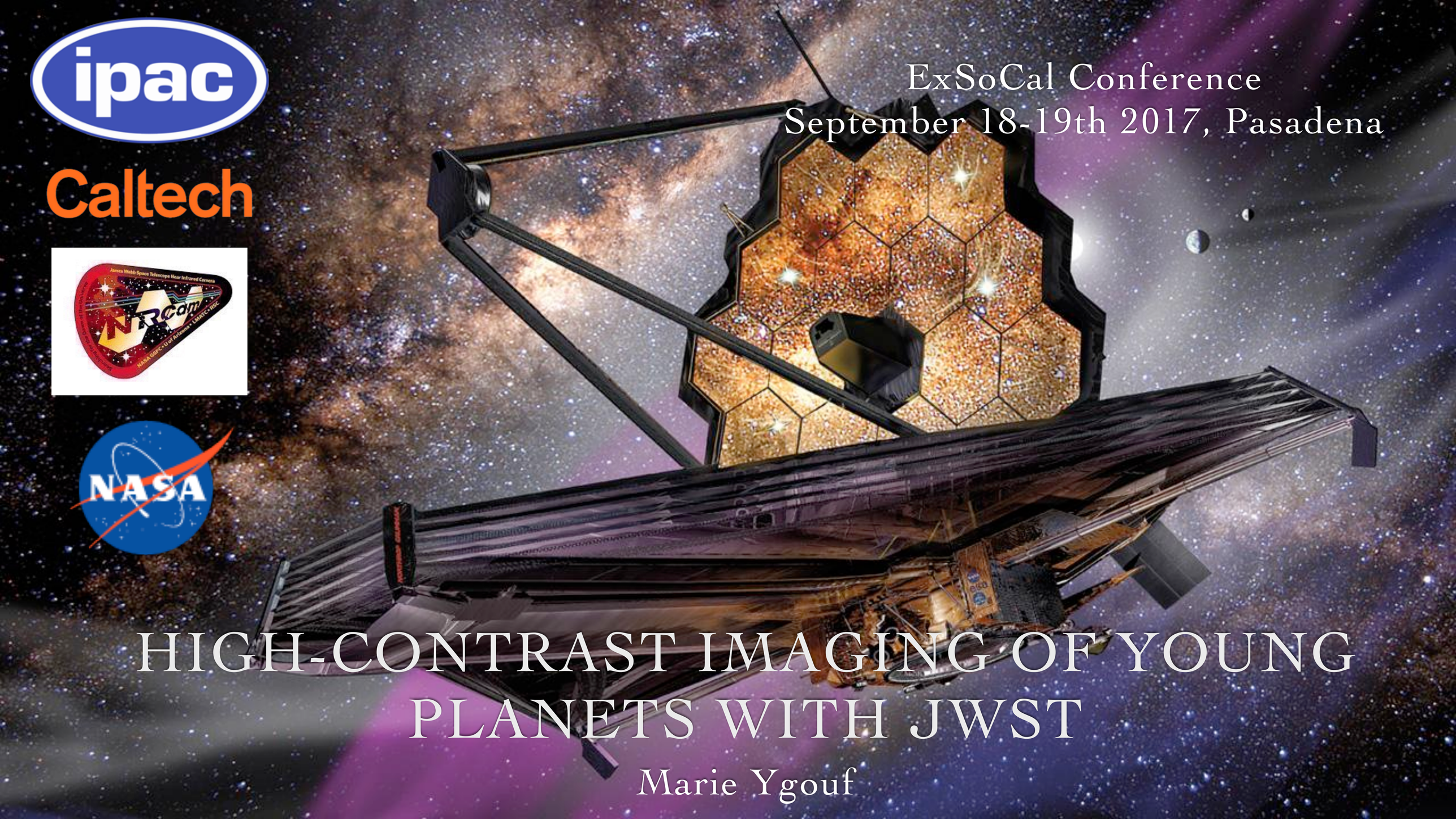
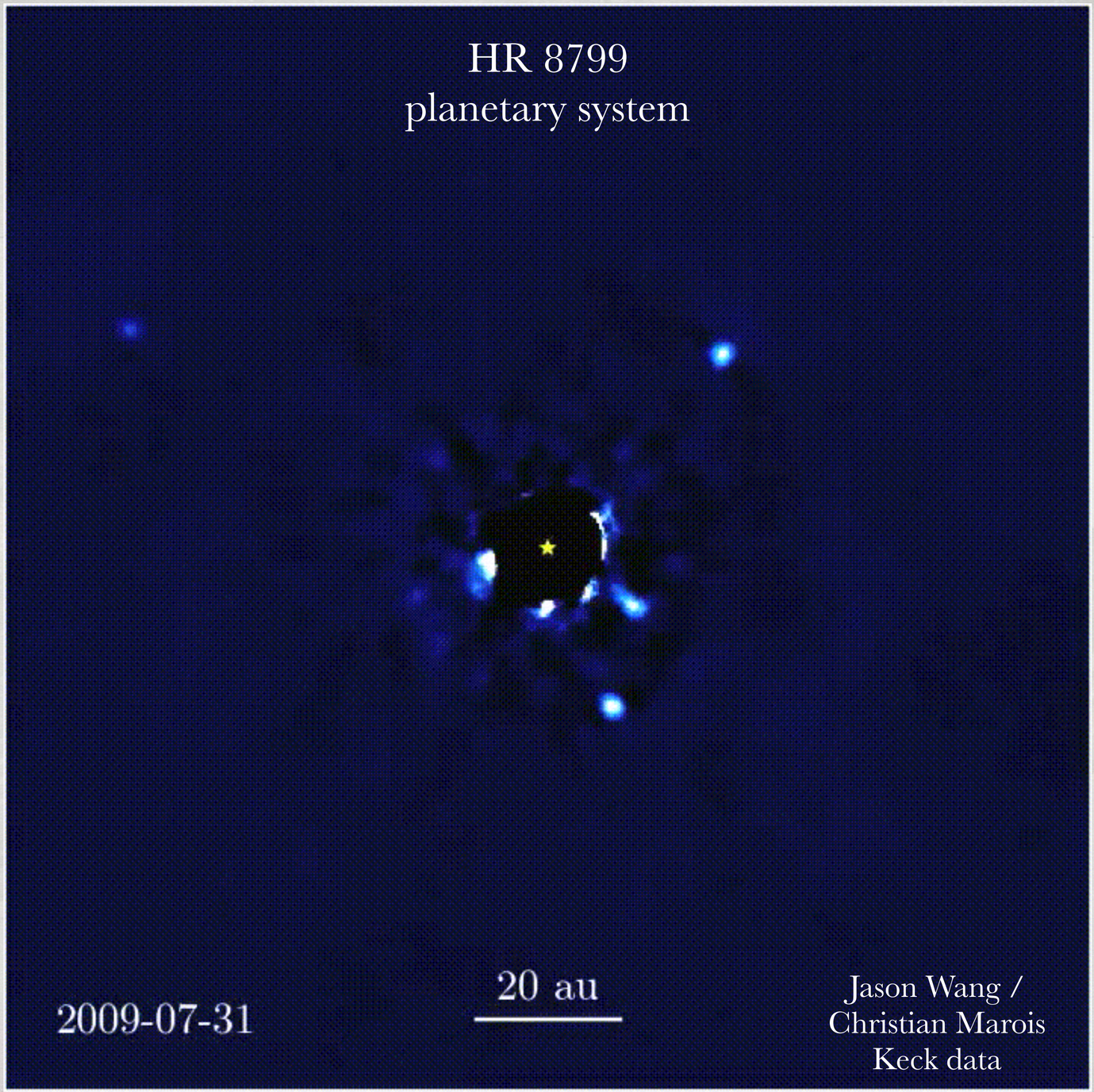


