Detecting Exoplanet Characteristics

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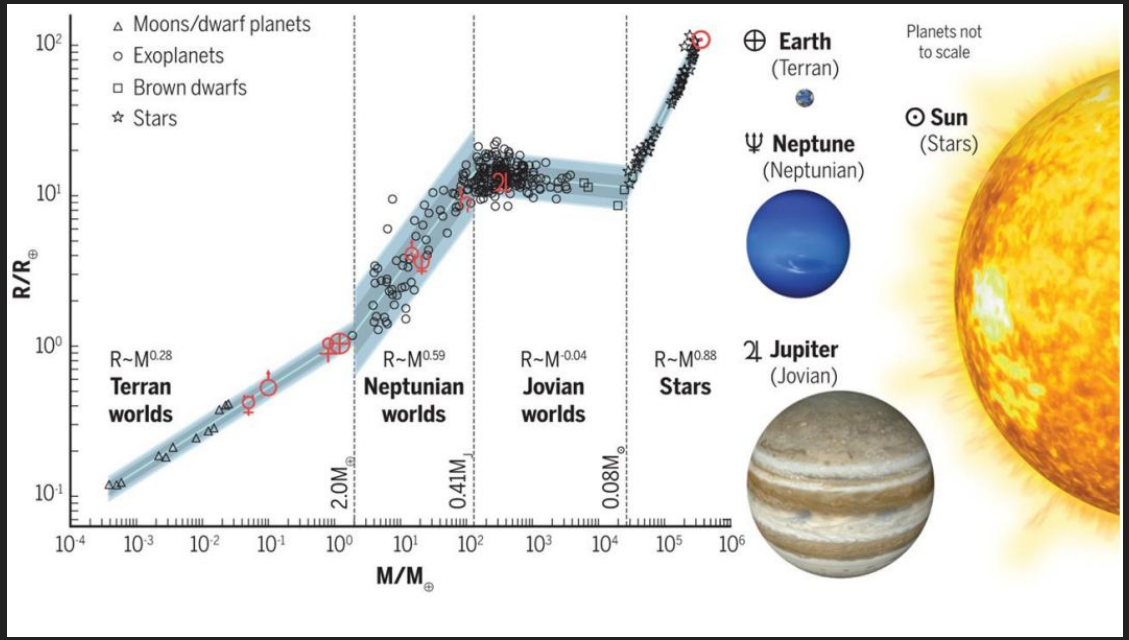
Motivation

Questions to answer:

- ★ How to measure an exoplanet's mass and radius?
- ★ What is physically observable?
- ★ How does HD 189733 b compare to other exoplanets?

