Flux Ratios and Planet Mass Estimation of HR 8799 C and HR8799 B

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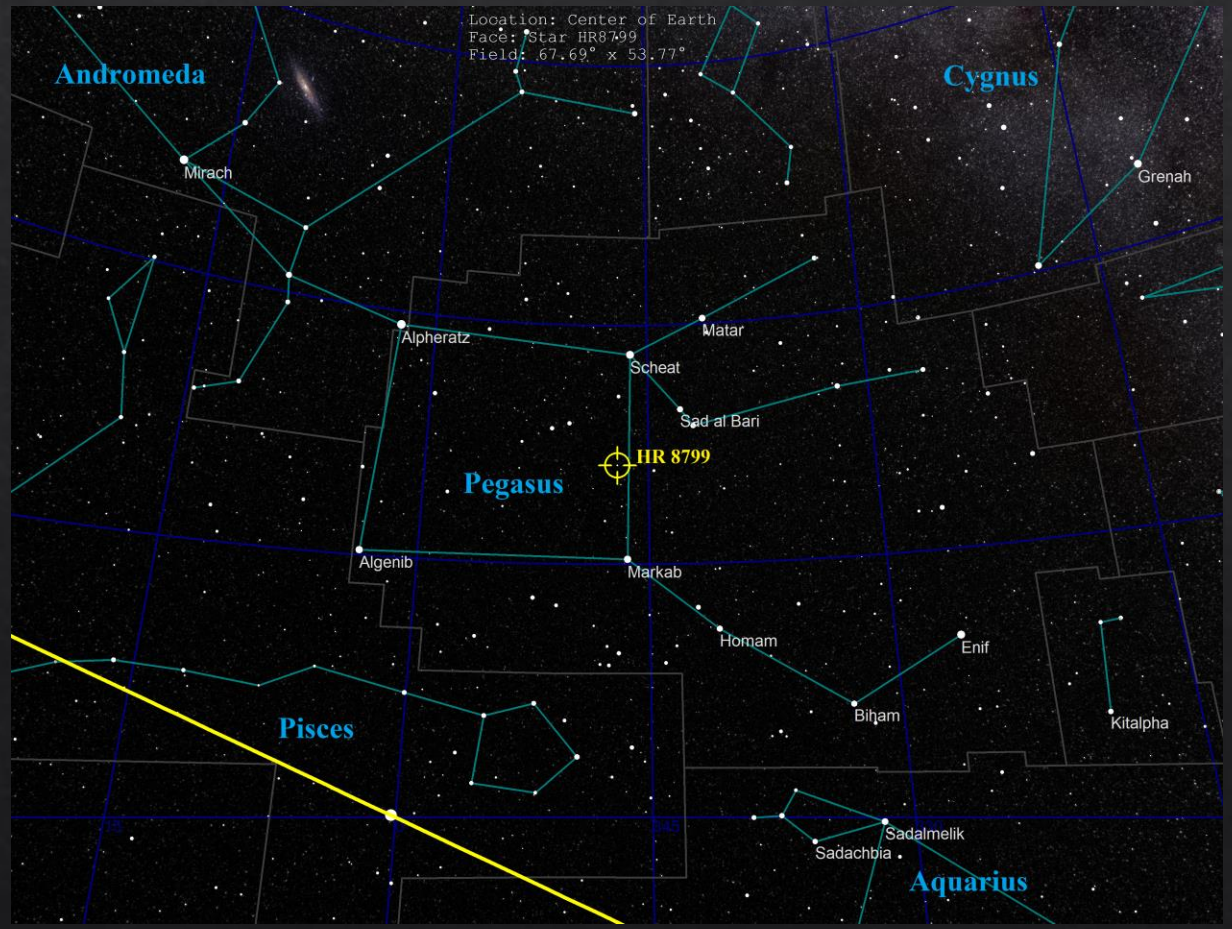
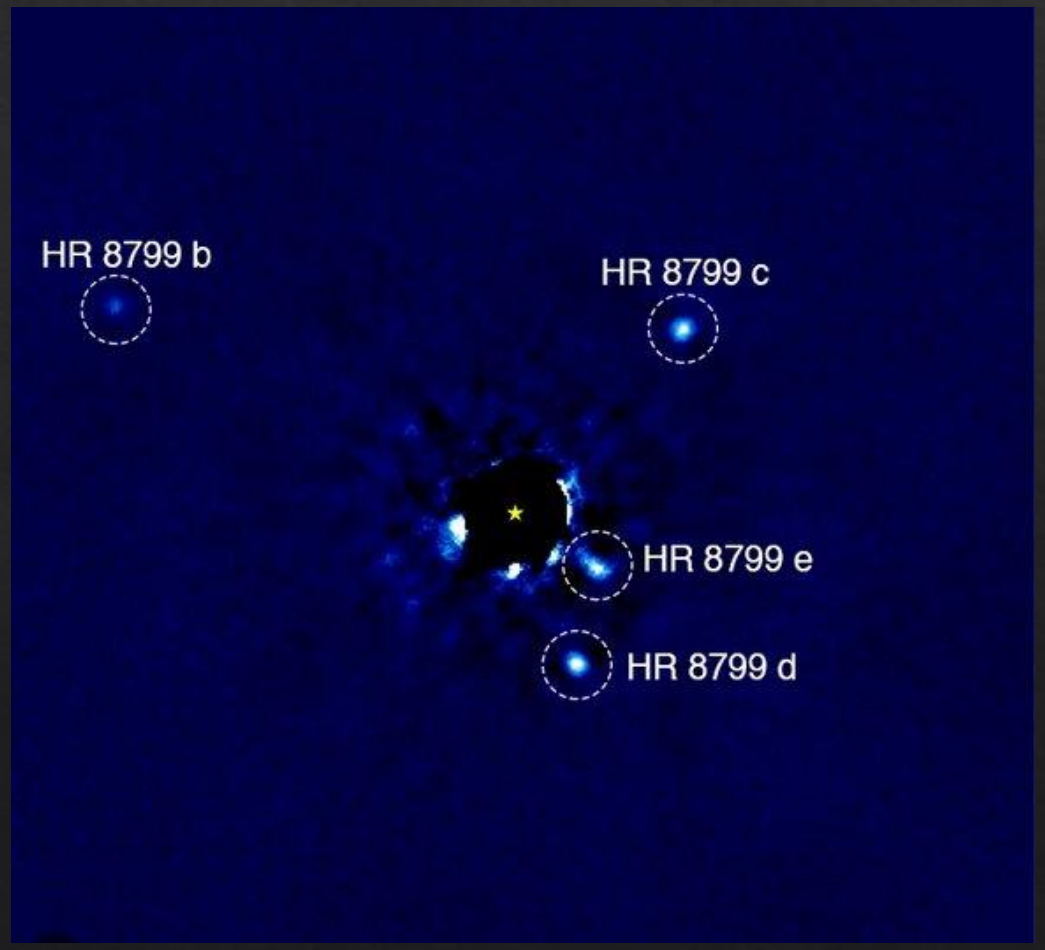
Overview

