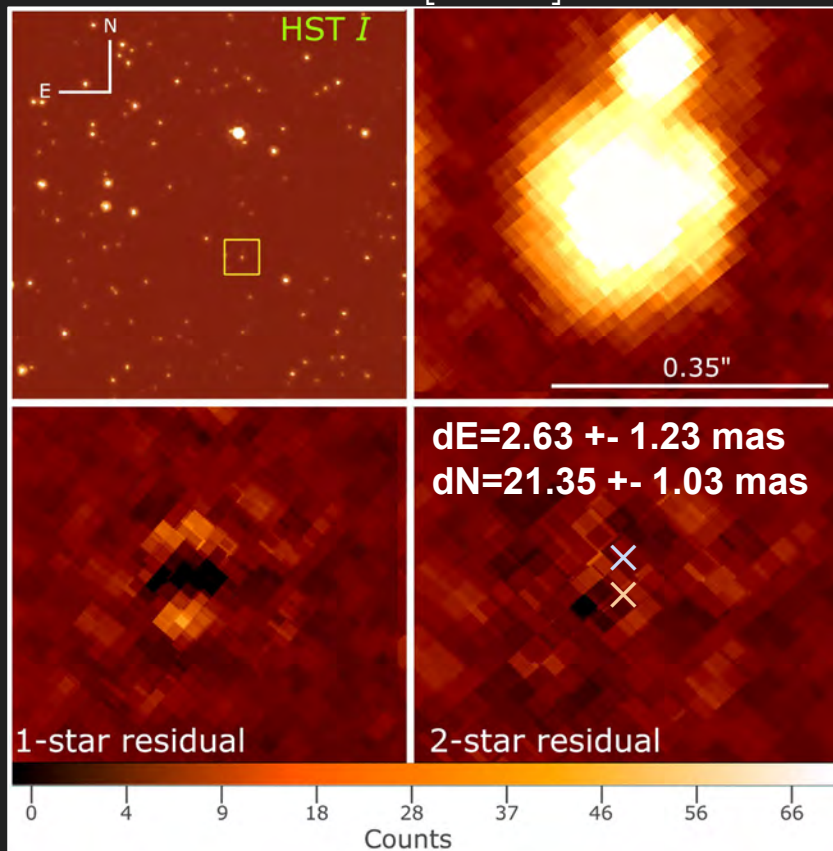


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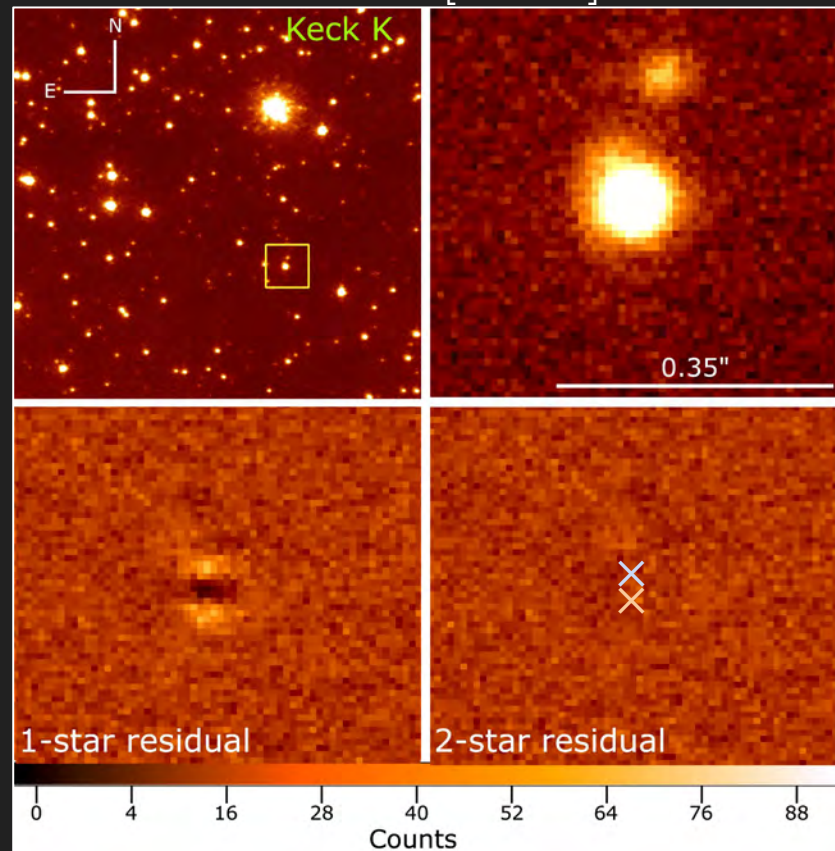


