

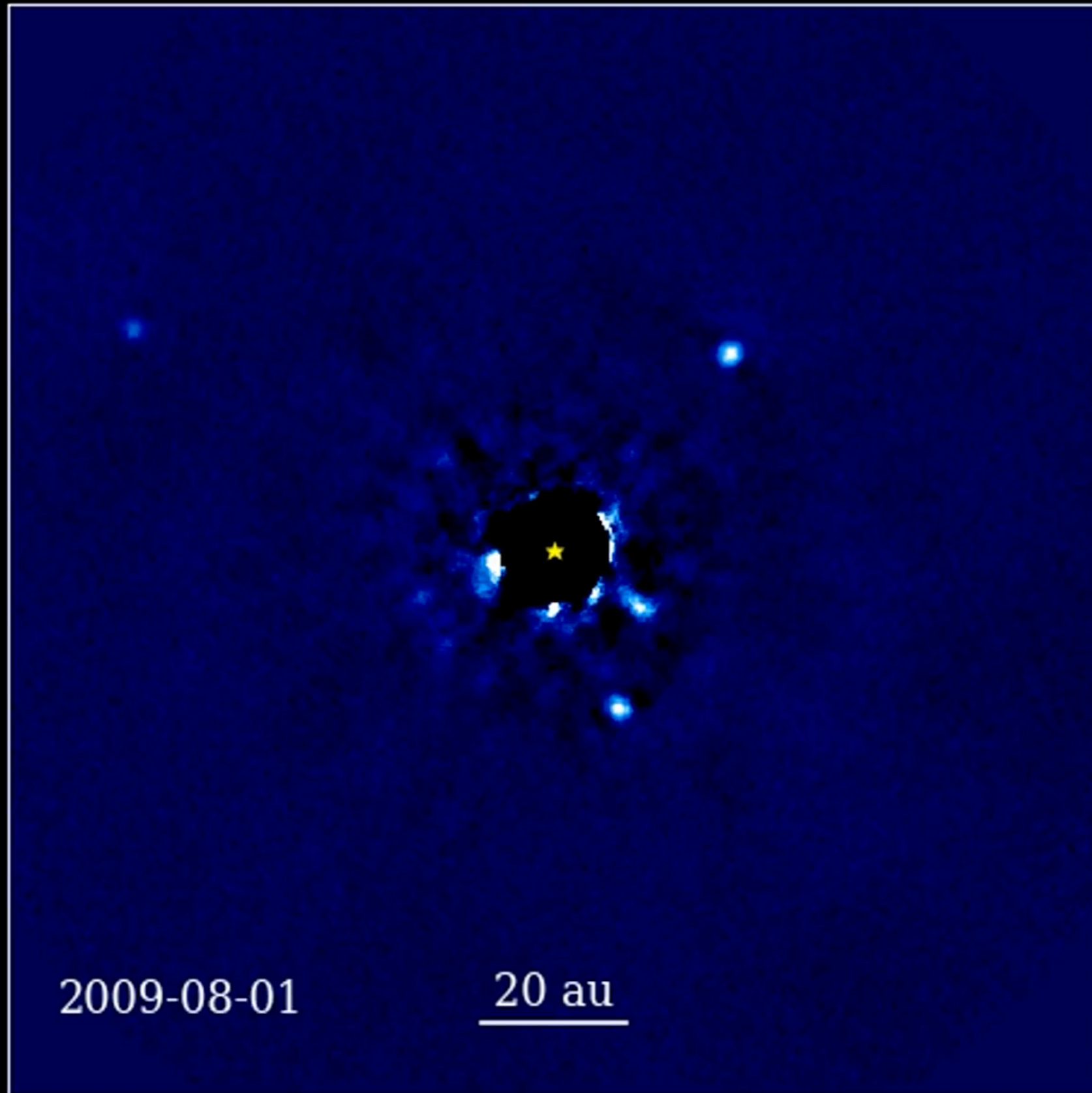
Orbits:

Planet Generation
Planet Propagation
Orbit Geometry

Eric Nielsen
New Mexico State University



Exoplanets in Motion



Orbital Parameters

semi-major axis

eccentricity

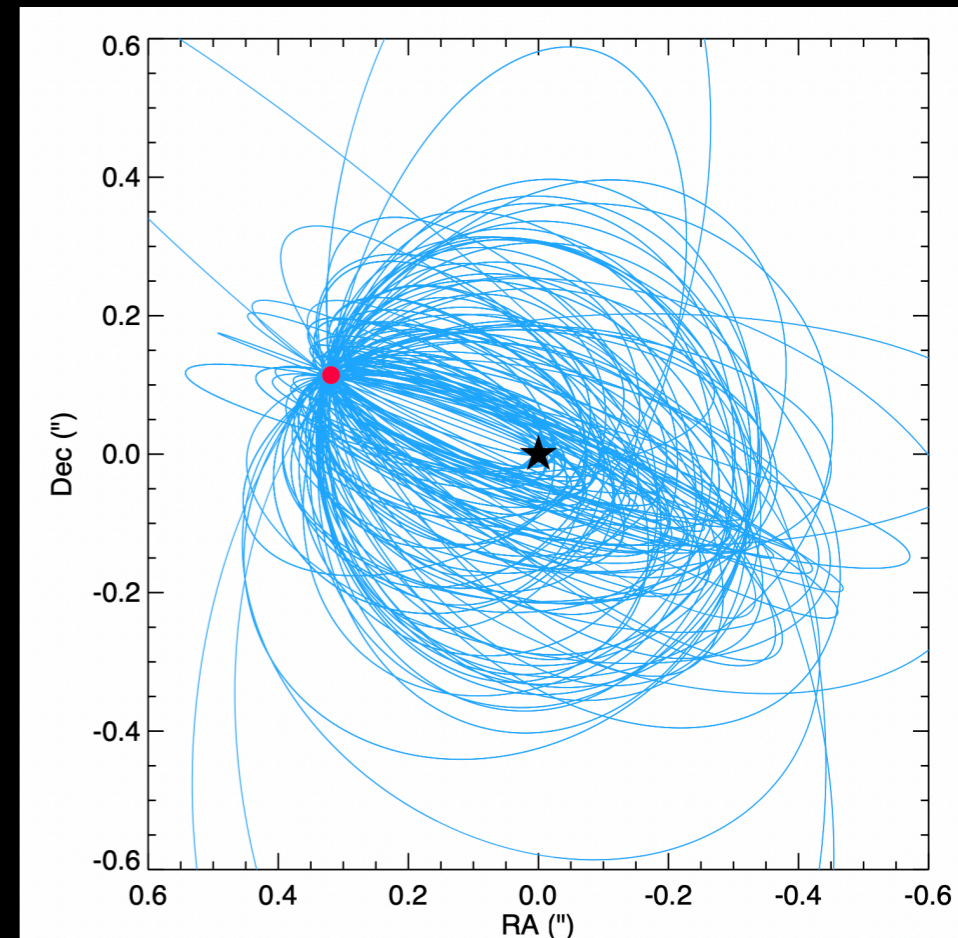
inclination angle

argument of periastron

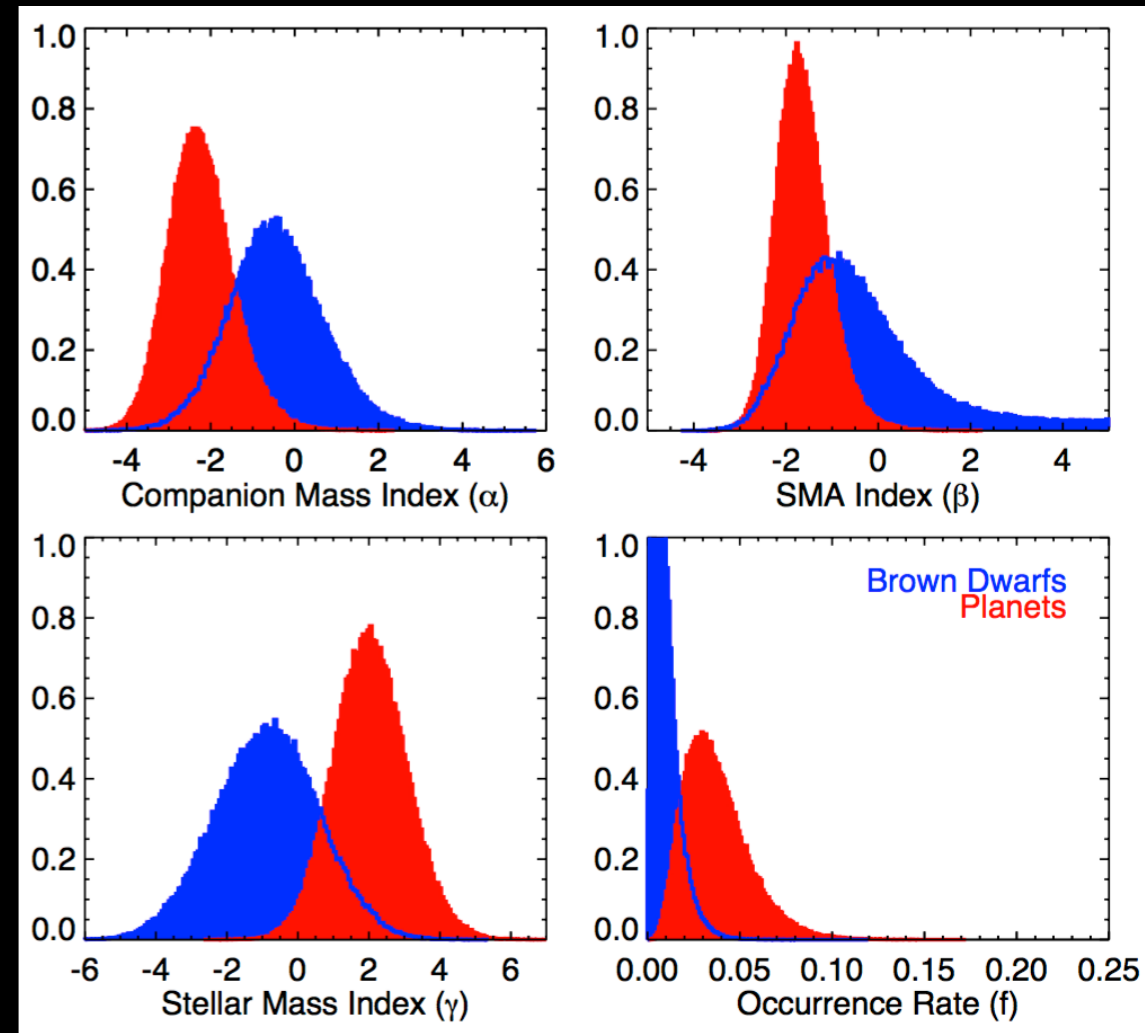
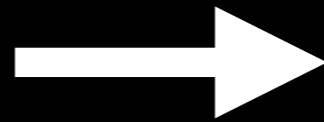
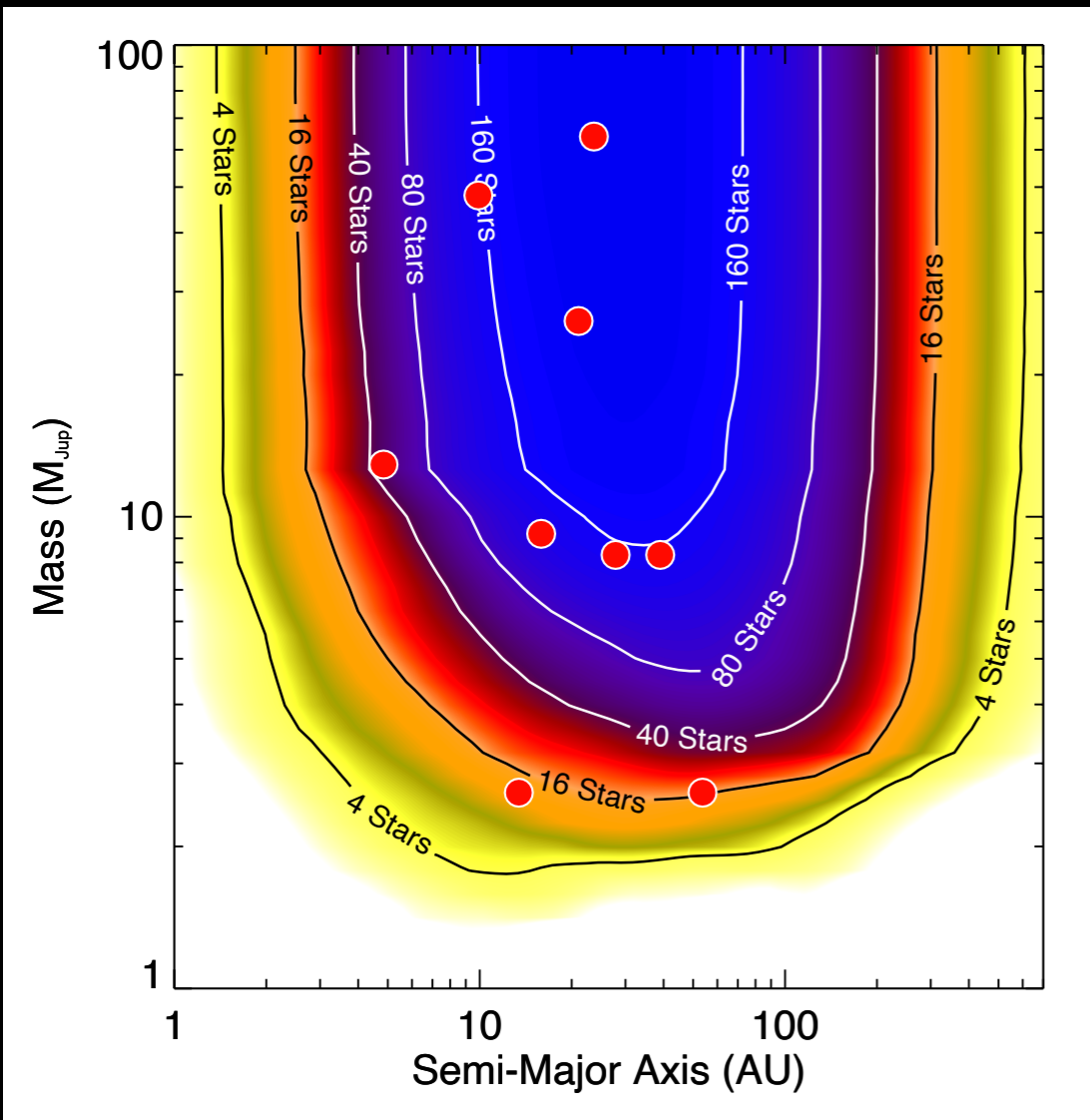
position angle of nodes