ExSoCal Conference
September 18-19th 2017, Pasadena

HIGH-CONTRAST IMAGING OF YOUNG PLANETS WITH JWST

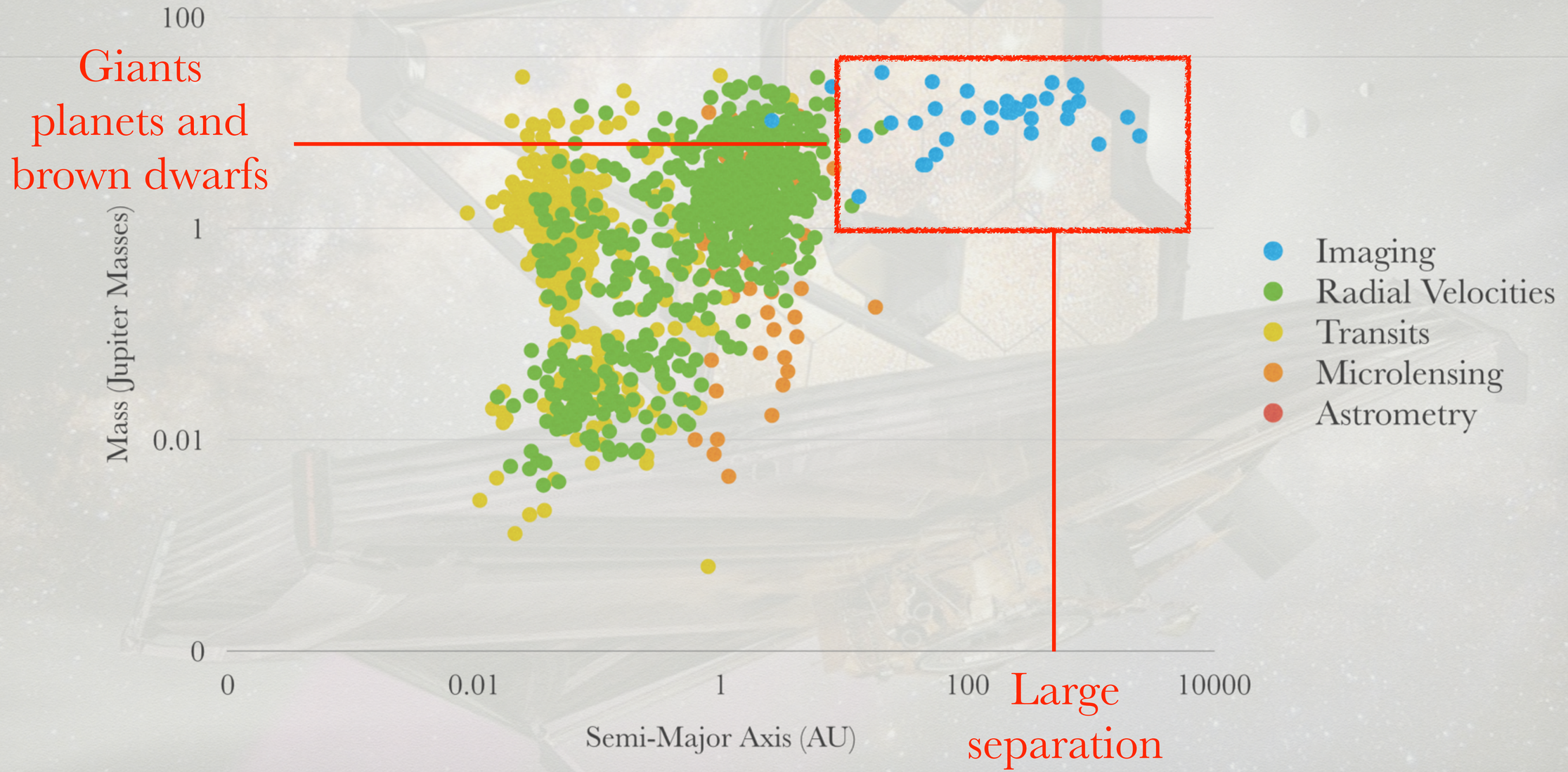
Marie Ygouf


HR 8799
planetary system
2009-07-31
20 au
Jason Wang /
Christian Marois
Keck data

Confirmed planets*

*As 14 June 2017 from exoplanetarchive.ipac.caltech.edu

Confirmed planets*



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High contrast imaging science goals

Characterization of known exoplanetary systems

- What is the occurence of wide separated young exoplanets?
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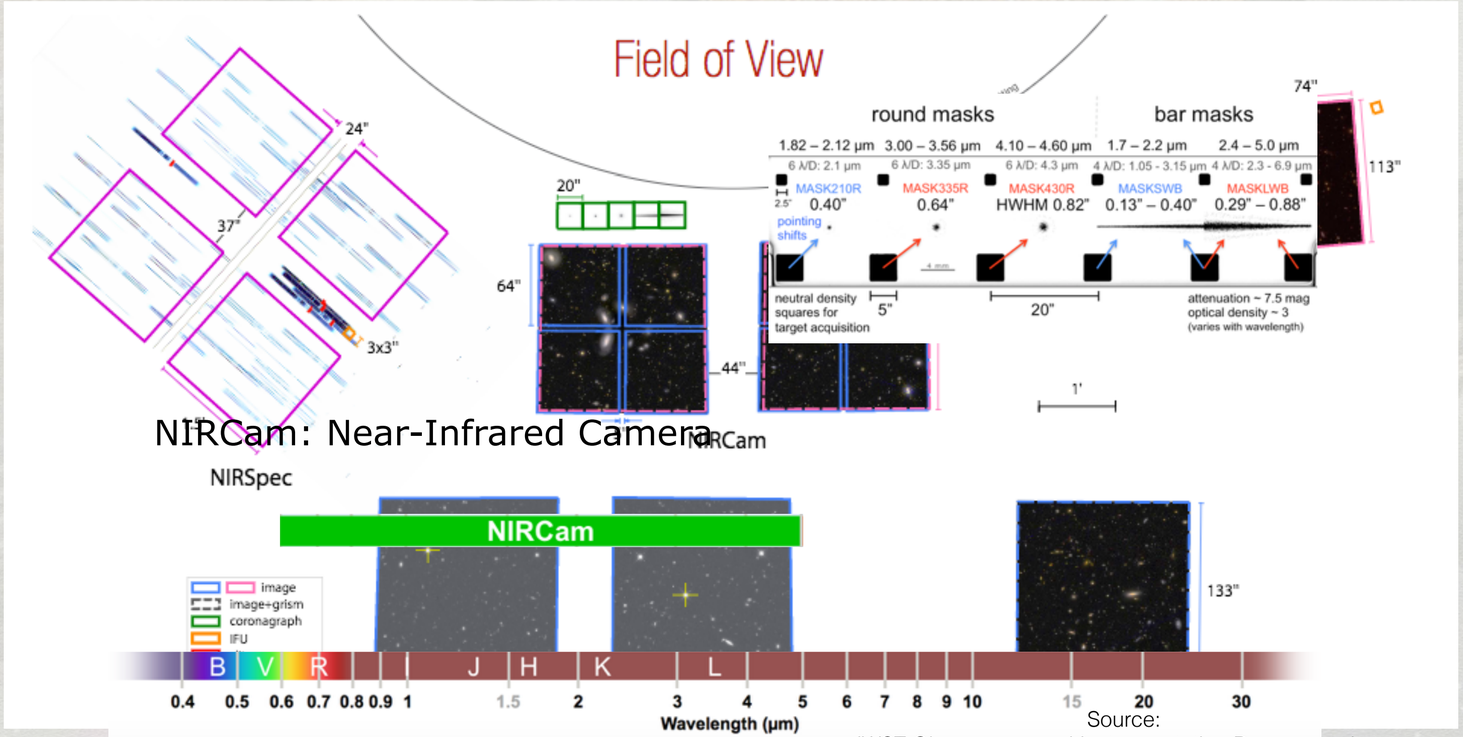
Search for new worlds