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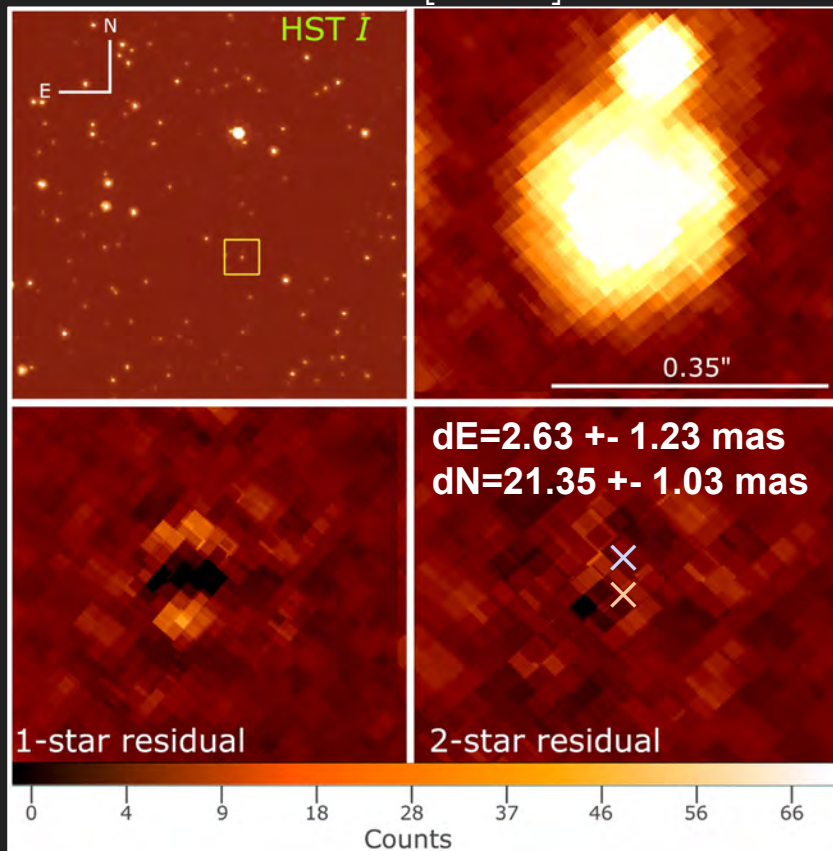


Keck 2018 [K band]

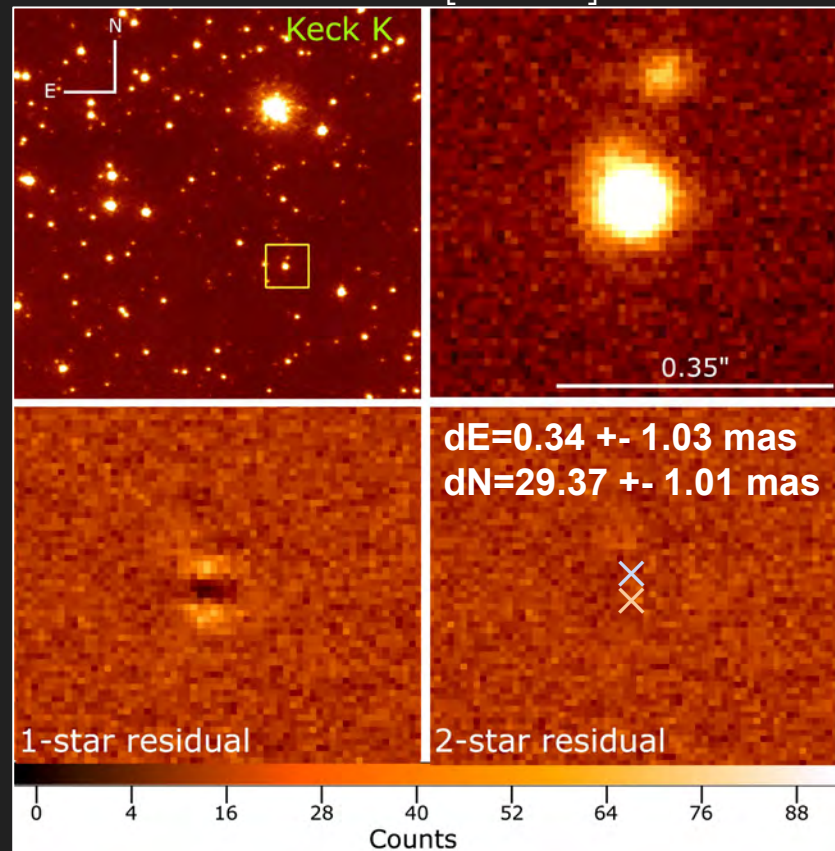


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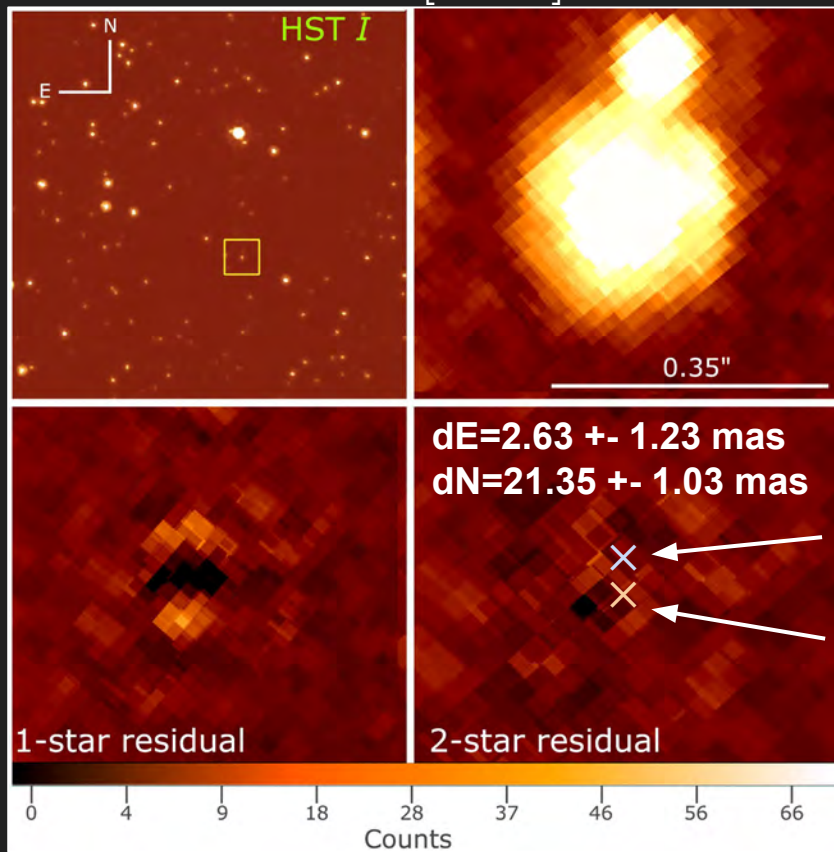


