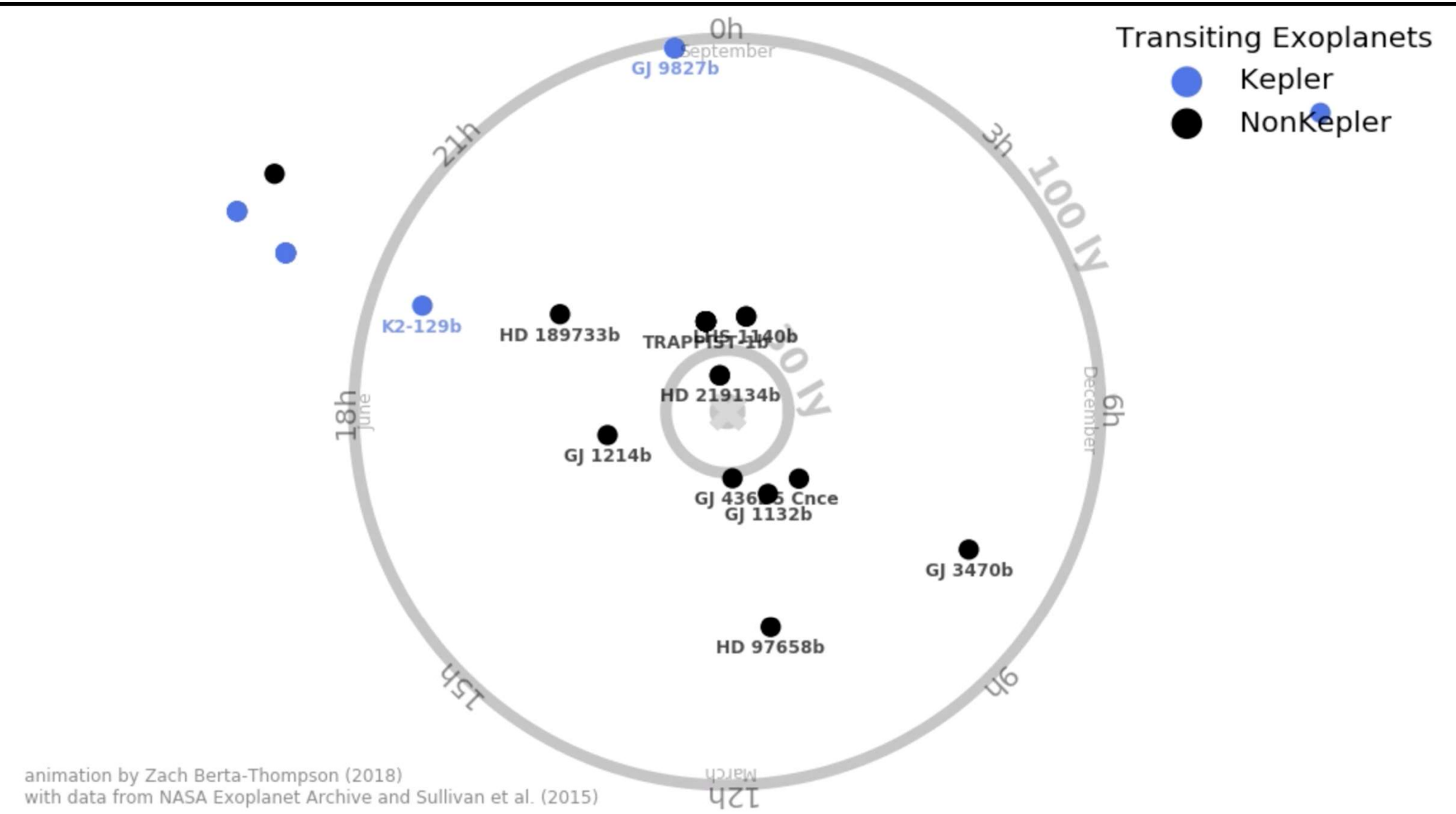
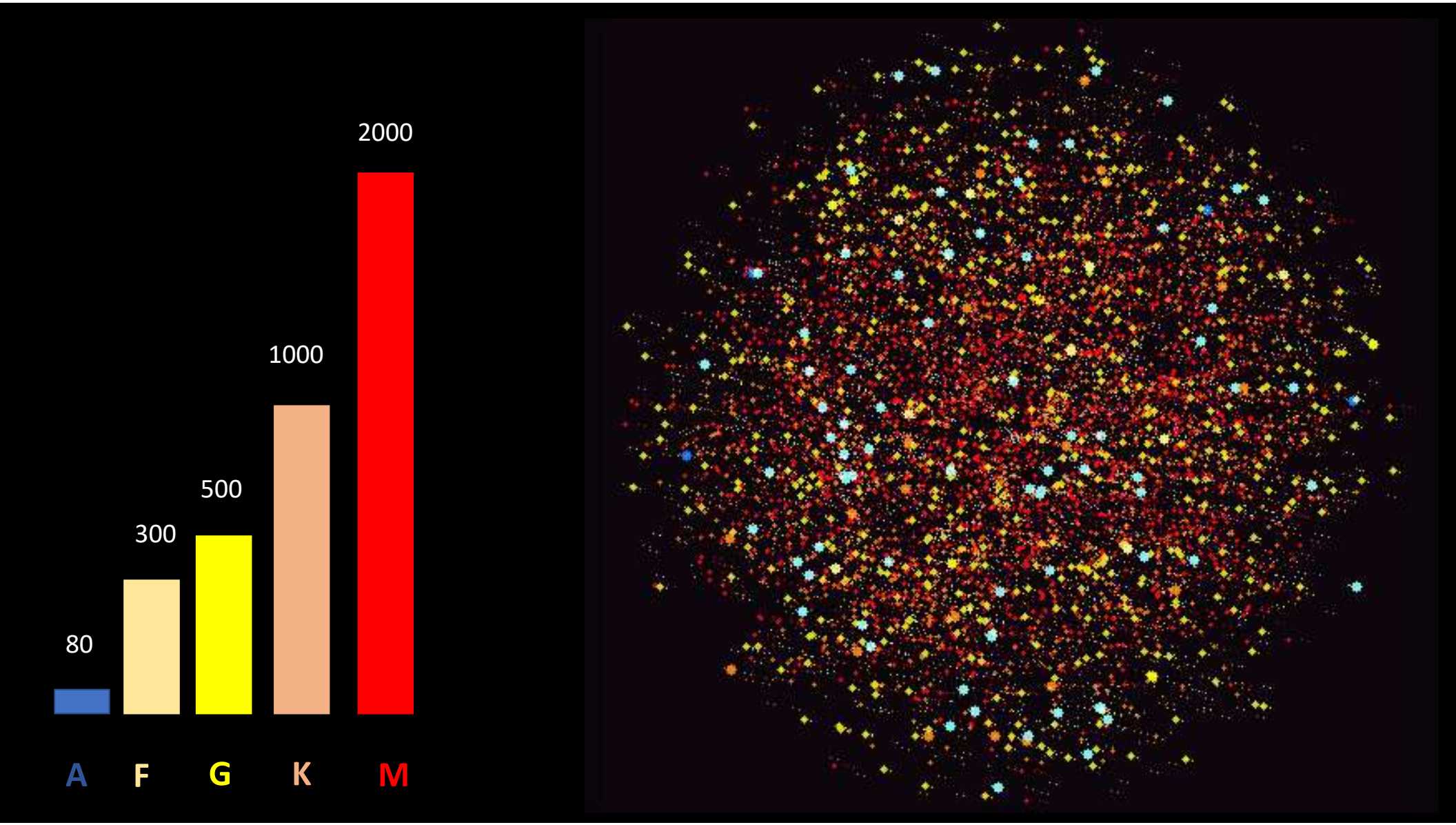
Detecting Transiting Exoplanets Near home