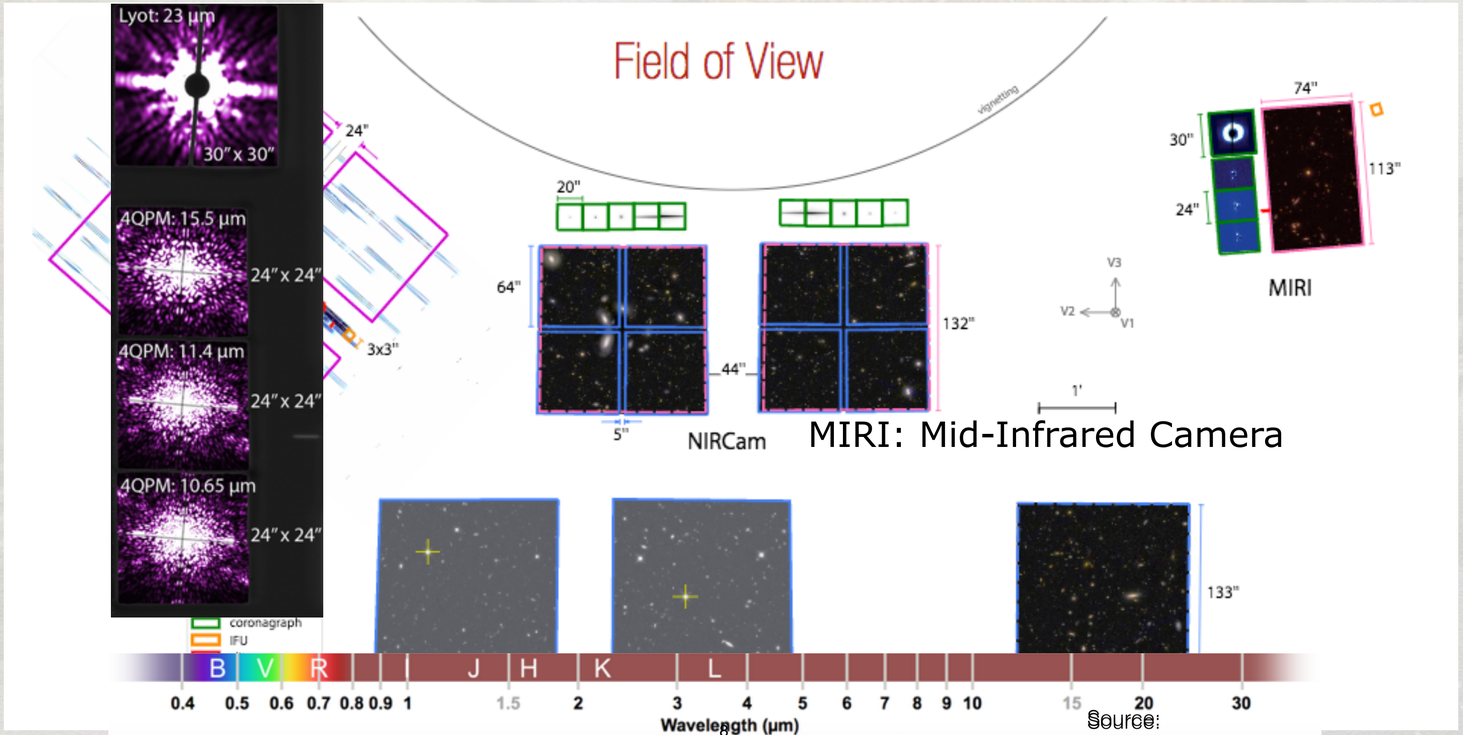
- How can we detect more of them?