Keck 2018 [K band]

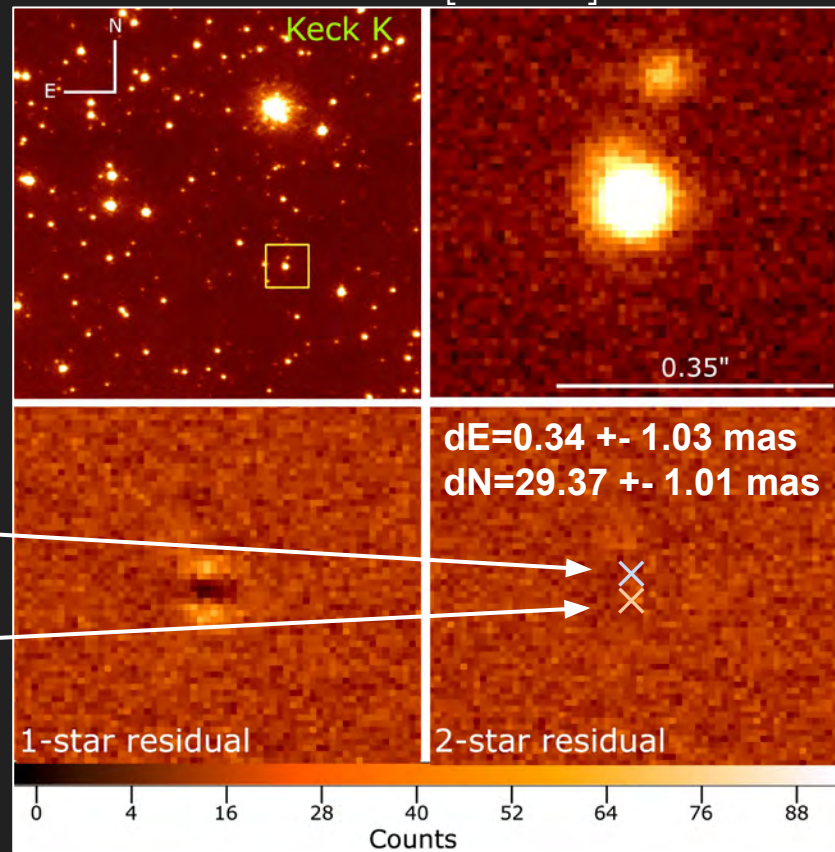


Imaging Results

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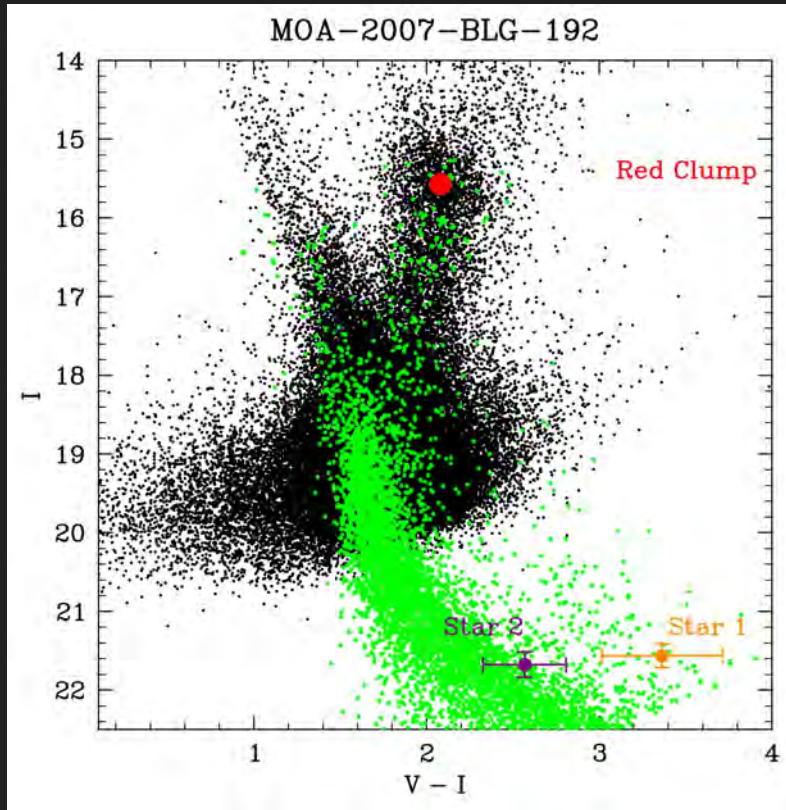
Which is Lens? Which is Source?

Which is Lens? Which is Source?
Color-Magnitude + $\vec{\mu}_{\text{rel}}$ will help us!