Chelsea X. Huang (MIT)

Exopag 19

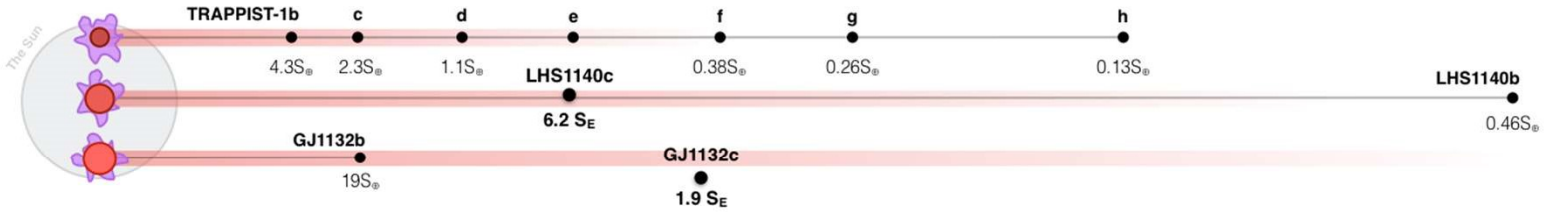
Transiting Exoplanets
Kepler
NonKepler
0h
September
3h
6h
December
9h
12h
March
15h
18h
June
21h
3000 ly
animation by Zach Berta-Thompson (2018)
with data from NASA Exoplanet Archive and Sullivan et al. (2015)


Transiting Exoplanets
Kepler
NonKepler
0h
September
GJ 9827b
3h
December
6h
9h
March
12h
15h
June
18h
21h
100 ly
30 ly
K2-129b
HD 189733b
TRAPPIST-1b
HD 219134b
GJ 1214b
GJ 1132b
GJ 3470b
HD 97658b
animation by Zach Berta-Thompson (2018)
with data from NASA Exoplanet Archive and Sullivan et al. (2015)

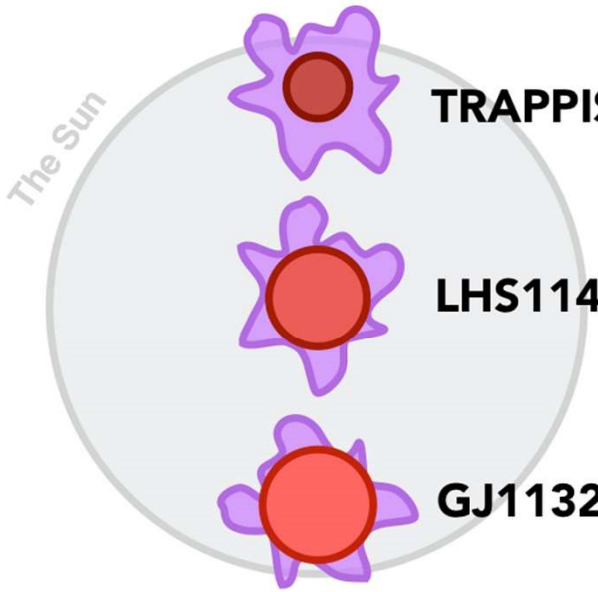

2000
1000
500
300
80
A
F
G
K
M

TRAPPIST
K2
MEarth
ELODIE
Transiting Radial Velocity planets
7
4
1
G
K
M
2000
2004
2005
2009
2011
2012
2015
2017
2018
First transiting planet
GJ 436 b
55 cnc e
HD 189733b
GJ 1412 b
HD 97658 b
GJ 3470 b
HD 219134 c
GJ 1132b
TRAPPIST-1 b,c,d,.e,f,g,h
K2-129b
GJ 9827 b,c,d
LHS 1140 b,c
TESS

The spectroscopically accessible transiting terrestrial planets



offer laboratories to explore the influence of different M dwarf environments on planetary atmospheres.