JWST Coronagraphs



Source:
JWST Observatory and Instrumentation Documentation

JWST Coronagraphs



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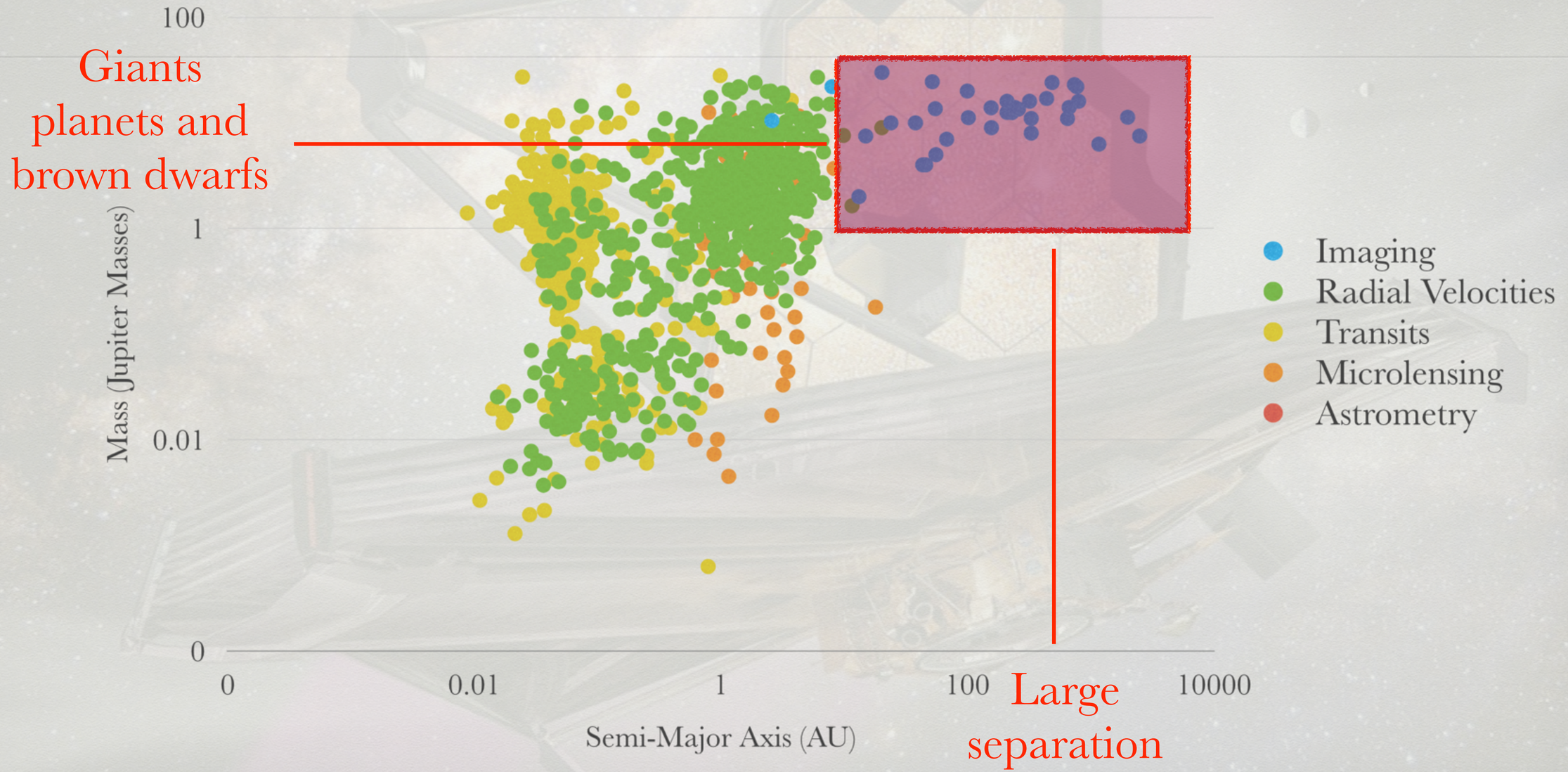

Giants planets and brown dwarfs

Large separation

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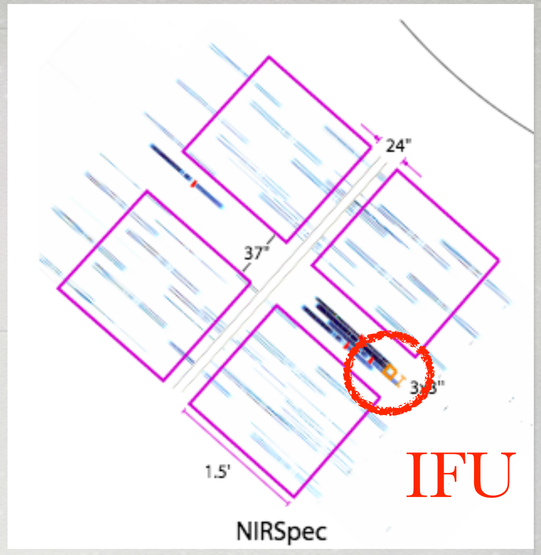

IFU

- Imaging
- Radial Velocities
- Transits
- Microlensing
- Astrometry

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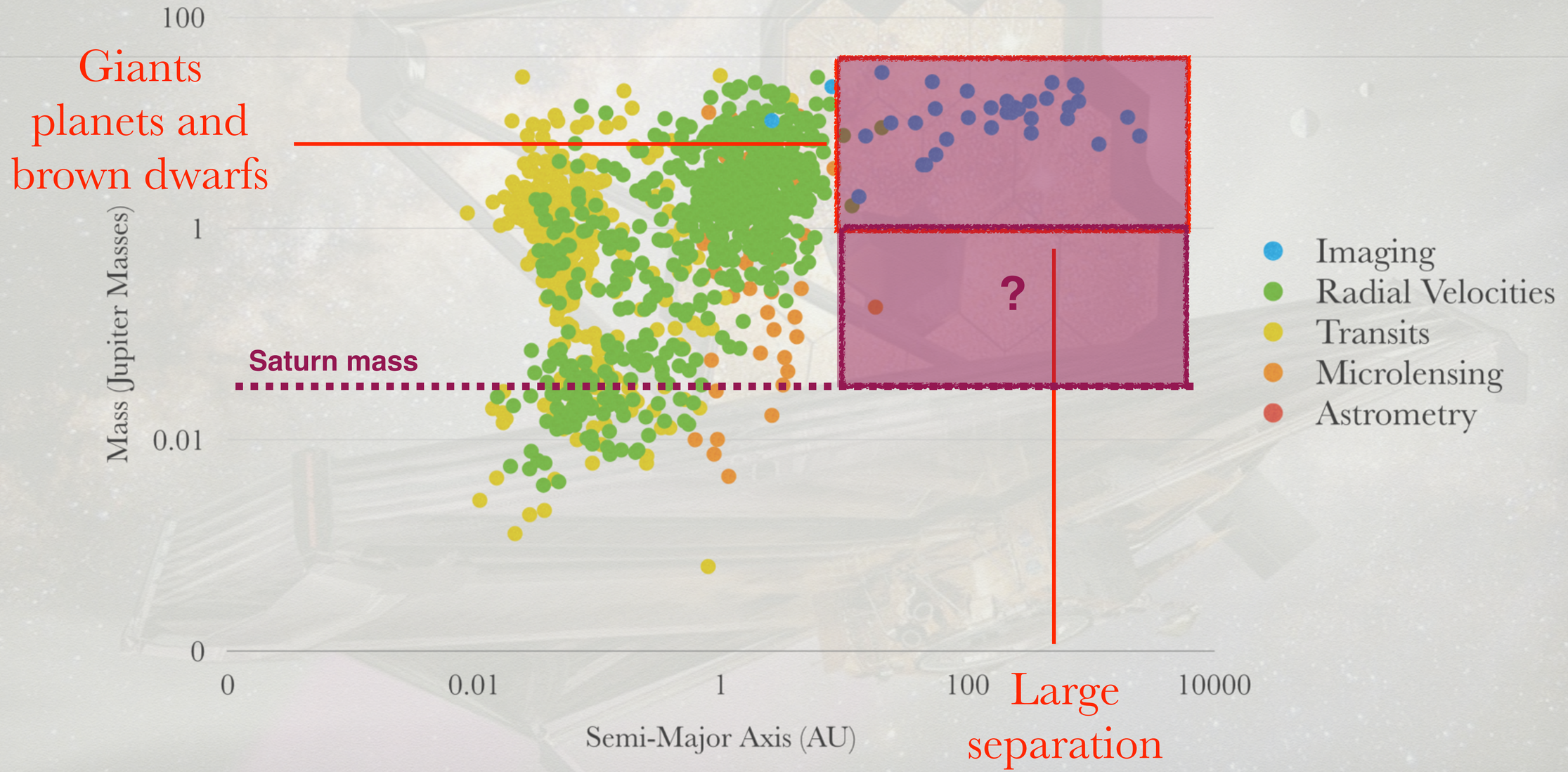