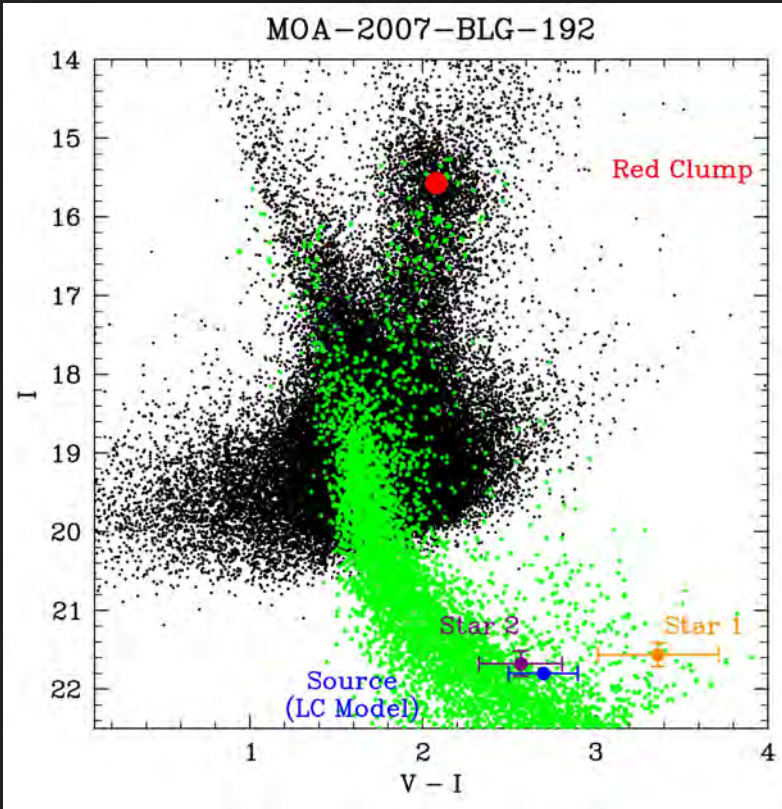
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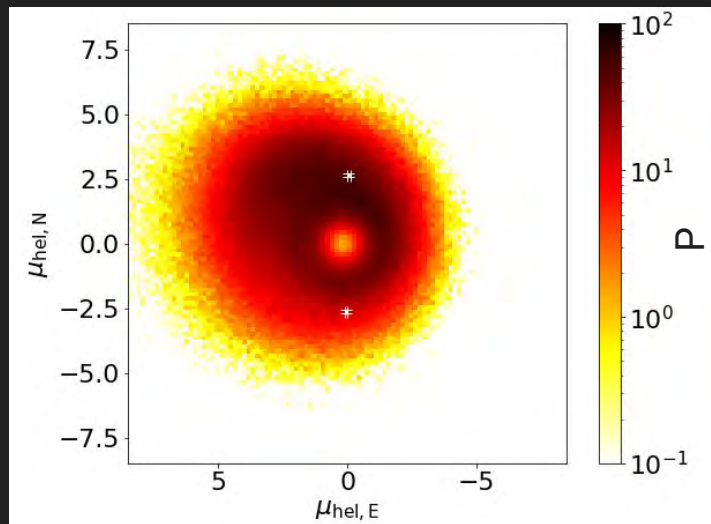
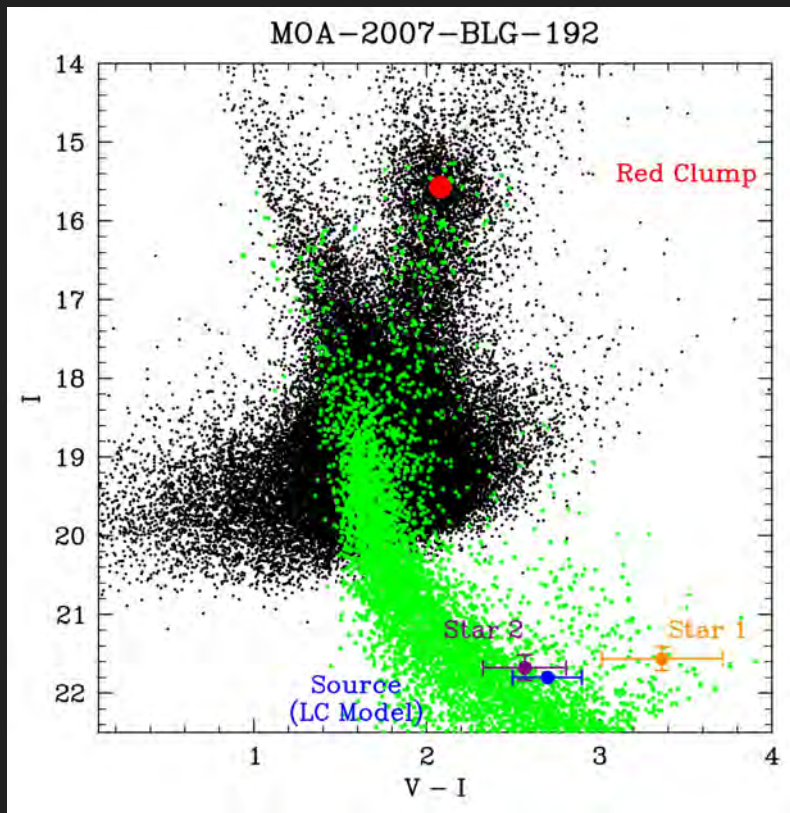
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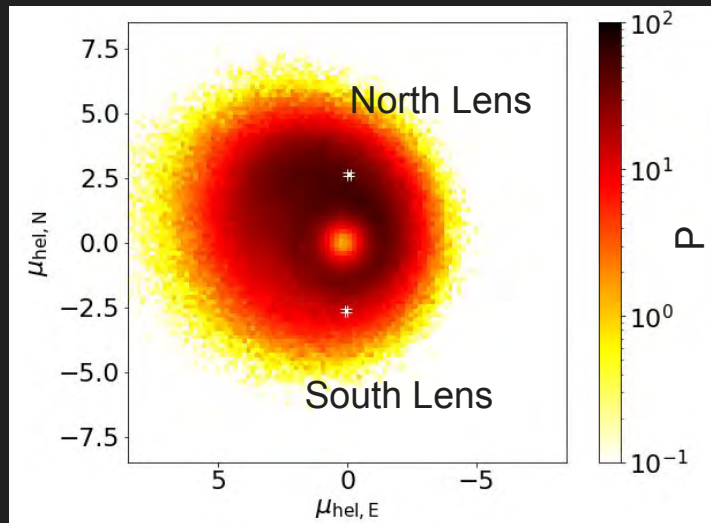
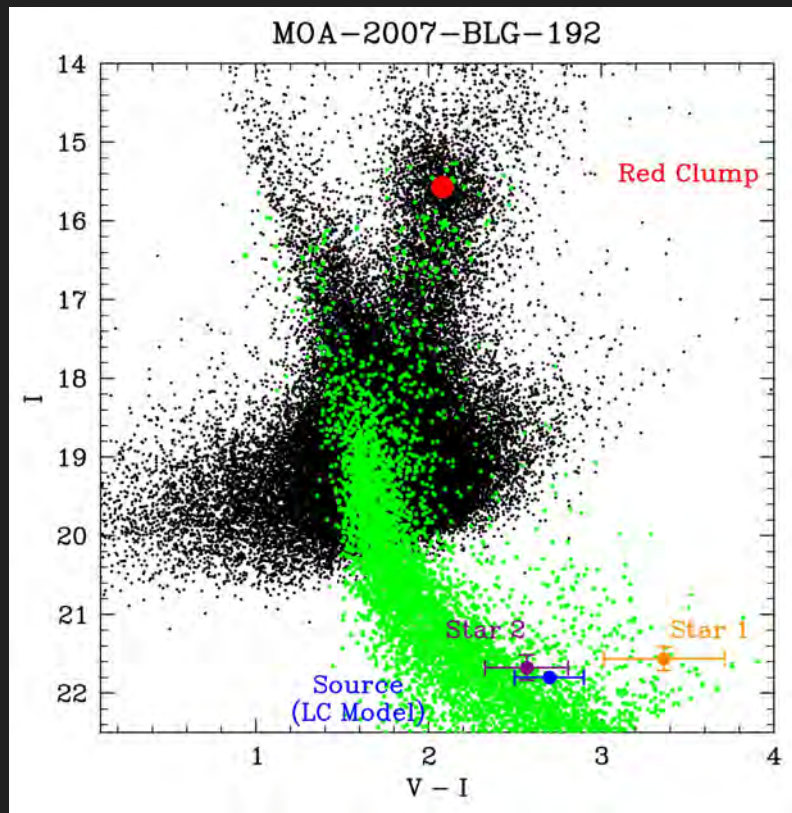
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Generated via Koshimoto+ (2021) Galactic Model + *genulens*