TRAPPIST-1 = moderately active 0.08$M_\odot$

Wheatley et al. (2017), Luger et al. (2017)

LHS1140 = currently inactive 0.15$M_\odot$

Dittmann et al. (2017)

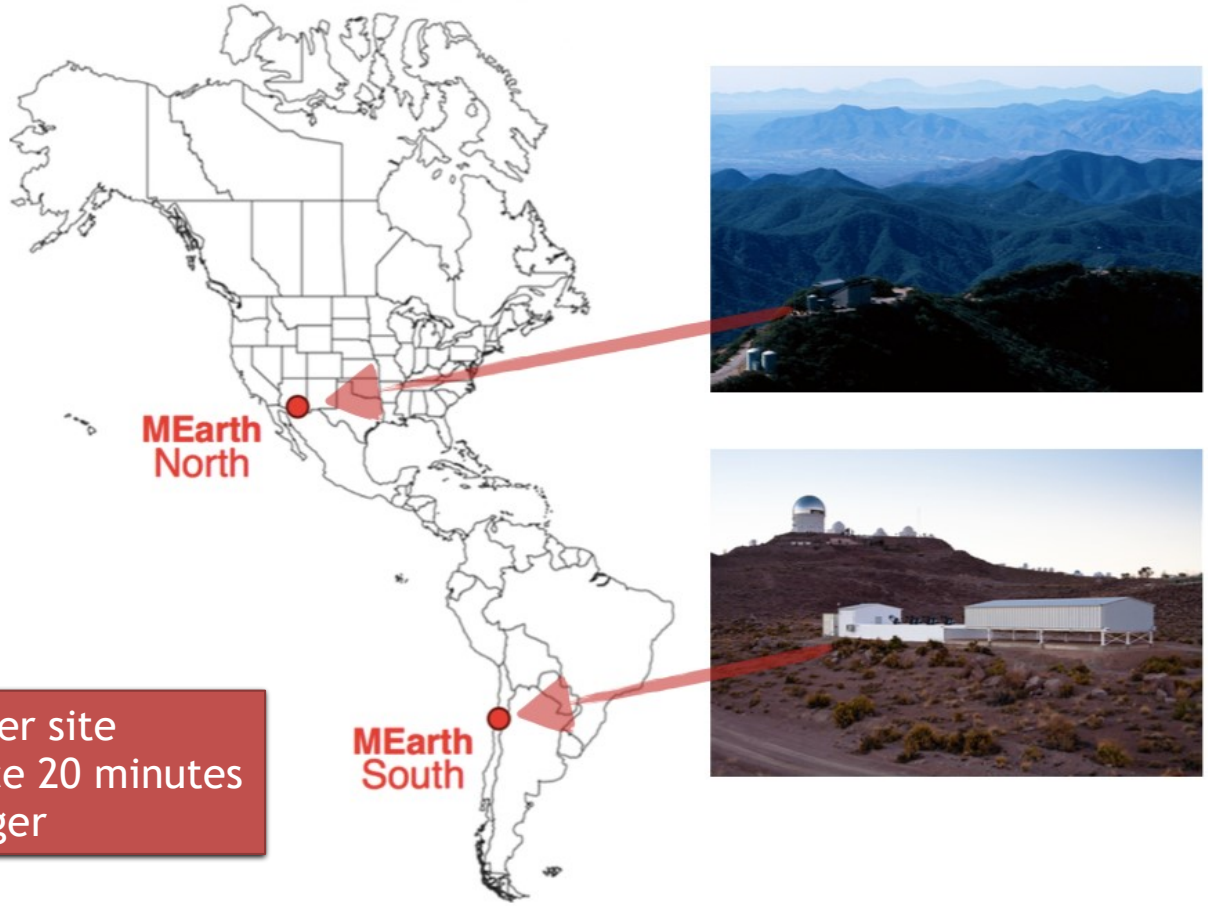
GJ1132 = currently inactive 0.18$M_\odot$

Berta-Thompson et al. (2017)