1. Star and Planet System
2. Obtaining Coordinates
3. Flux and Mass calculation
4. Mass Comparison
5. Curves at different ages

Star and Planet System

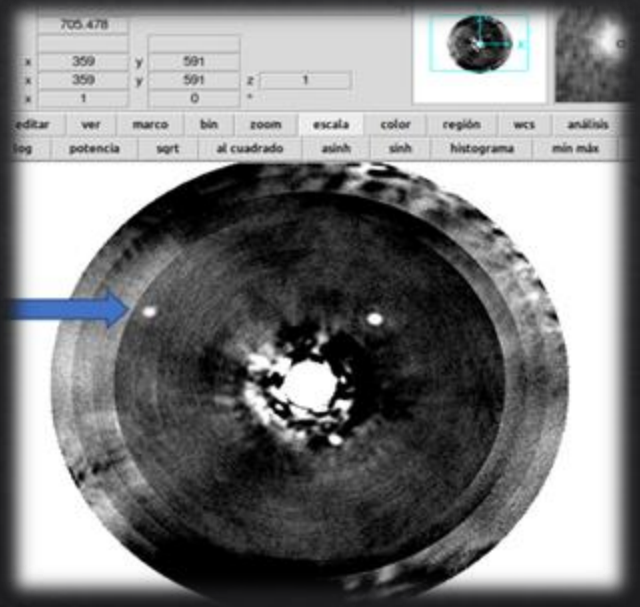
- Distance: 40.9 parsec.
- 30 million-year-old star
- Gamma Duradus Variable Star



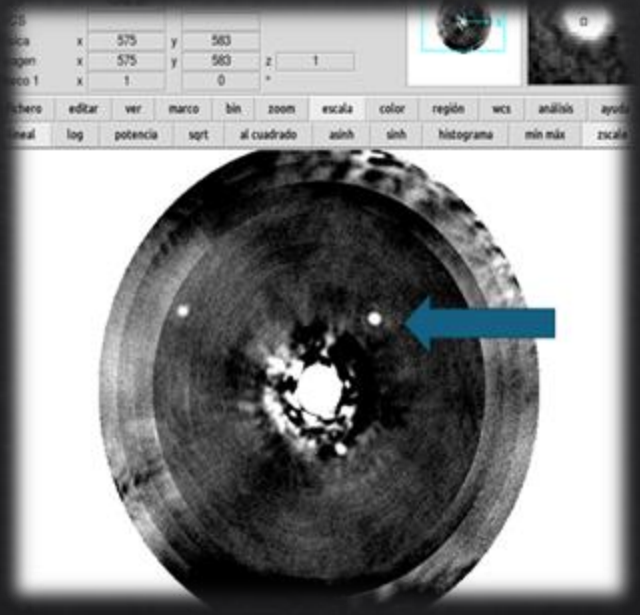


Obtaining Coordinates

- HR 8799 C Outermost Planet.
- (359, 591)
- SNR ~ 10



- HR 8799 B Innermost Planet.
- (575,583)
- SNR ~ 8.7



Flux and Mass calculation (without much analysis)

Planet to star ratio = (planet flux / algorithm throughput) / star flux

(! Calibration Times !)

Absolute Magnitude of Star (L Band) = apparent magnitude (L Band) - 5 * log10(40.879/10)

Planet Absolute Magnitude (L Band) = Abs M of Star - 2.5 * log10(planet fluxratio)

AMES-COND Model
(Baraffe et al. 2003)

Mass Comparison

Planet	HR 8799c	HR 8799b
Planet mass, m (mJup)	10.060	6.344

Our results

Percentage Error

- 25% Inner Planet
- 6.3% Outer Planet

Table 1. The Best-fitting, Strictly Periodic Model of the HR 8799 Planetary System

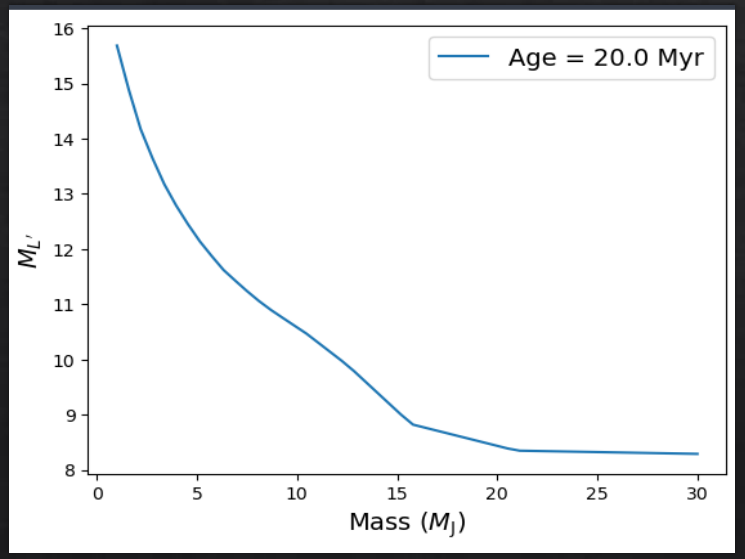
Parameter/Planet	HR 8799e	HR 8799d	HR 8799c	HR 8799b
Planet mass, $m(m_{\rm Jup})$	7.4 ± 0.6	9.1 ± 0.2	7.8 ± 0.5	5.7 ± 0.4
	7.34688506	8.97059370	7.78986828	5.85290522