Which is Lens? Which is Source?

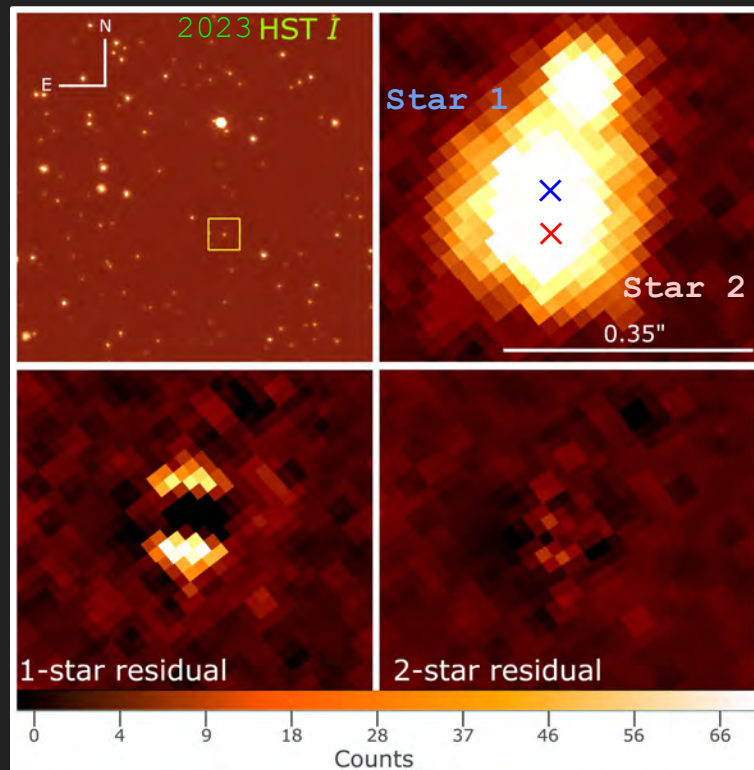
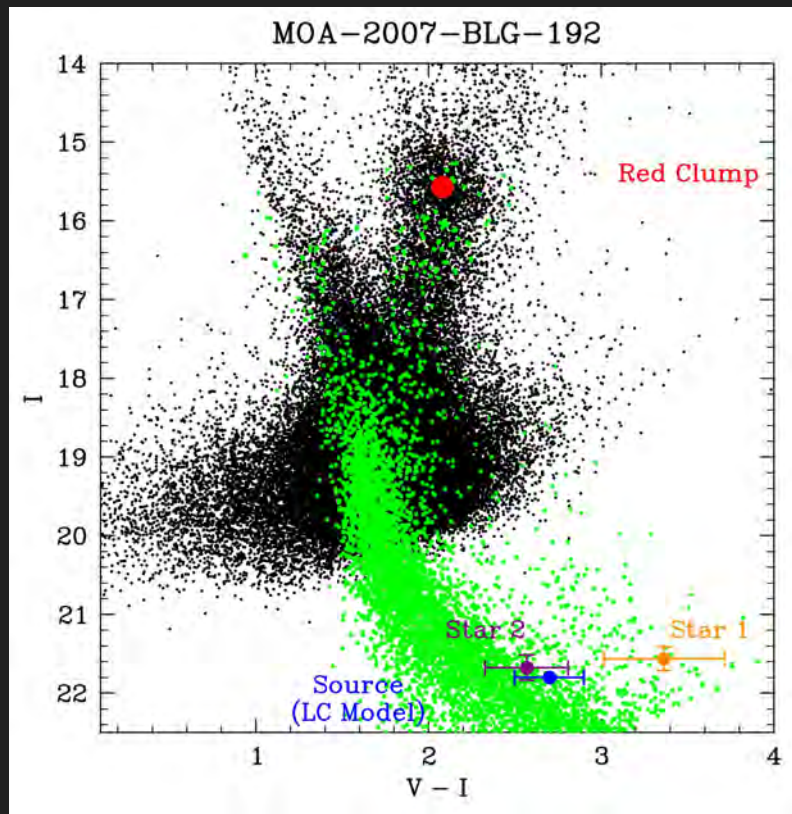
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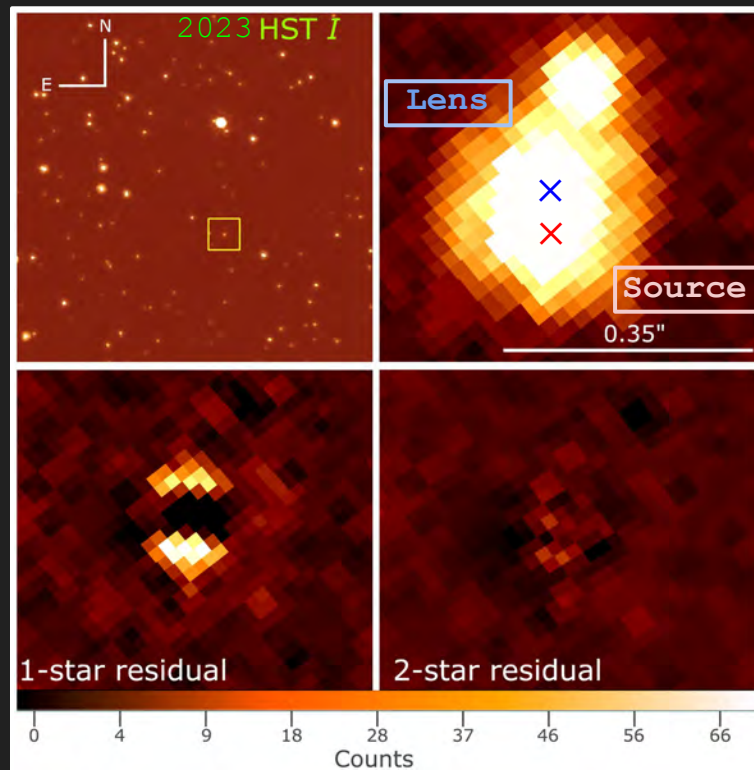