slide courtesy Z. Berta-Thompson

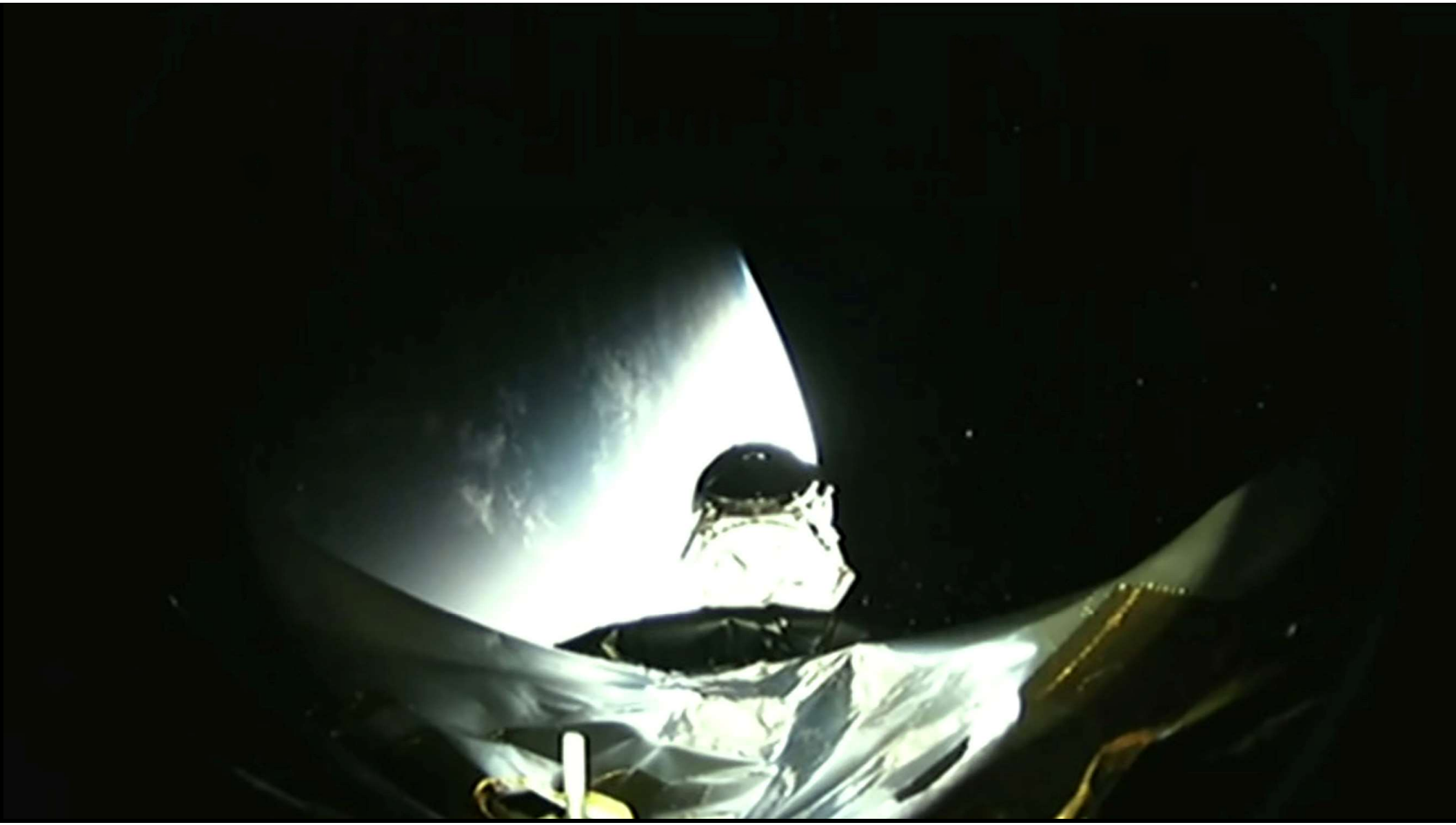

The MEarth Project
Slide courtesy MEarth team

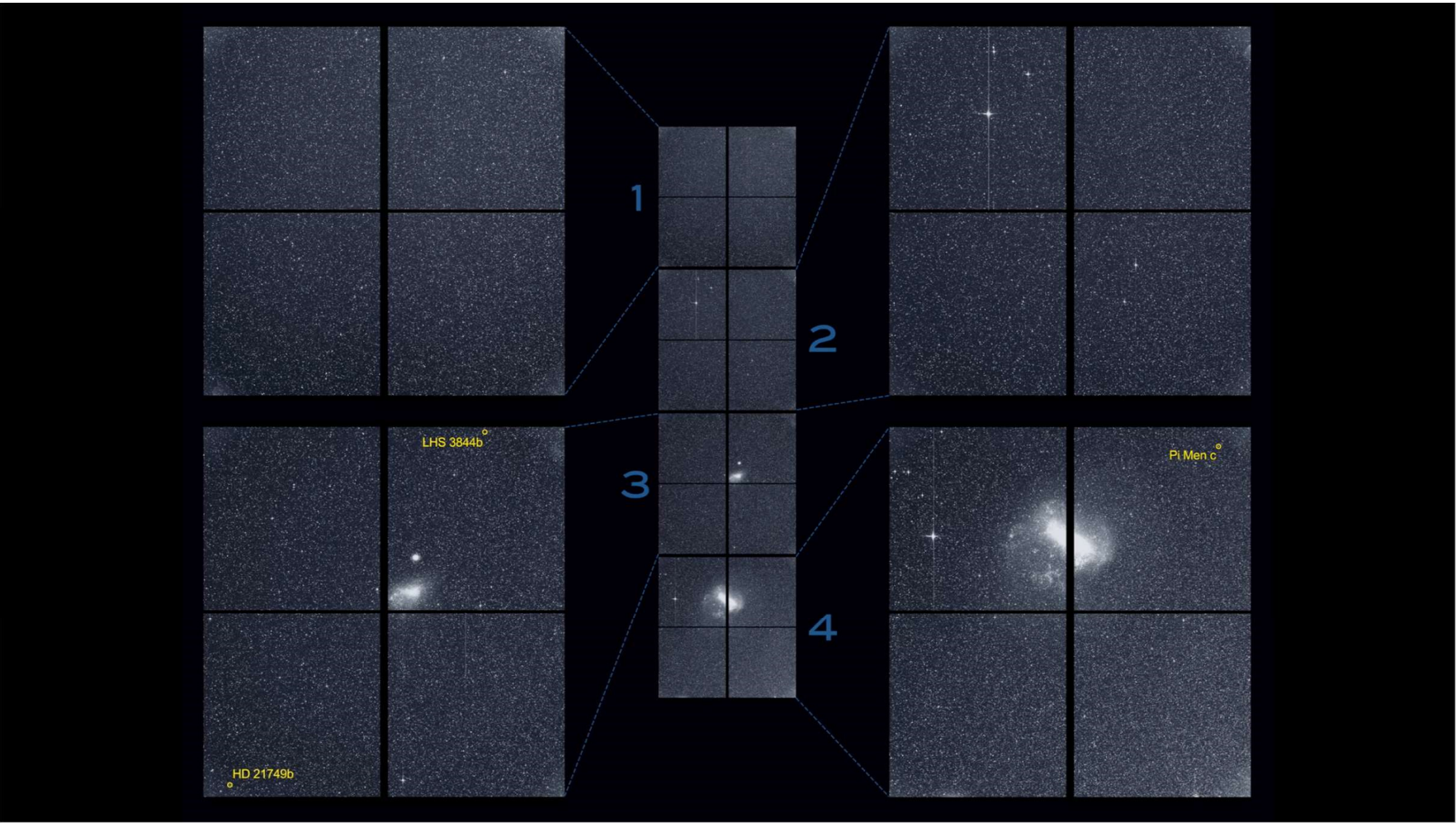
MEarth Hardware (in a Nutshell)