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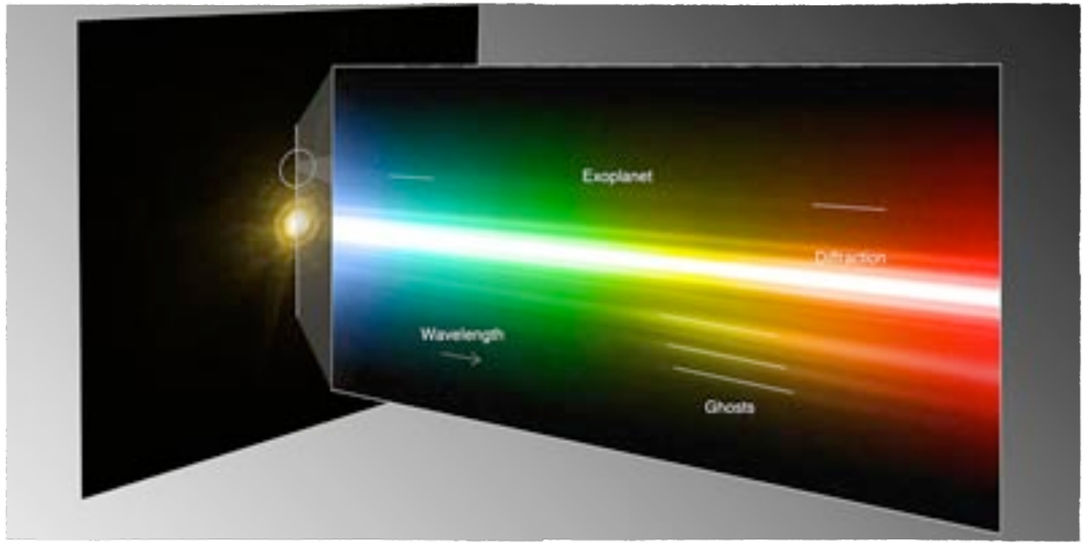
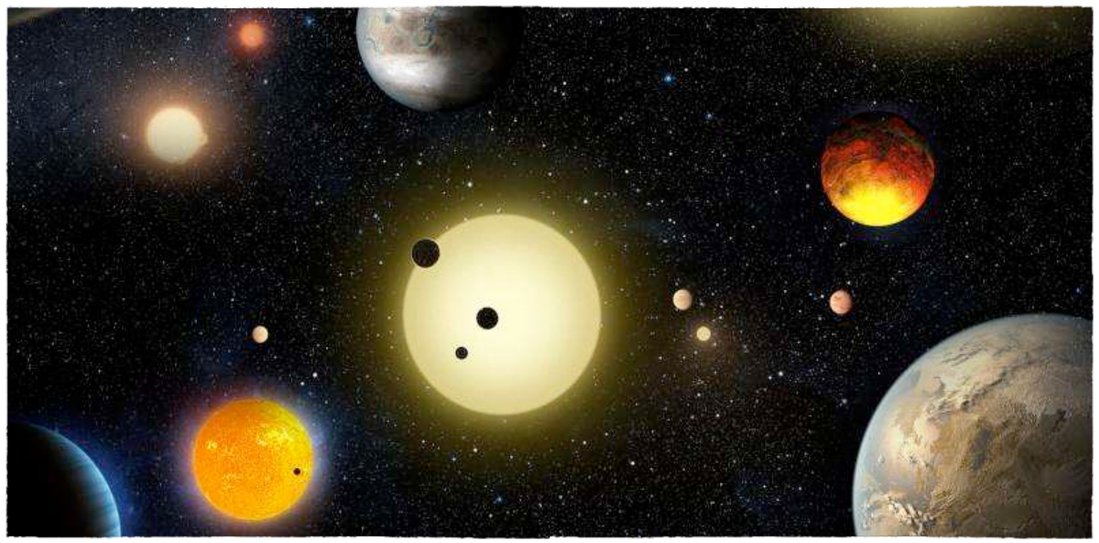
Coronagraphic Imaging of Young Planets
NIRCam GTO Program (PI: Chas Beichman)

Characterization of known exoplanetary systems



Search for new worlds



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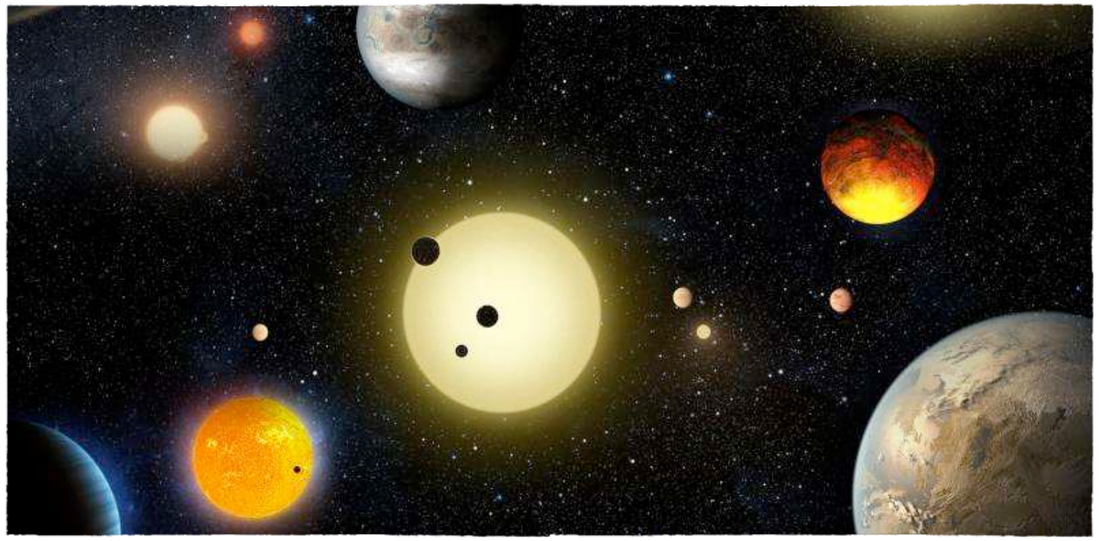

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  Telescope Team GTO

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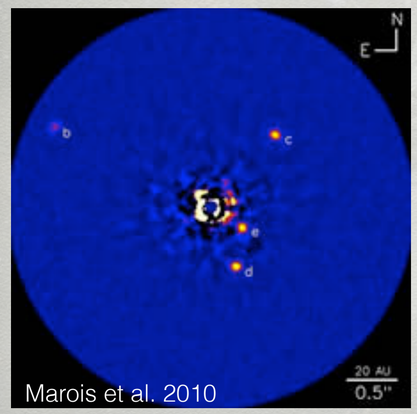
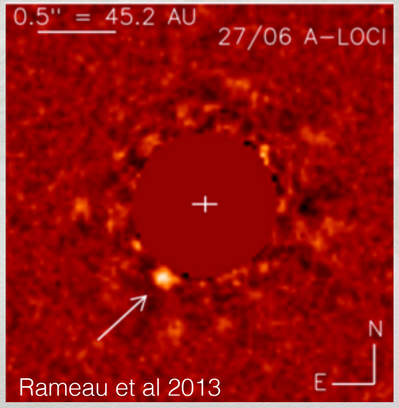
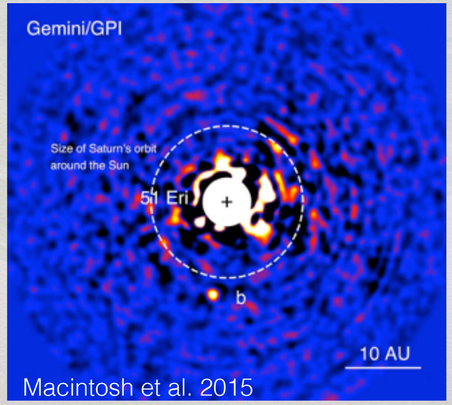