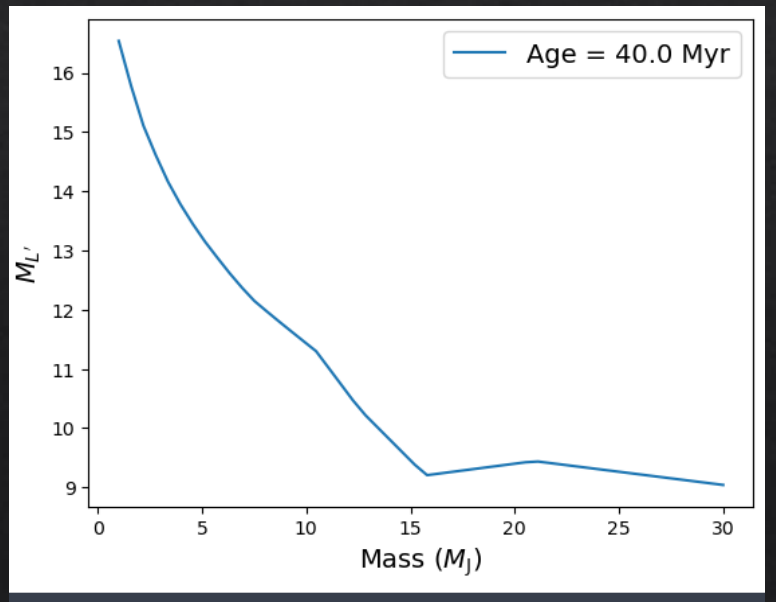
Goździewski, et al. (2020)

Curves at different ages

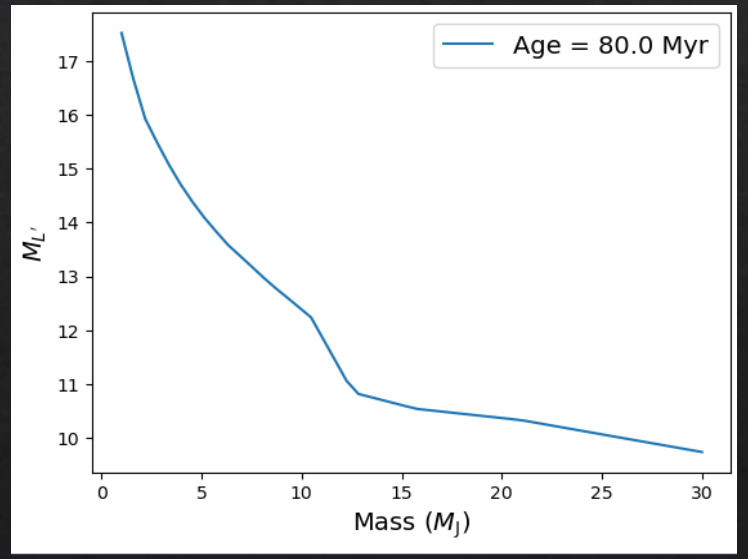
What happens to our mass estimate if we assume an age that is 2x younger and 2x older?

2 Times Younger





2 Times Older



THANK YOU FOR YOUR TIME