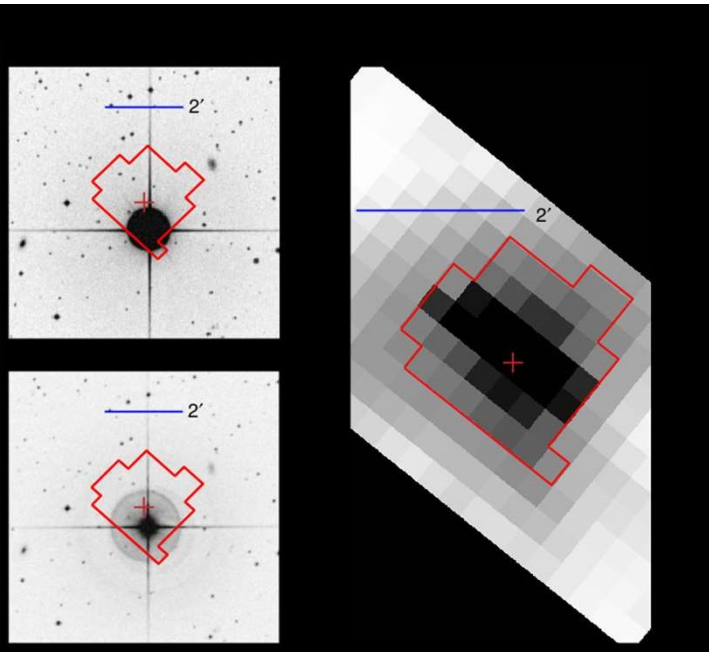


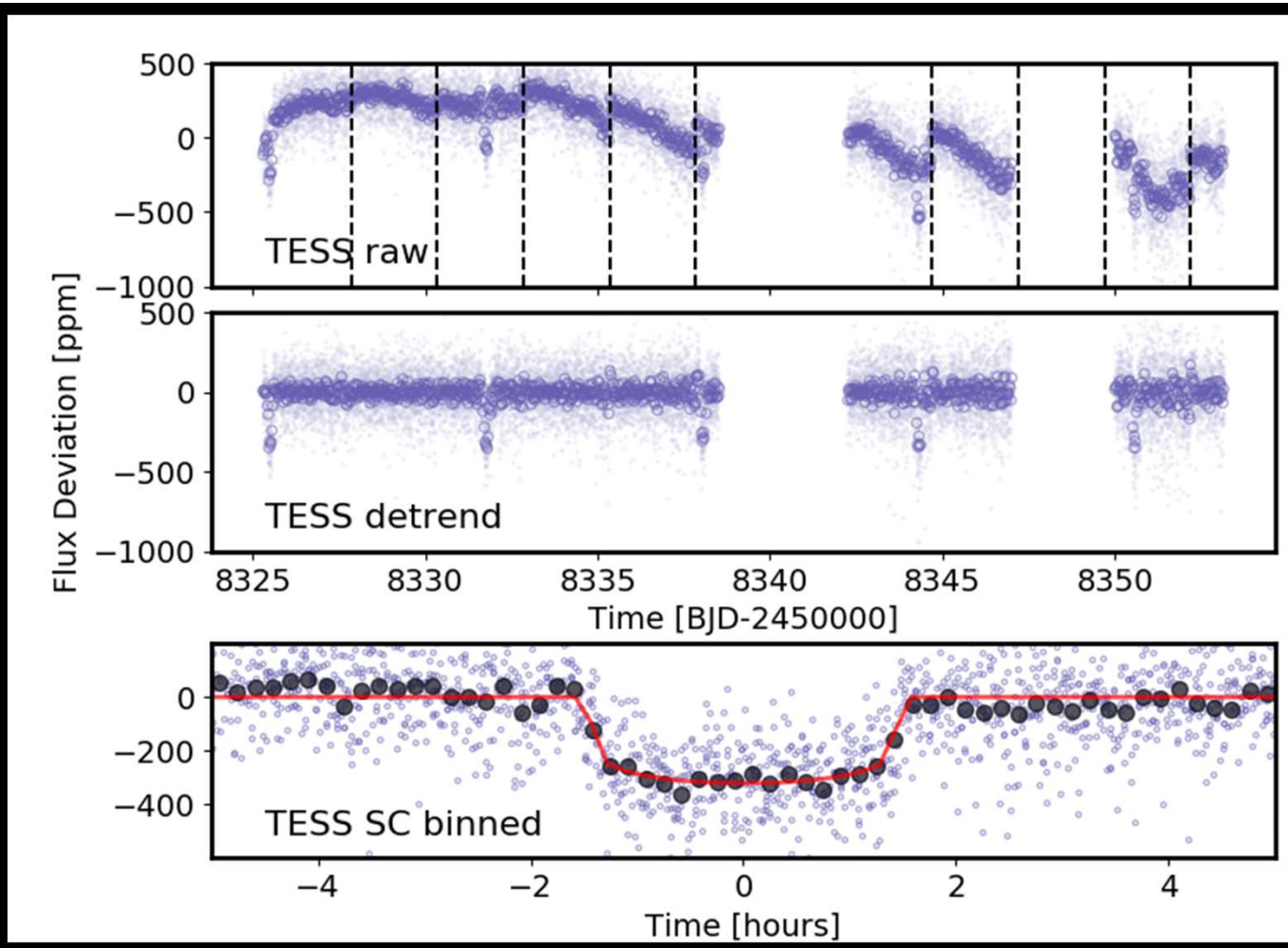
8 Telescopes per site
Typical cadence 20 minutes
Real-time trigger