Marois et al. 2010



Rameau et al 2013



Macintosh et al. 2015

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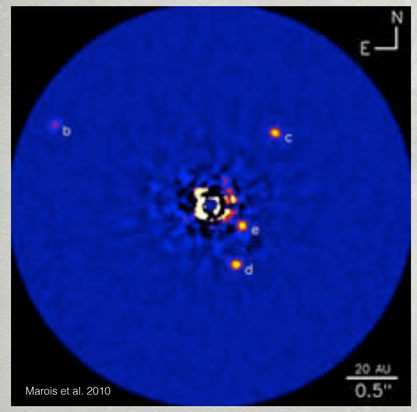
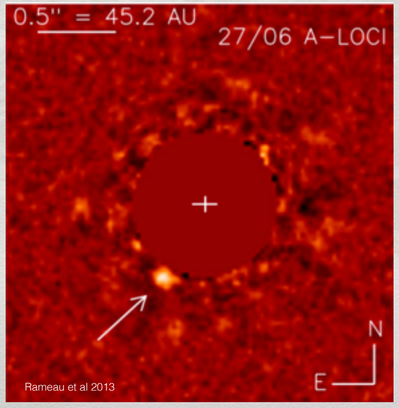
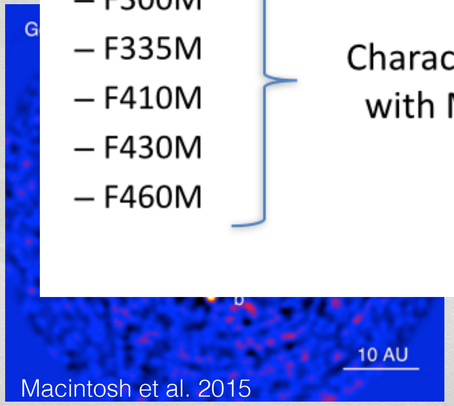
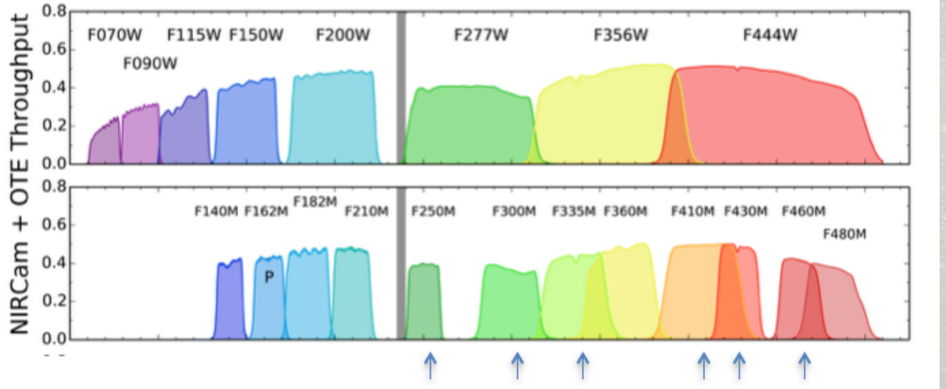






– F250M
– F300M
– F335M
– F410M
– F430M
– F460M

Characterization with MASKLW



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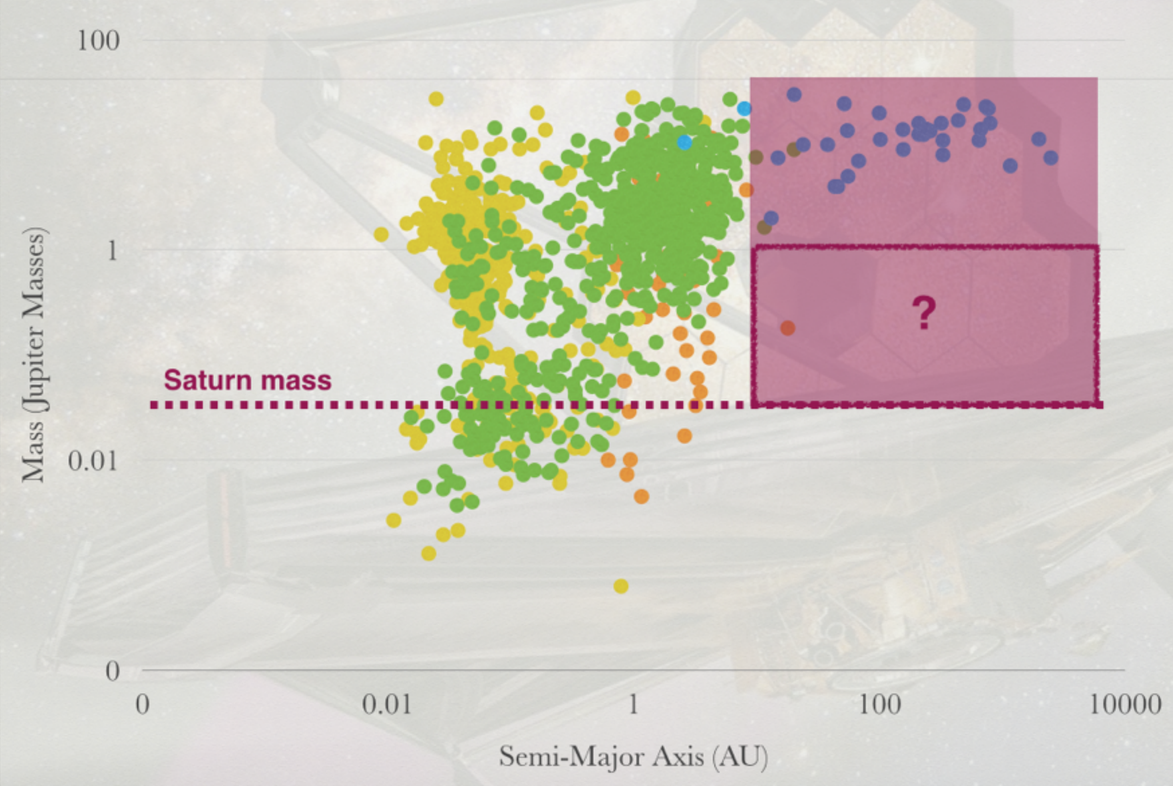