epoch of periastron passage

period

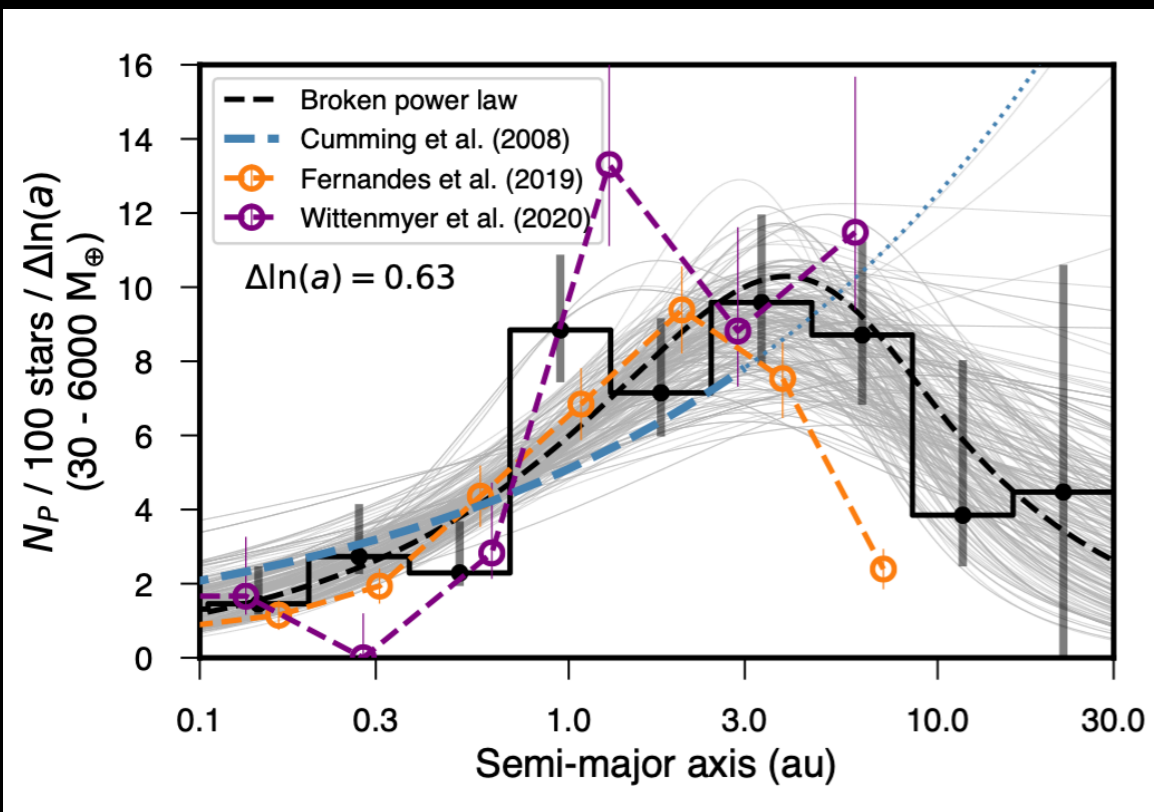


Demographics to Exoplanet Parameters

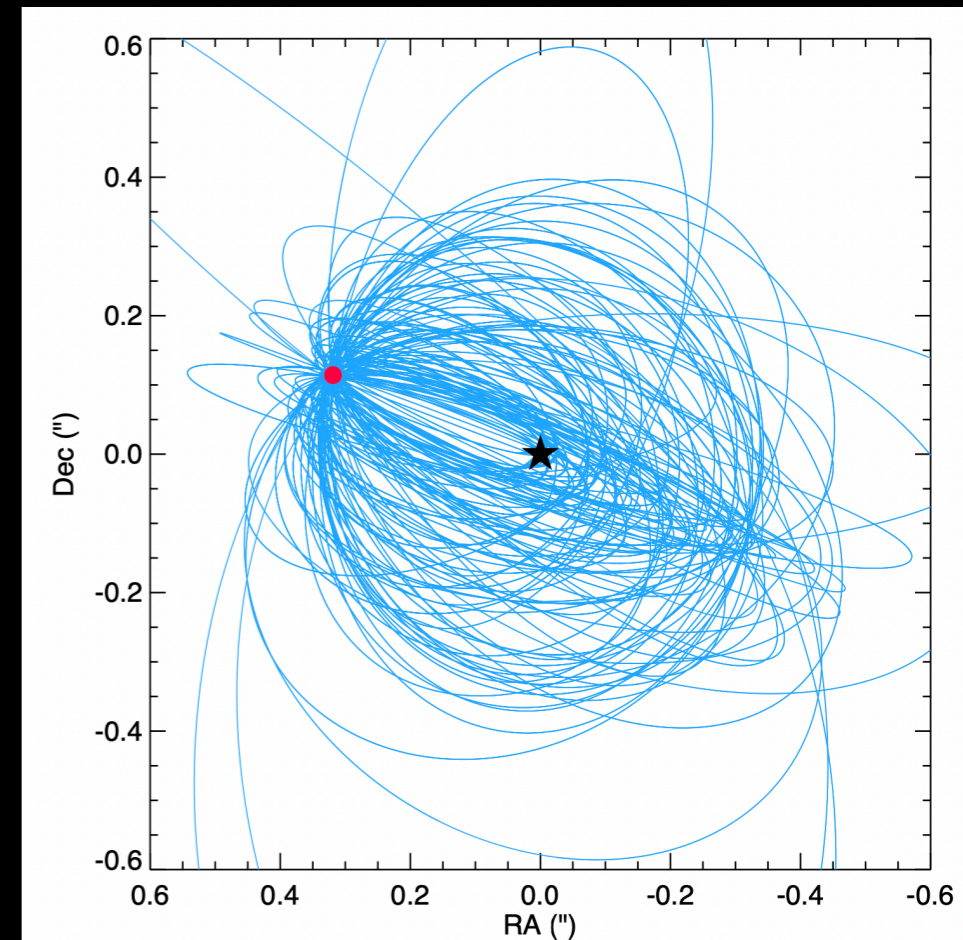


Nielsen et al. 2019

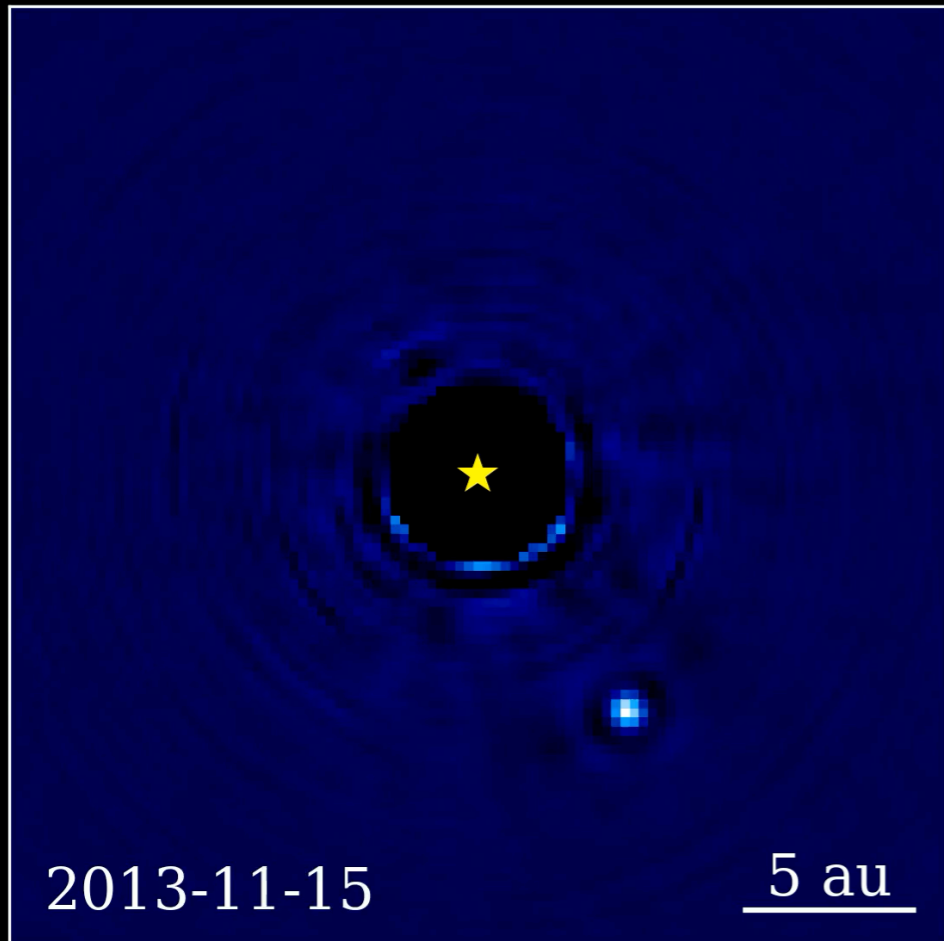
Exoplanet Parameters to Simulated Exoplanets