Slide courtesy MEarth team




1
2
3
4
LHS 3844b
Pi Men c
HD 21749b



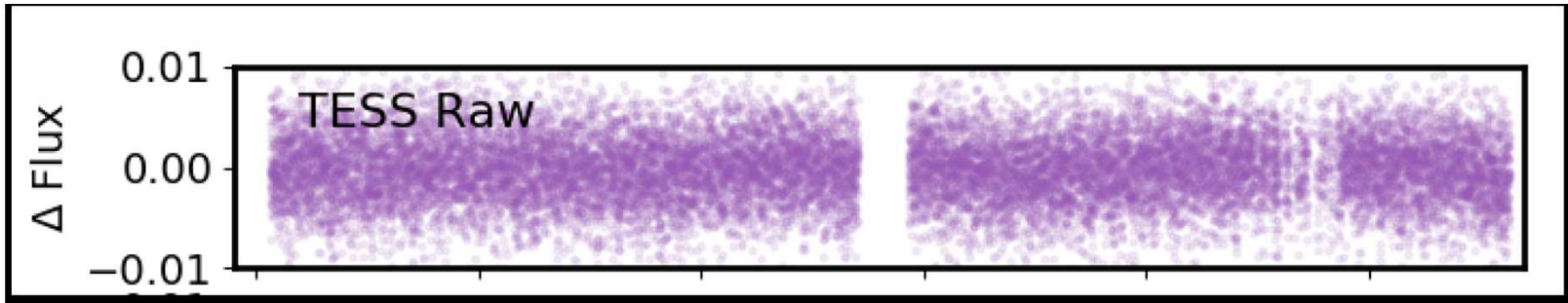


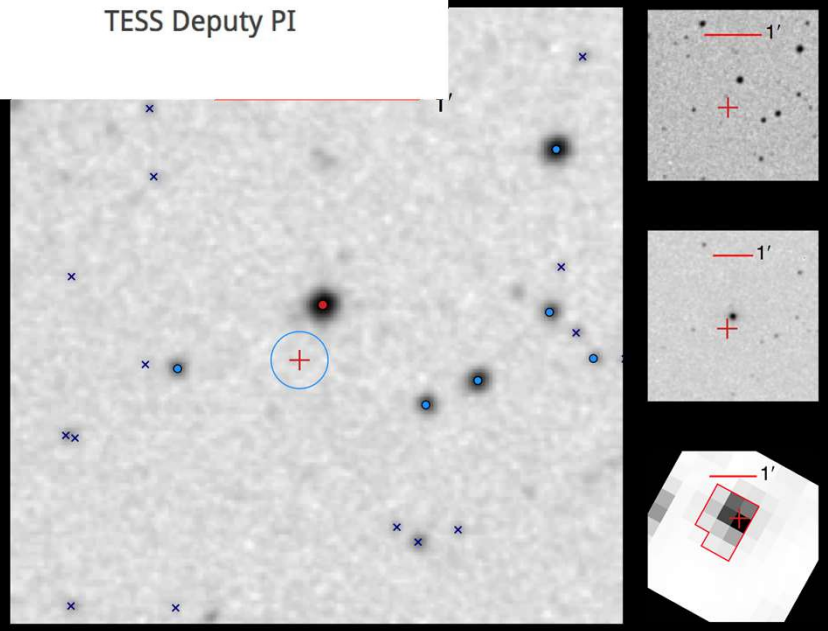
Total noise 30 ppm per 6 hour (10 ppm white noise)

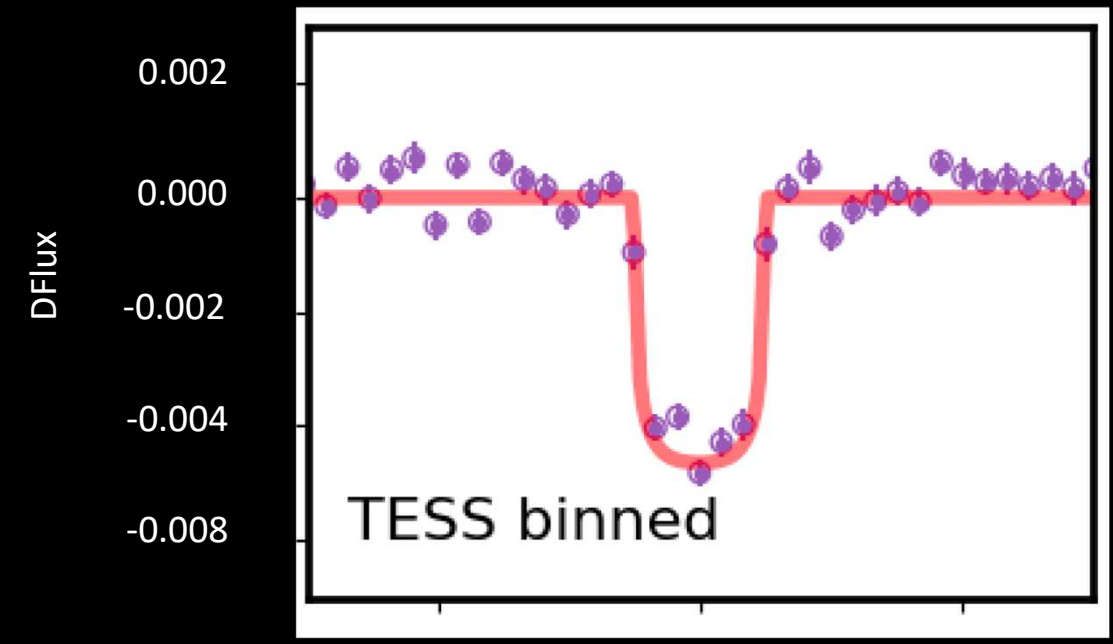
Huang et al (2018)

Roland Vanderspek

TESS Deputy PI

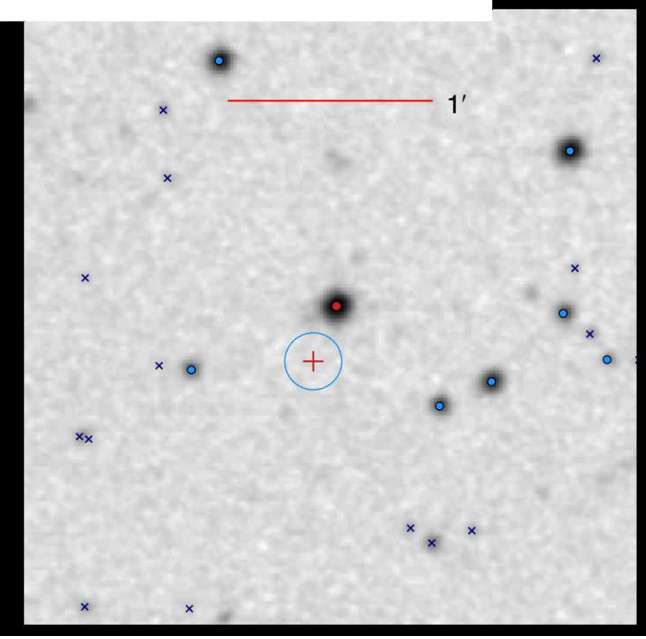


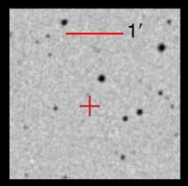


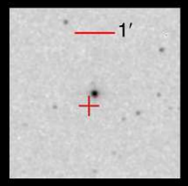


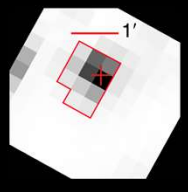
Vanderspek et al (2018)