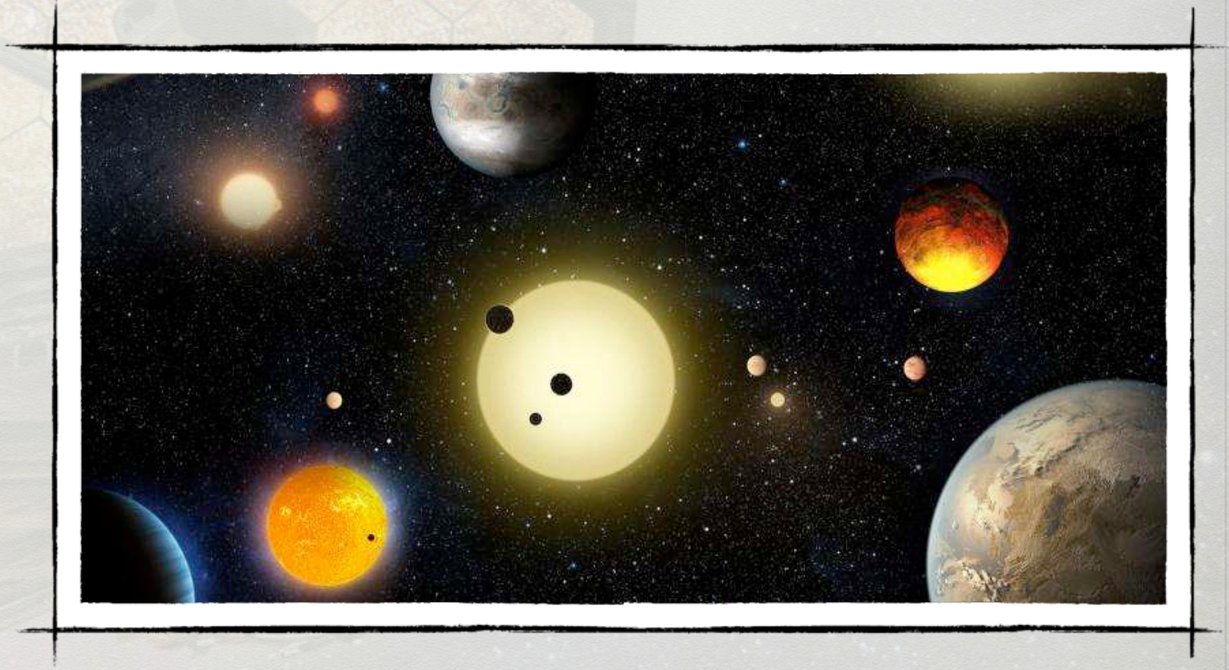

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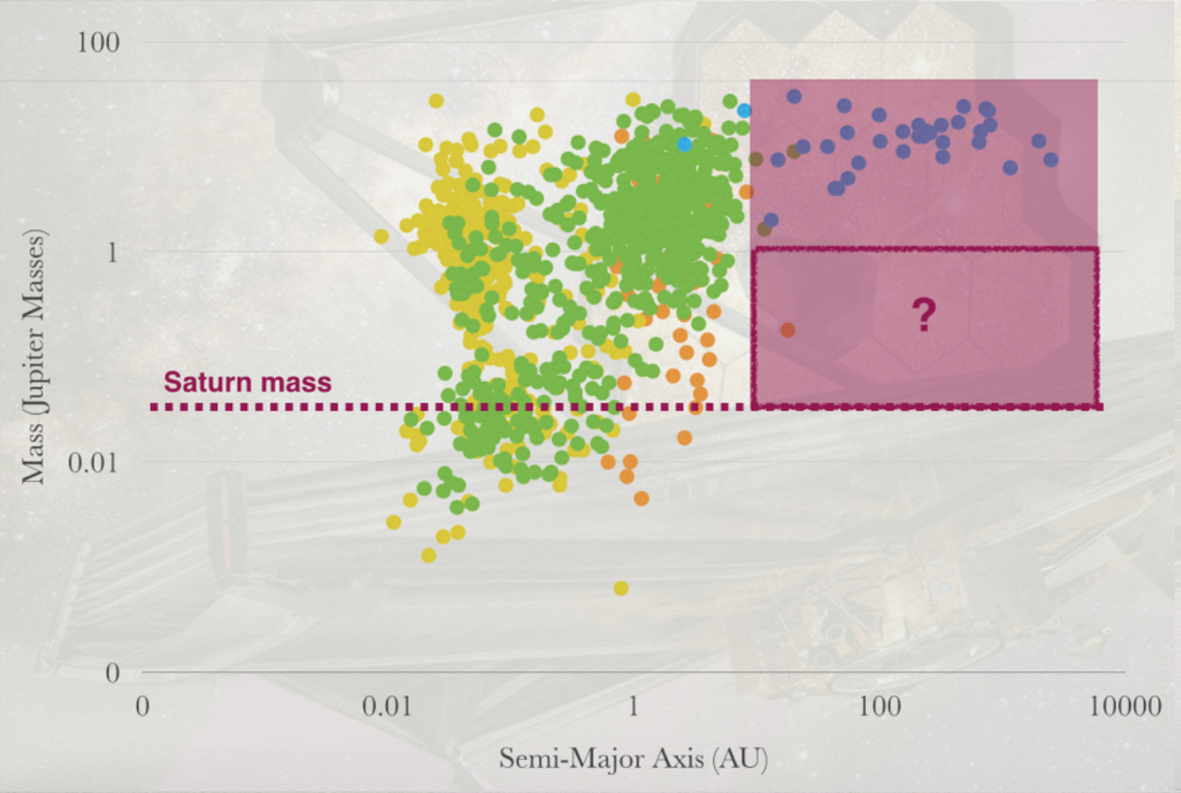

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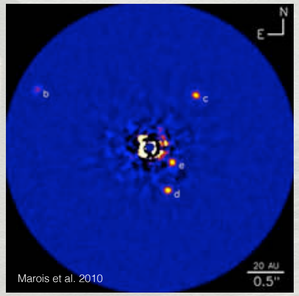

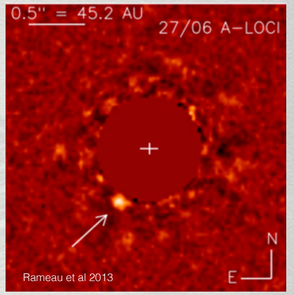

Moonshots

Marois et al. 2010

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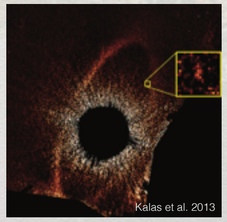