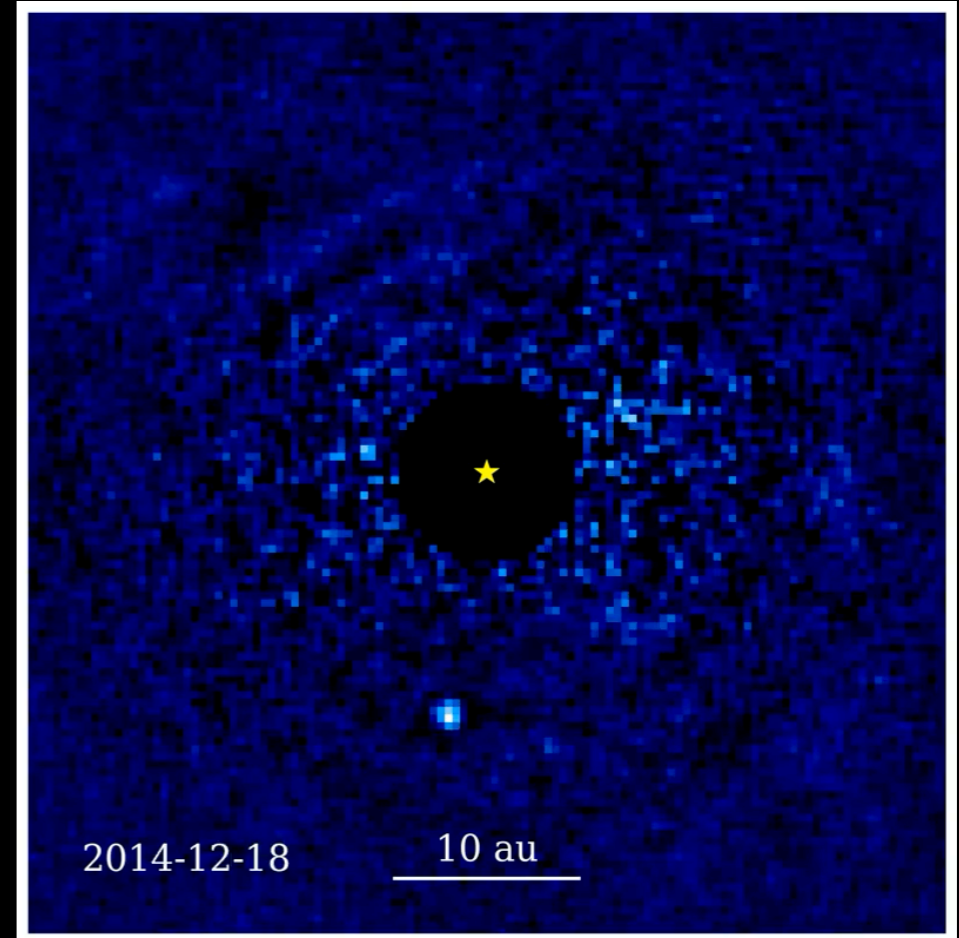
Fulton, Rosenthal et al. 2021



Inclination Angle

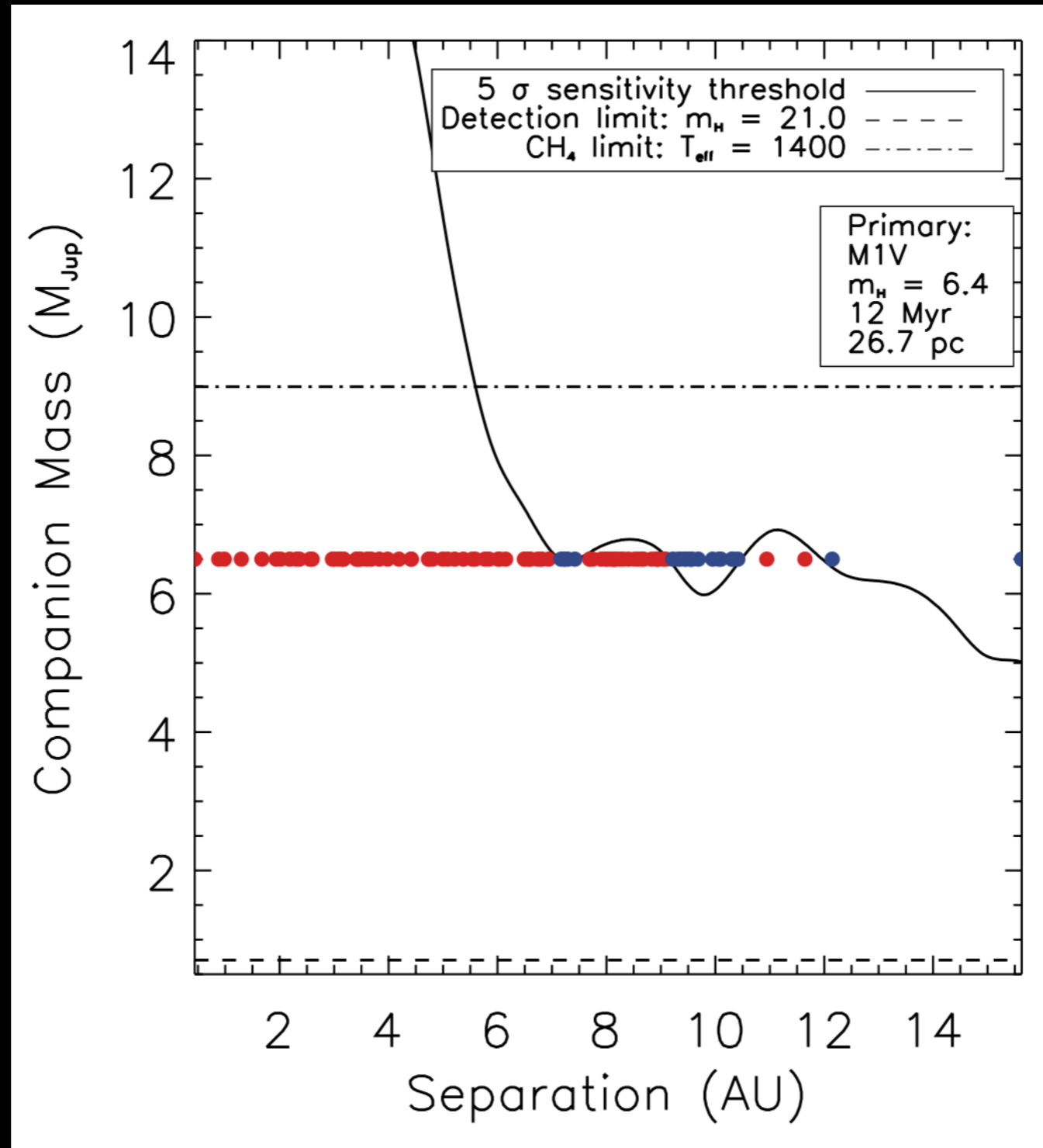


beta Pic b
Jason Wang/GPIES

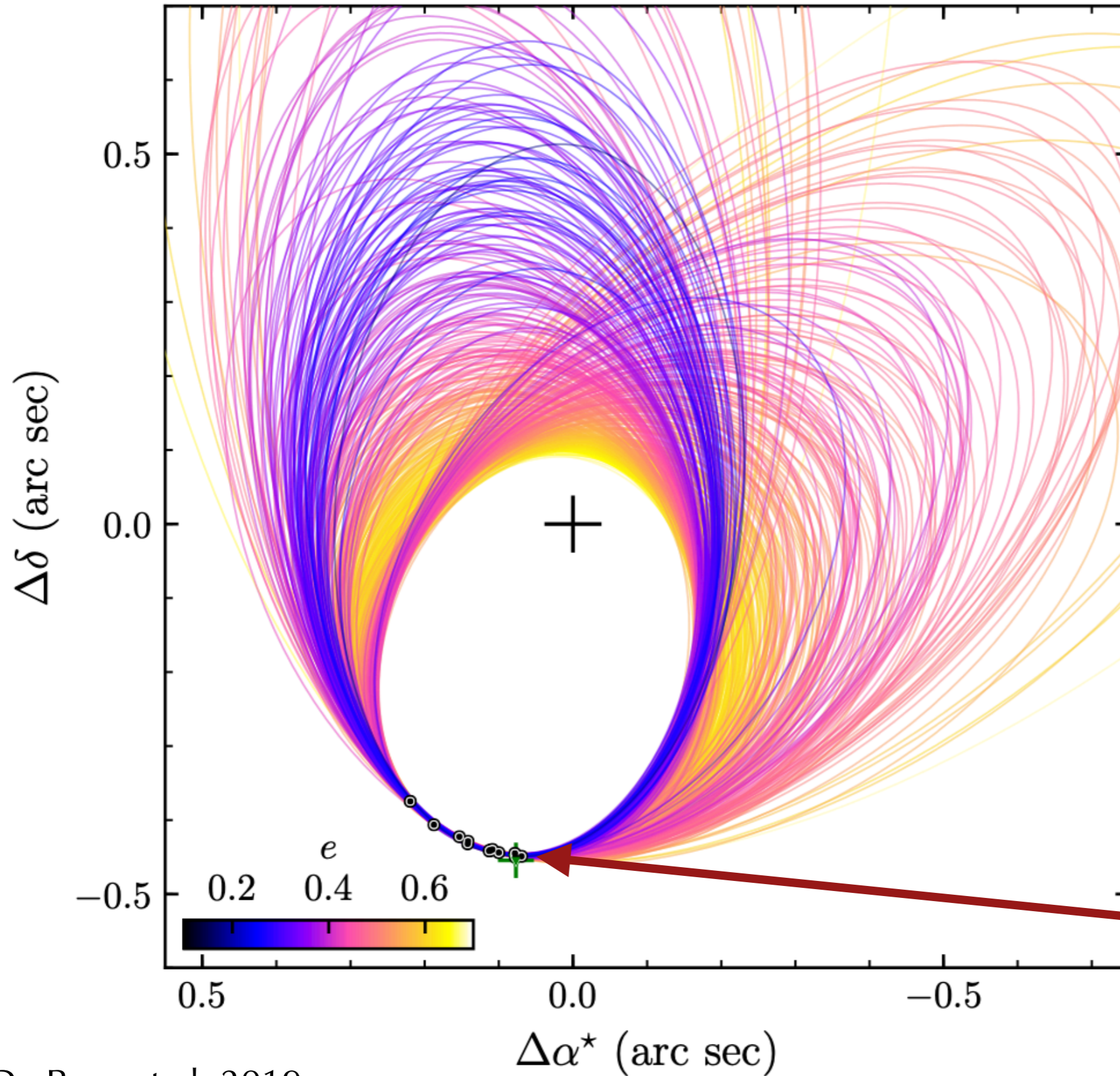


51 Eri b
Jason Wang/GPIES