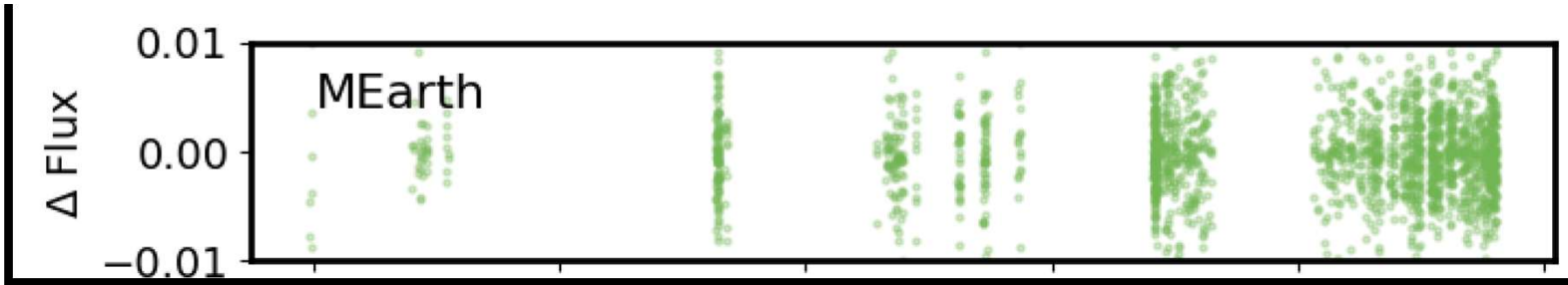
Roland Vanderspek
TESS Deputy PI

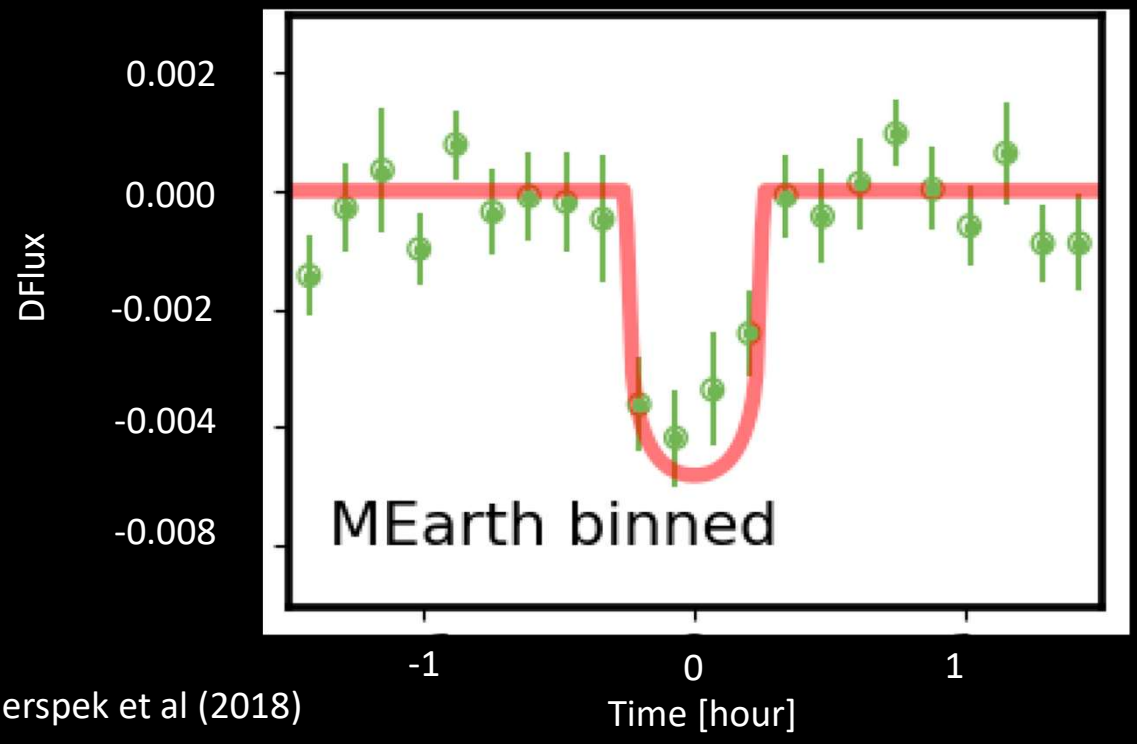




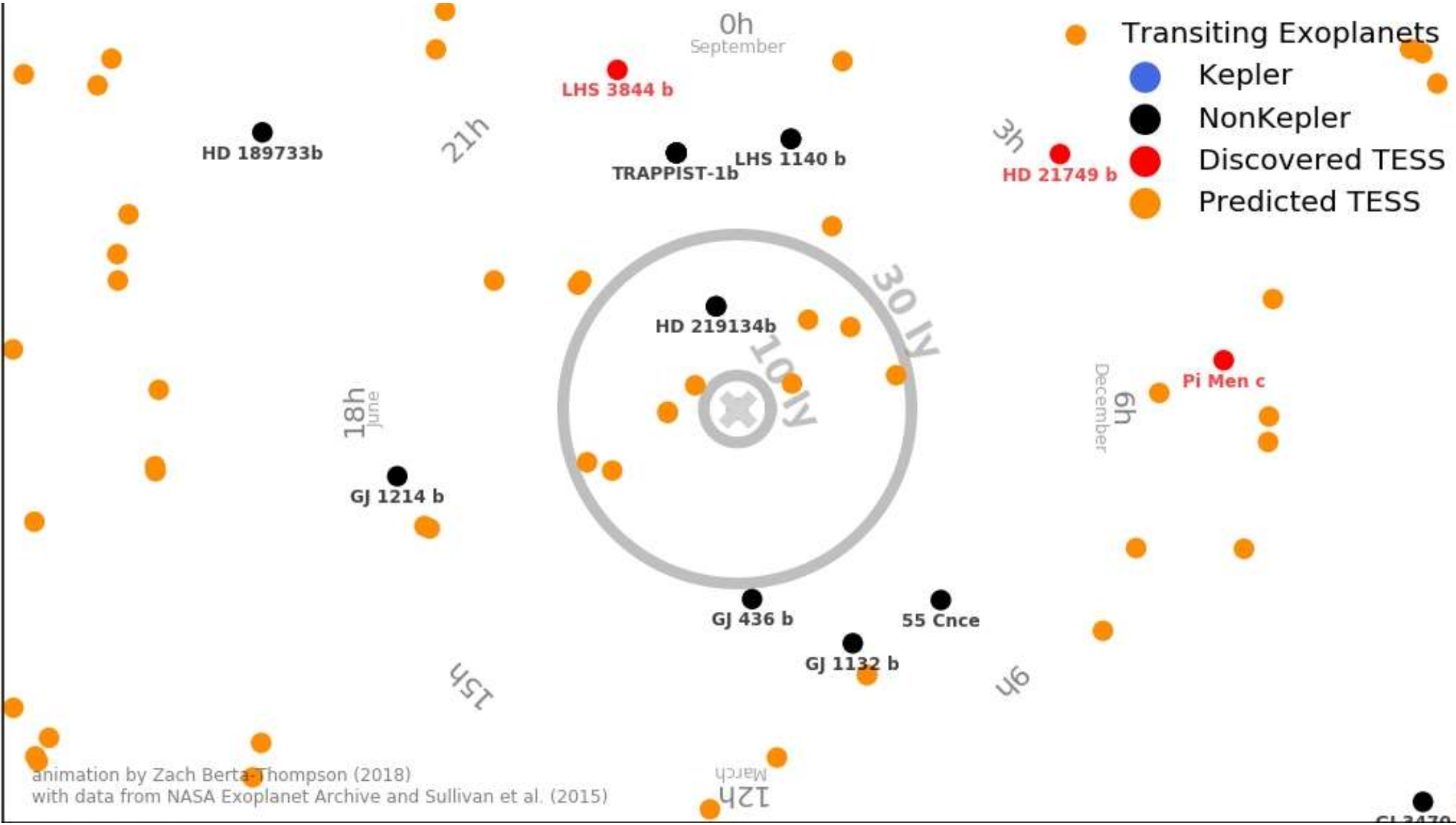