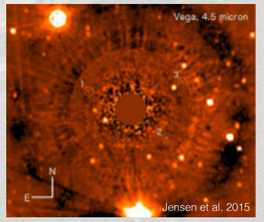

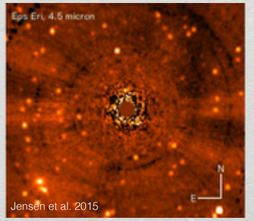

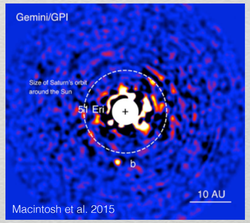

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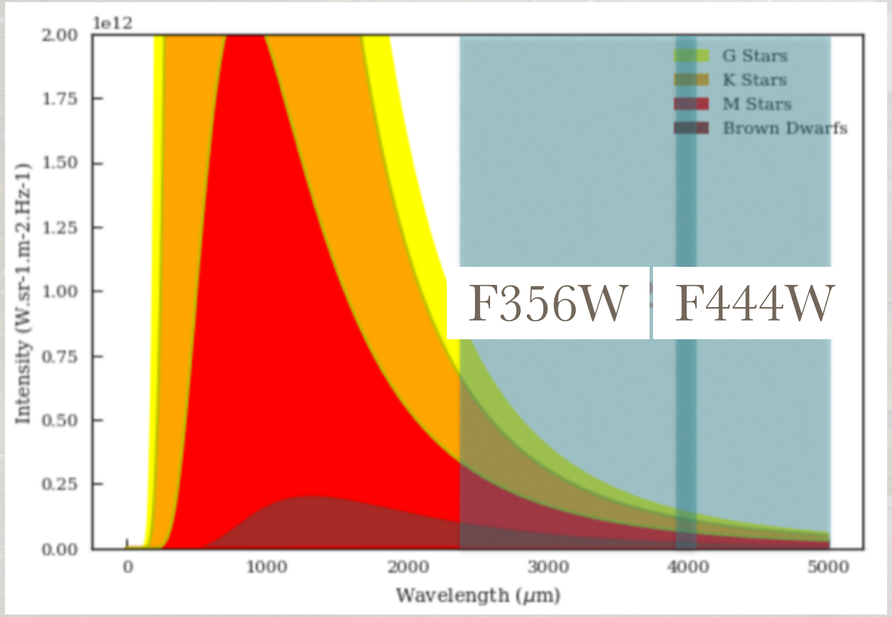

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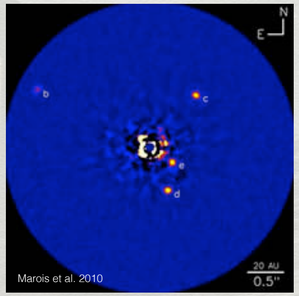

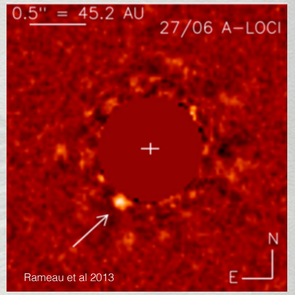

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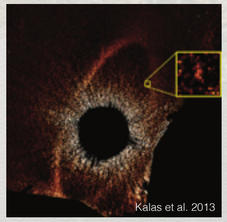

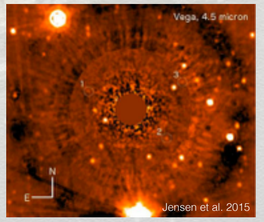

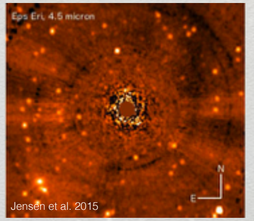

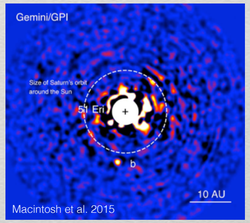

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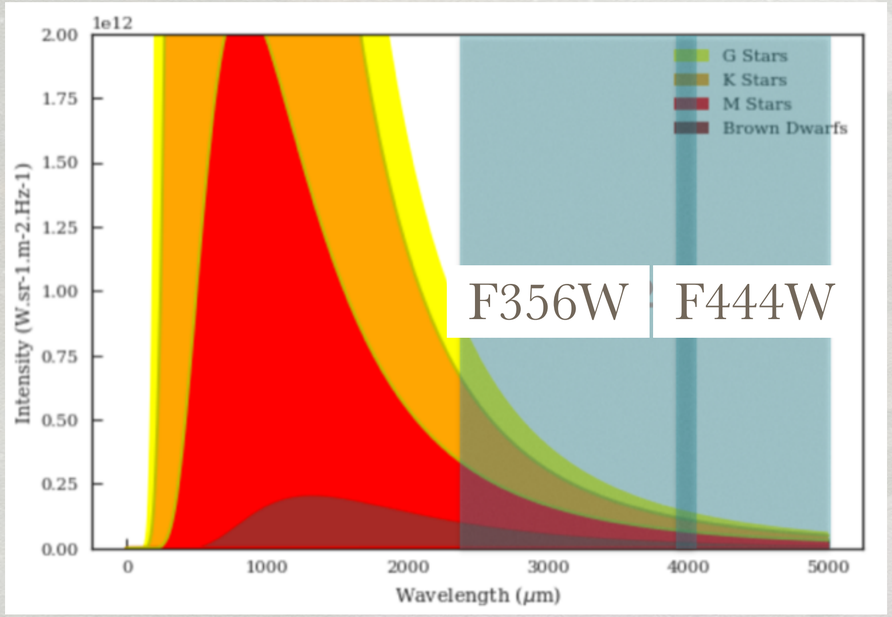

CALCULATED PLANET MAGNITUDES (10 PC) FOR 50 MYR

M_{pl} ($M_\odot$)	T_{eff} (K)	L_{pl} ($L_\odot$)	log(g) (cgs)	F356W (mag)	F444W (mag)
0.0001	139	−8.453	2.41	20.33	17.29
0.0002	196	−7.794	2.65	19.65	16.7
0.0003	232	−7.465	2.79	19.23	16.32
0.0004	262	−7.232	2.89	18.9	16.04
0.0005	285	−7.069	2.97	18.68	15.85
0.001	375	−6.587	3.27	17.88	15.16
0.002	491	−6.1	3.55	16.51	13.97
0.003	585	−5.789	3.72	15.75	13.36
0.004	676	−5.531	3.84	15.01	12.82
0.005	756	−5.336	3.93	14.44	12.44
0.006	840	−5.152	4.01	13.91	12.11
0.007	928	−4.978	4.08	13.39	11.8
0.008	1010	−4.832	4.14	12.96	11.55
0.009	1085	−4.706	4.19	12.59	11.36
0.010	1171	−4.569	4.23	12.21	11.17

Adapted from Beichuan et al. 2010: Extension of COND03 models (Baraffe et al. 2003) for planetary masses down to 0.1 MJup

Search for new worlds

- Exposure time computations for searches up to Saturn Masses at 4” with a 10 nm wavefront drift using the extension of COND03 models (Baraffe et al. 2003) for planetary masses down to 0.1 MJup (Beichman et al. 2010)

Target	Mass	Exposure Time	SNR >
HD 95086	Jupiter	~2000	6
HR 8799	Saturn	~3200	4
51 Eri	Saturn	~2000	12
Vega	Saturn	~3800	9
Fomalhaut	Saturn	~3800	18
Eps Eri	Saturn	~3800	136

Take Home Messages

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- The "Coronagraphic Imaging of Young Planets" program has been designed to do what NIRCam will do best: characterization of known exoplanets and search for news worlds at lower mass limits down to at least Saturn masses

First results in about 20 months, … stay tuned