Orbital properties and completeness

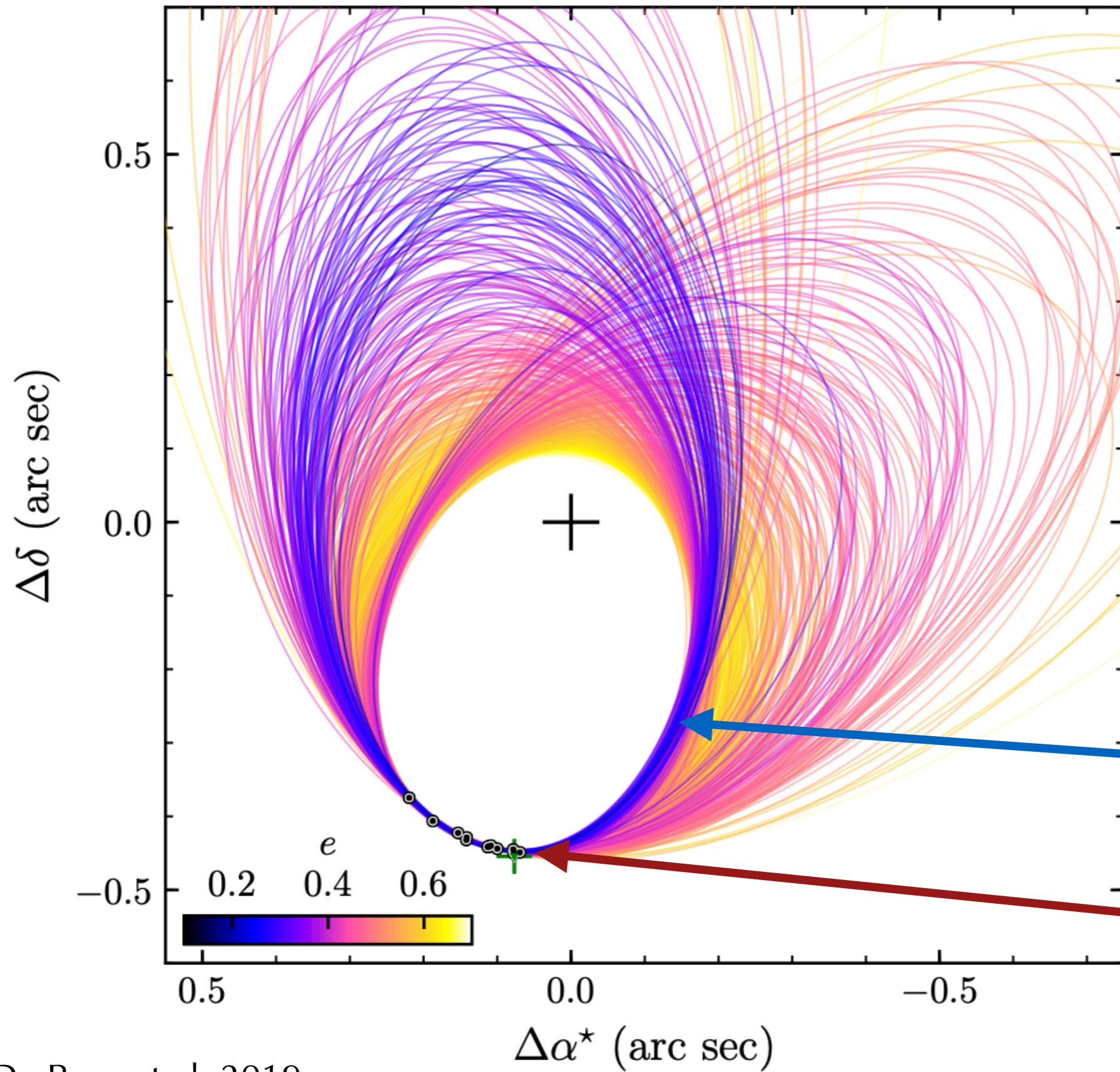


51 Eridani b and orbital completeness



2014: Detected by GPIES

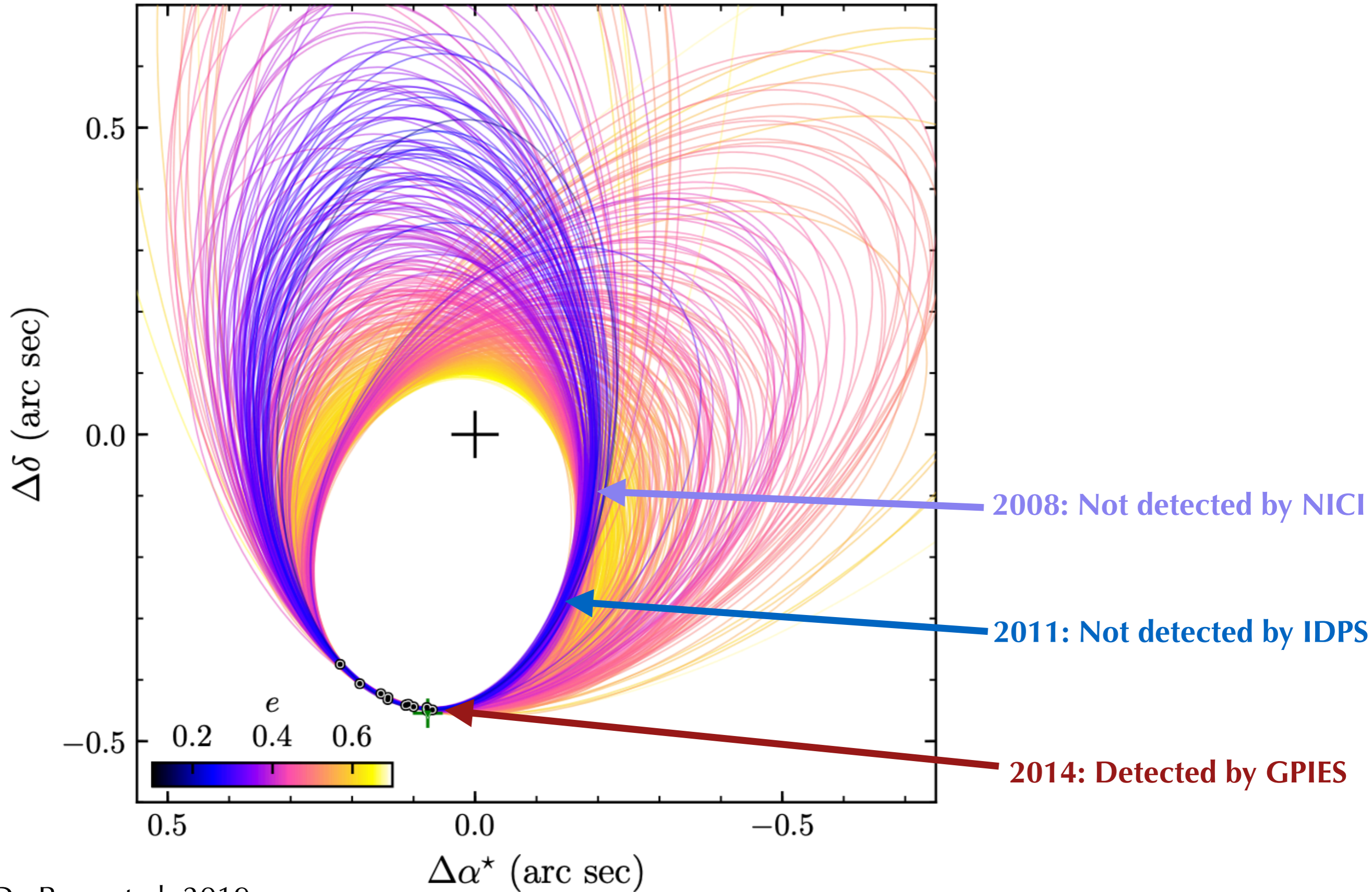
51 Eridani b and orbital completeness