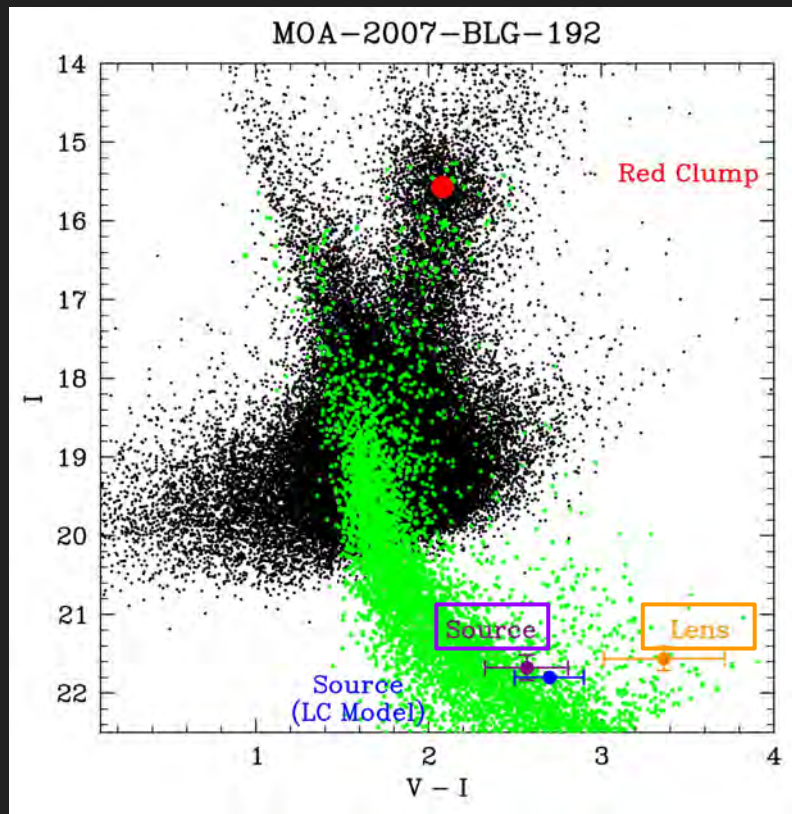
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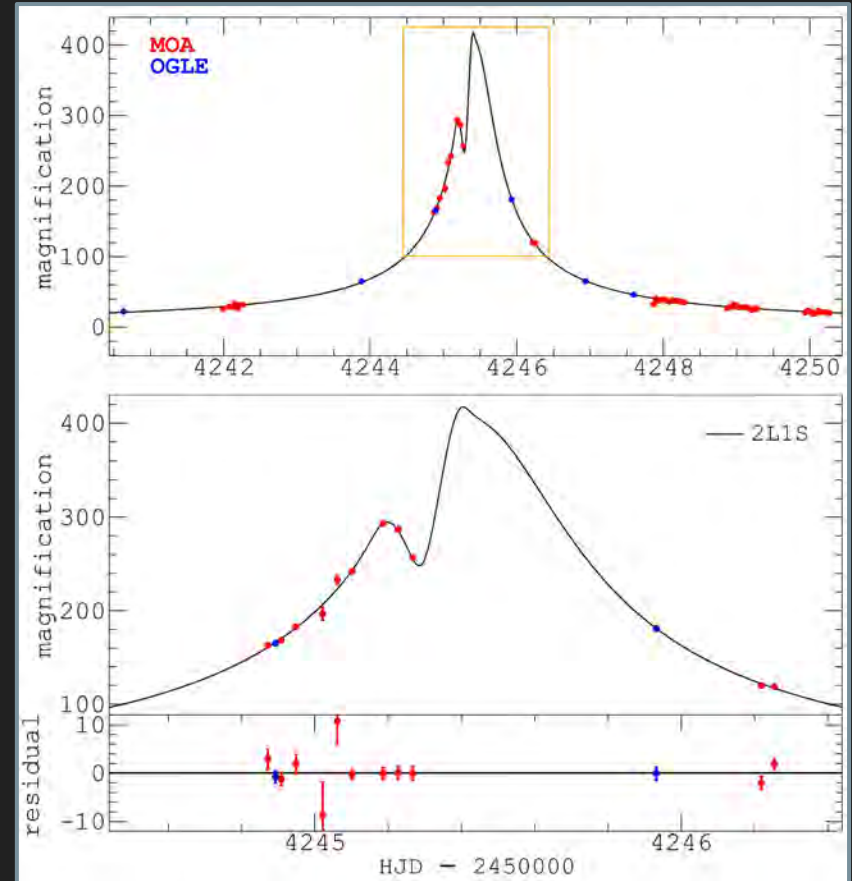
(Re-)Modeling Light Curve w/ Imaging Constraints