Vanderspek et al (2018)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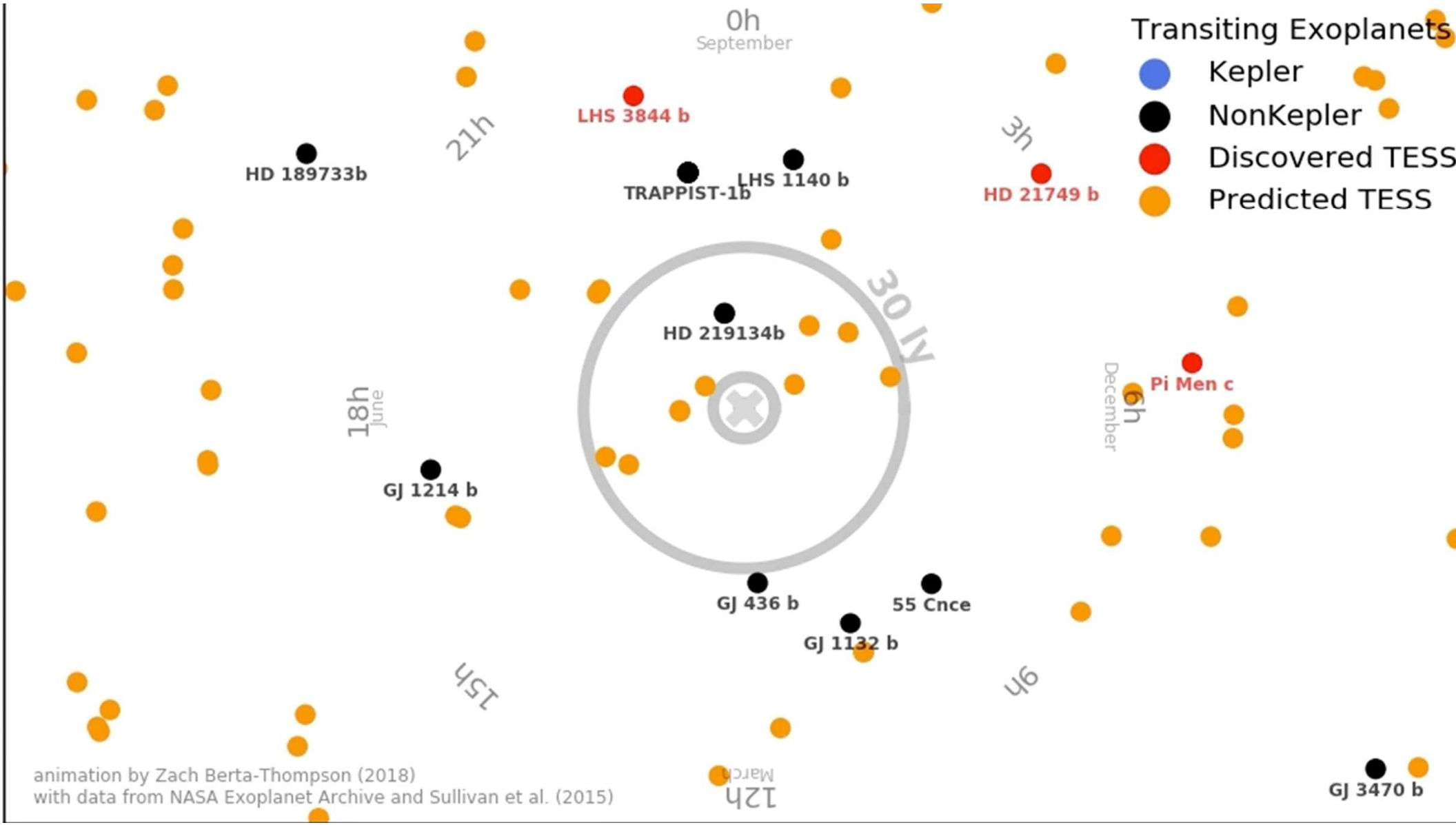
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