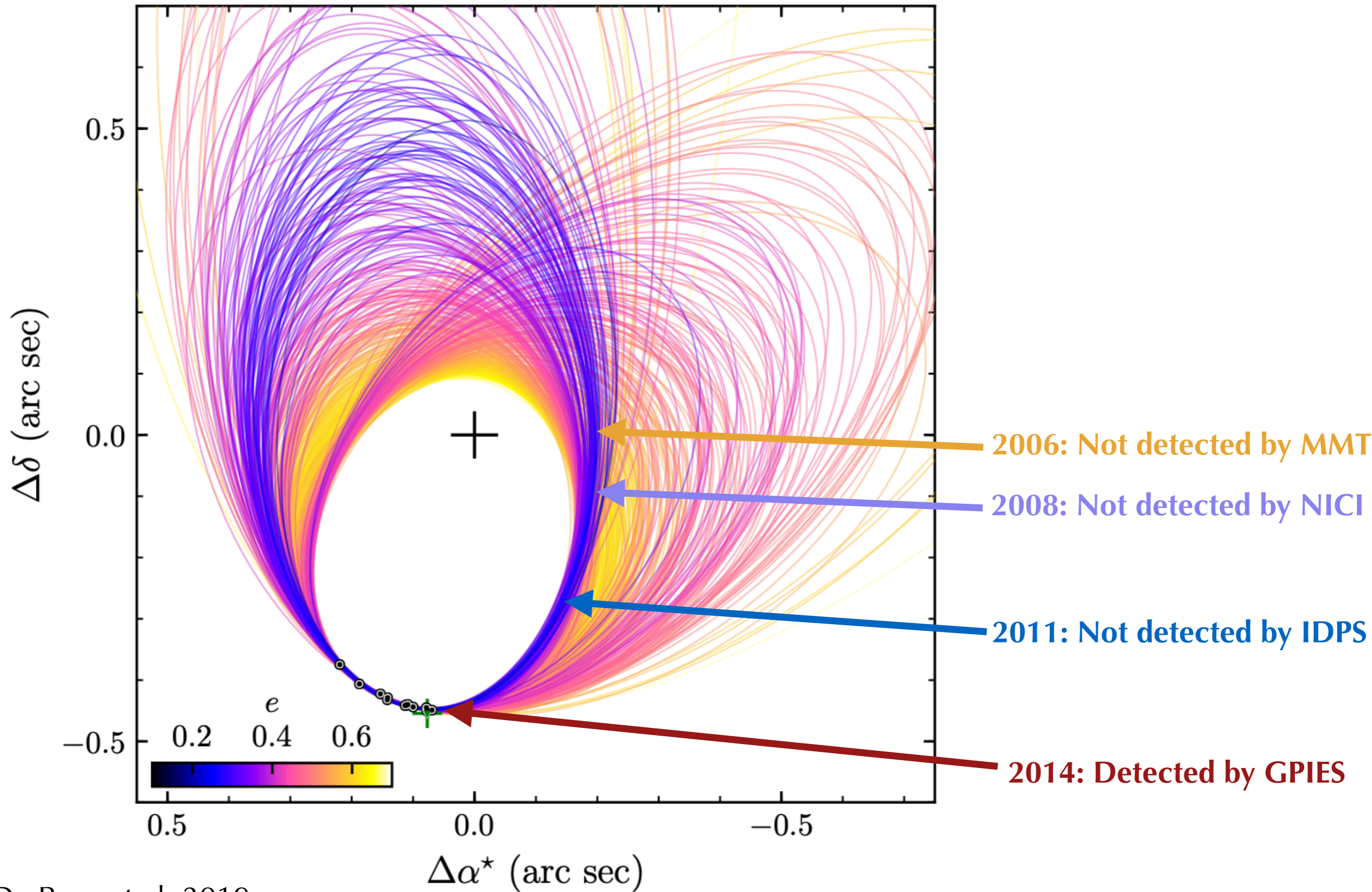
2011: Not detected by IDPS

2014: Detected by GPIES

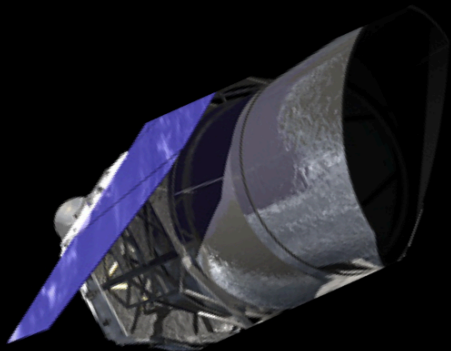
51 Eridani b and orbital completeness



51 Eridani b and orbital completeness



Reflected Light