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Use μ_{rel} and lens/source flux to constrain new modeling

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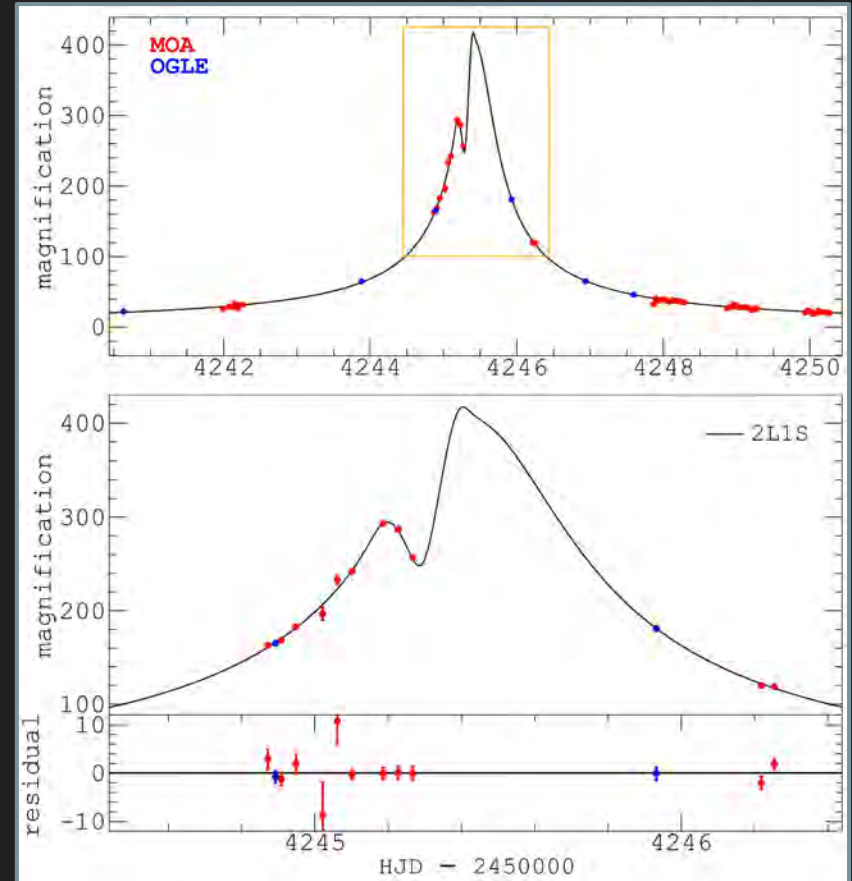
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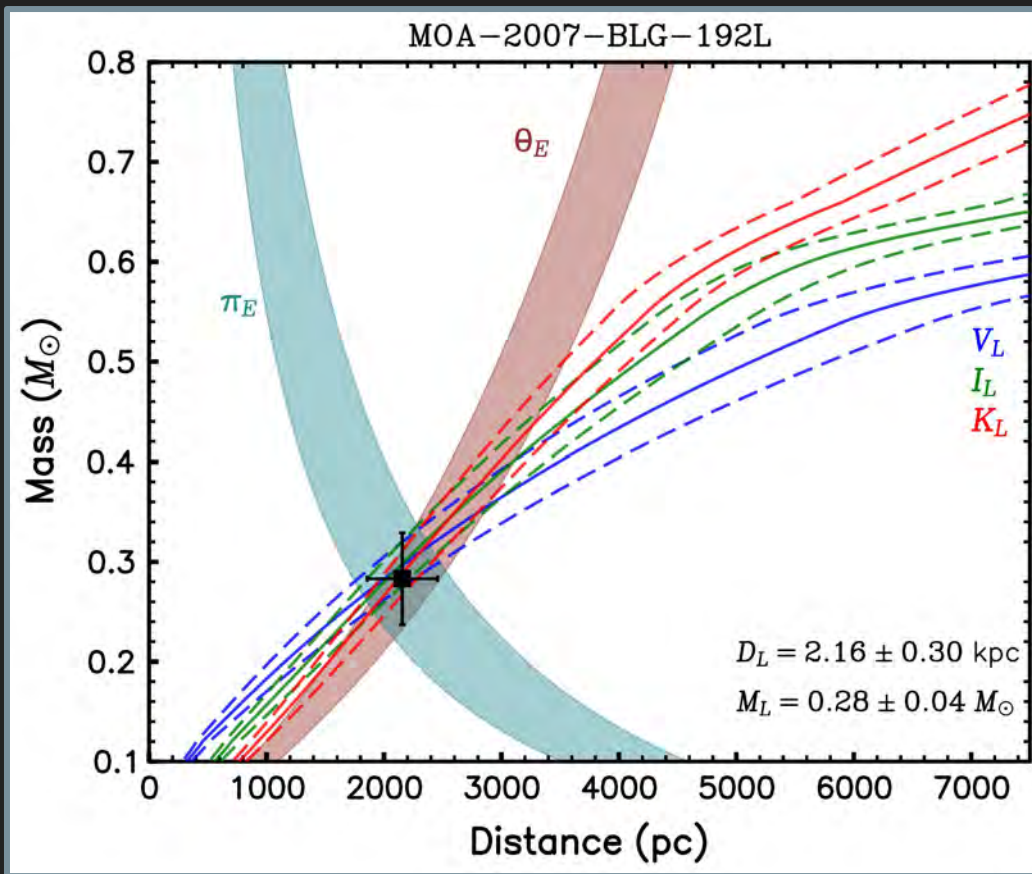
Use μ_{rel} and lens/source flux to constrain new modeling