Orbital Parameters

semi-major axis

eccentricity

inclination angle

argument of periastron

position angle of nodes

epoch of periastron passage

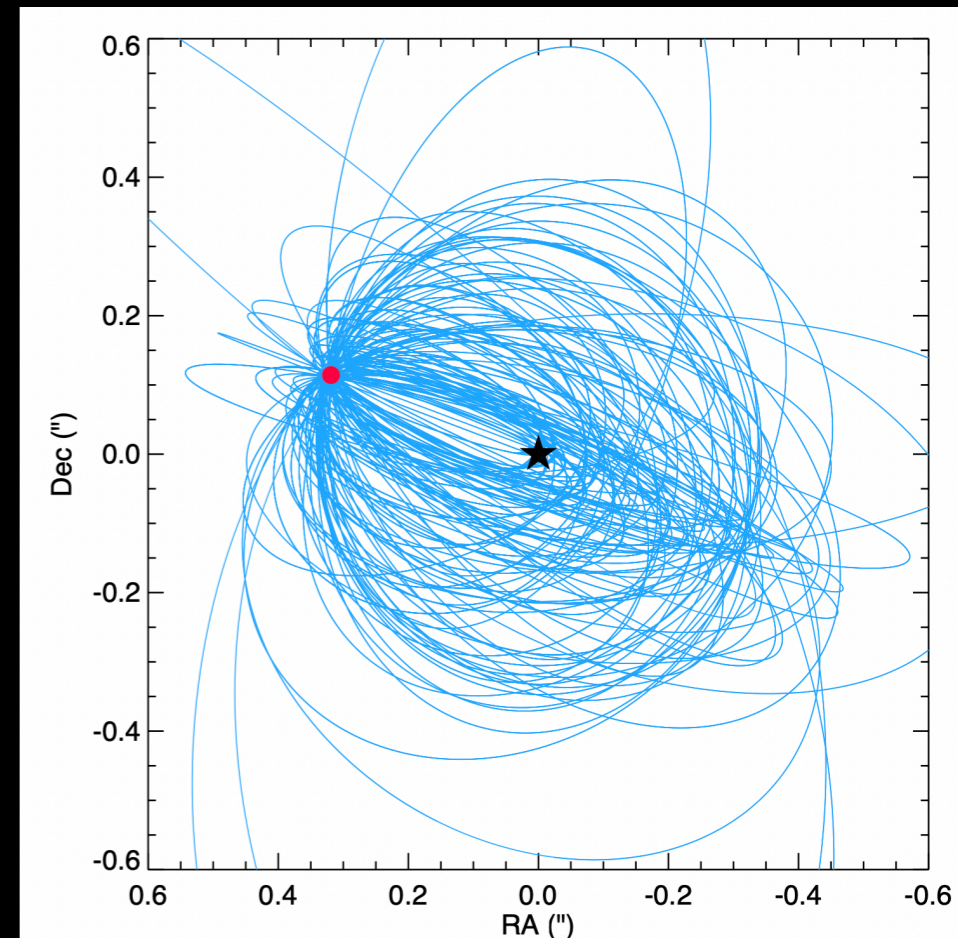
period

Reflected light planets:

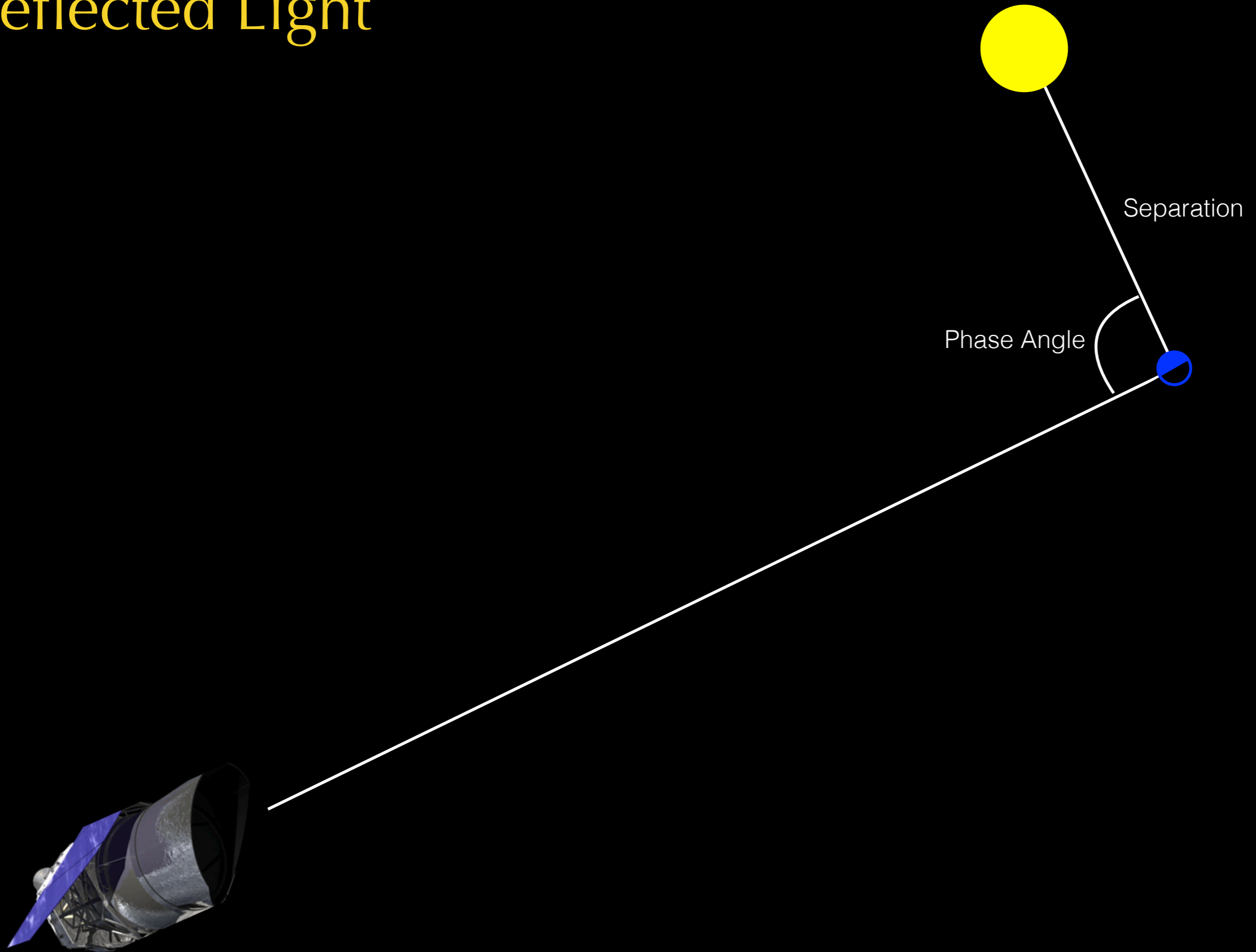
radius

albedo

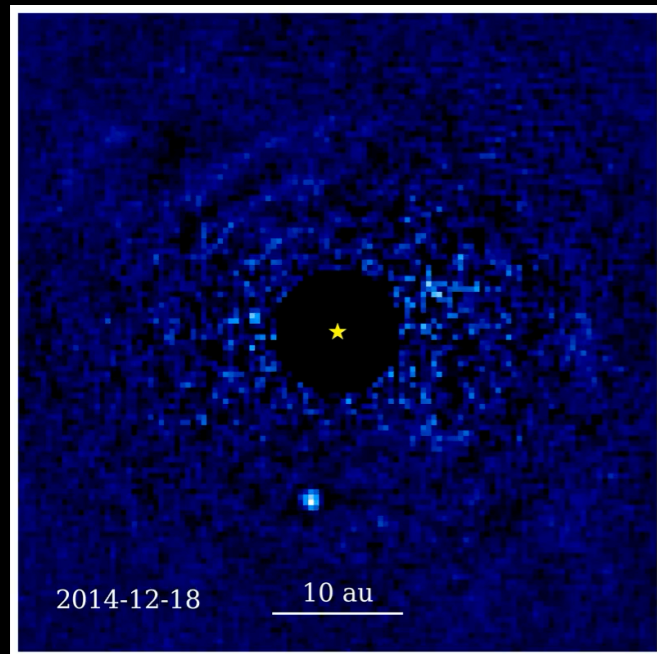
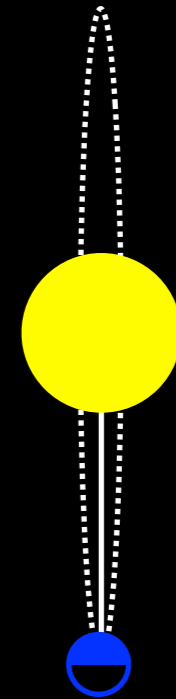
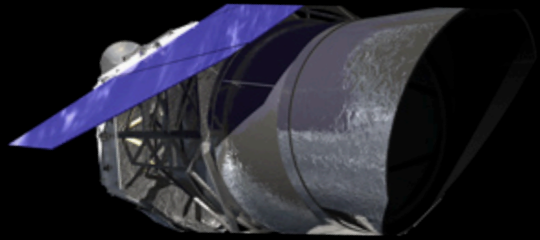
phase function



Reflected Light



Face-on orbits



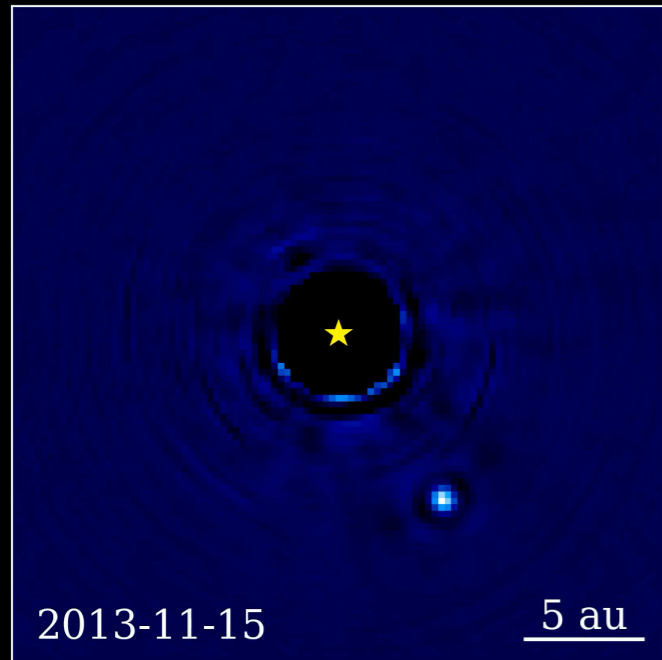
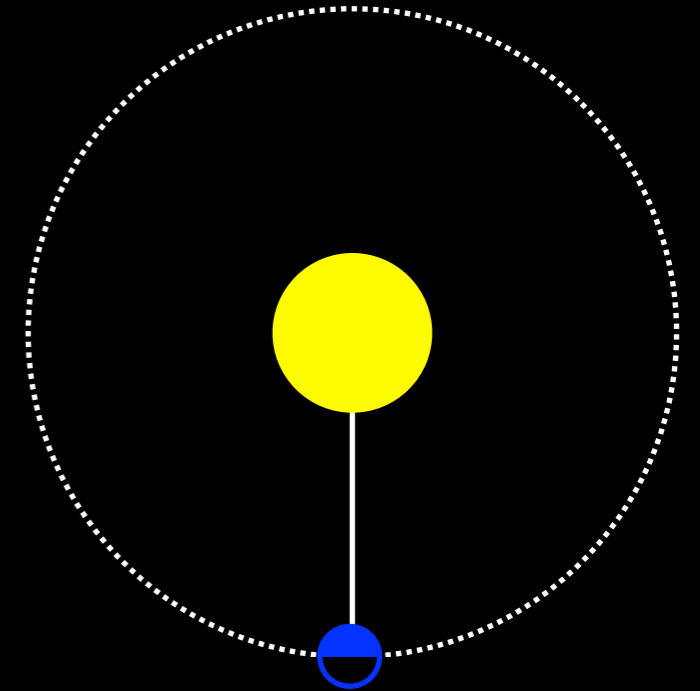
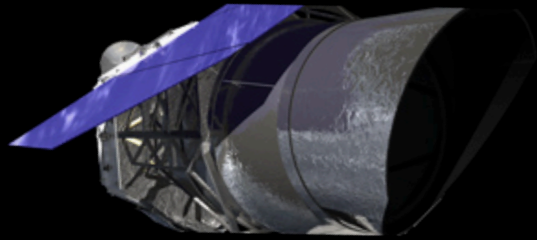
Inclination angle near 0 (or 180):

Phase angle always near 90

Projected separation always close to semi-major axis

51 Eri b
Jason Wang/GPIES

Edge-on orbits



Inclination angle near 90:

Phase angle varies from 0-180

Projected separation can be very small

beta Pic b
Jason Wang/GPIES