Mass ratio (q) uncertainty remains large due to poor light curve sampling



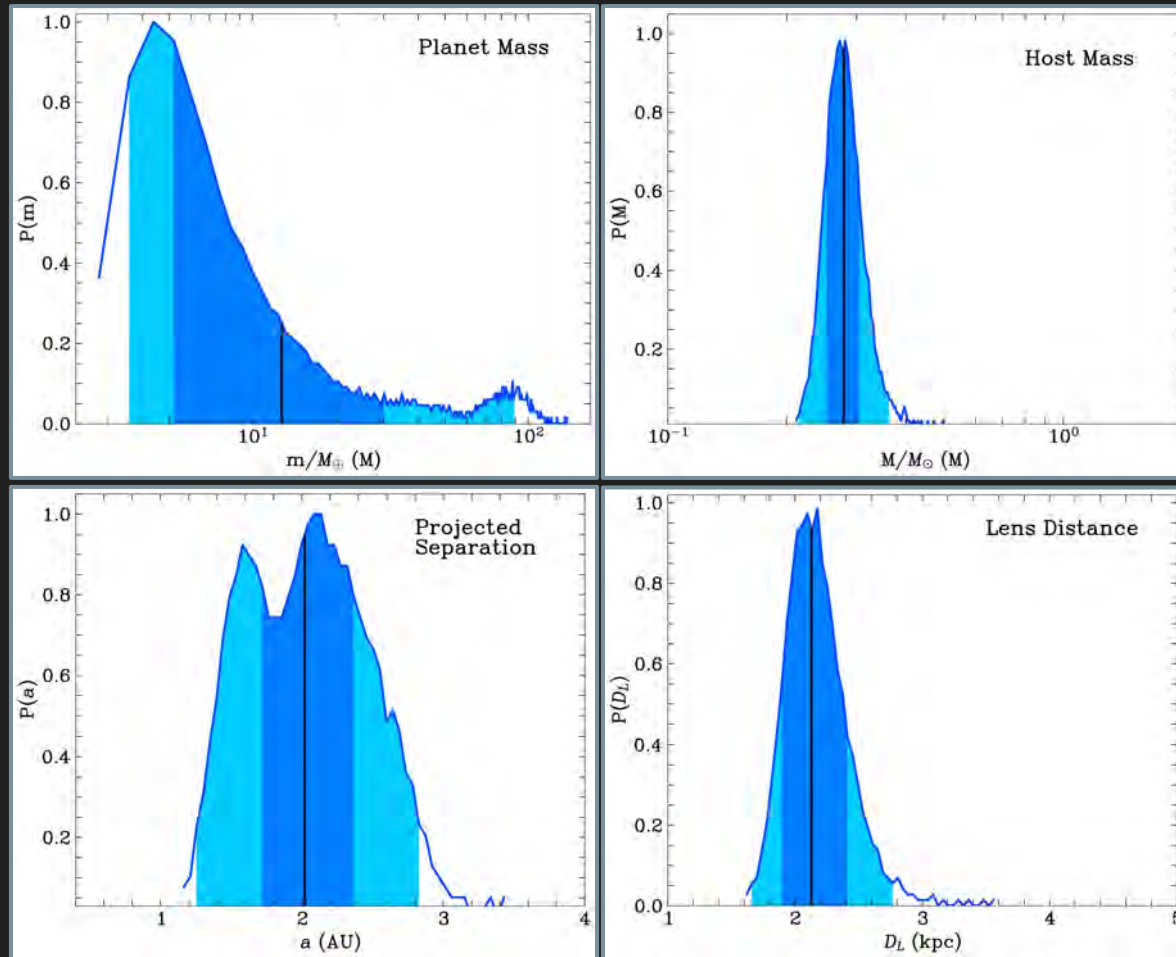
Mass-Distance Relation

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Lens System Physical Parameters

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Summary

- High-resolution imaging → **detect the lens**
- Measure precise mass for the **host star**
 - **error** on planet **mass remains large**
- Super-Earth/Sub-Neptune mass planet with **larger mass than previously published**
- Useful practice for **Roman microlensing (RGES)**