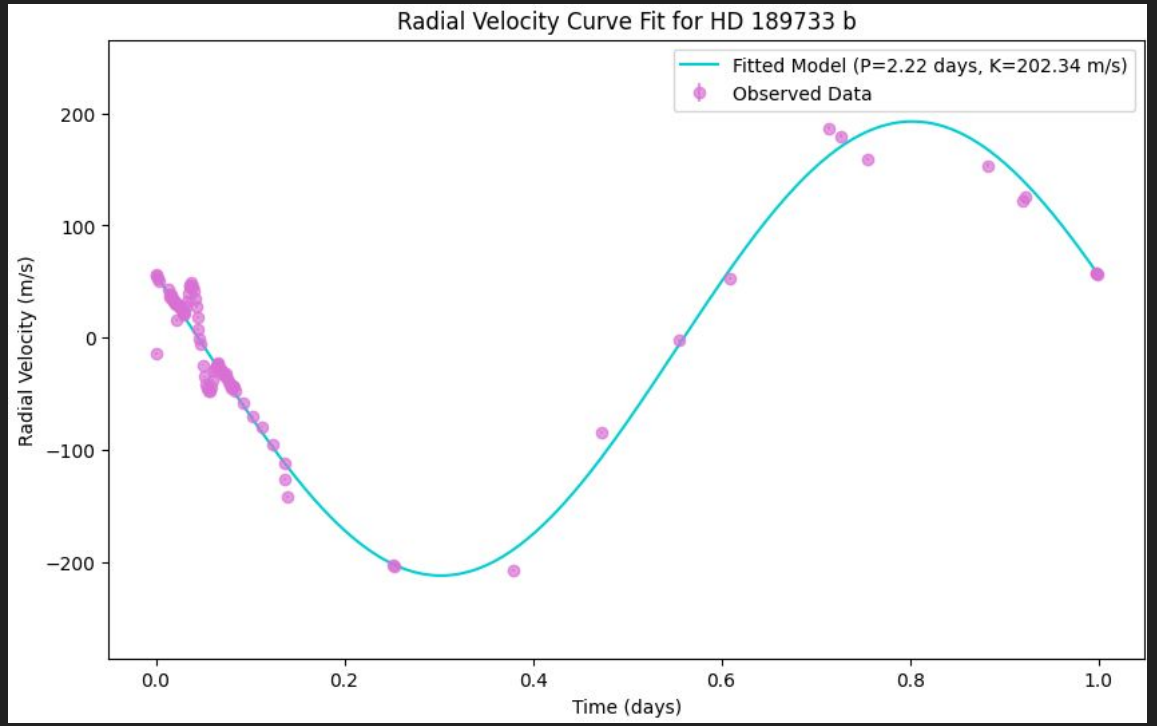


Where would it fall on the mass-radius chart?

Mass

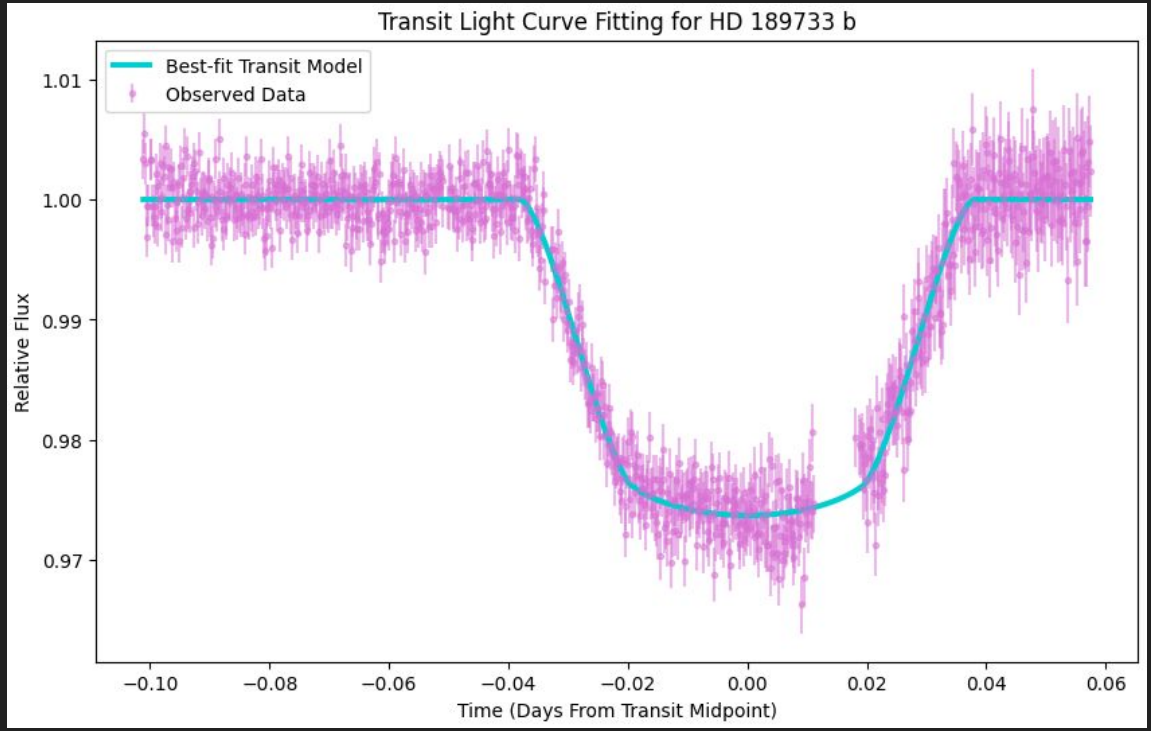
- ★ Scipy fit to determine the radial velocity amplitude
- ★ Calculated the planet mass from the radial velocity
- ★ Uncertainty given from propagation of errors of the radial velocity fit

Note: we used a Lomb-Scargle Periodogram to determine the period of the planet



Radius

- ★ Batman light curve package, nonlinear limb darkening
- ★ Scipy fit to determine the planet/star radius ratio
- ★ From accepted stellar radius, find exoplanet's radius
- ★ Uncertainty directly from fit



Density

- ★ Trivially, divide the mass (M) by the volume ($4\pi R^3/3$)
- ★ Uncertainty from propagation of errors of the mass and radius

Results

Our results:

Mass: $1.138 \pm 0.031\ M_{\odot}$

Radius: $1.165 \pm 0.005\ R_{\odot}$

Density: $0.891 \pm 0.027\ g/cm^3$

Accepted values:

Mass: $1.123 \pm 0.045\ M_{\odot}$

Radius: $1.138 \pm 0.027\ R_{\odot}$

Density: $0.943\ ^{+0.081}_{-0.072}\ g/cm^3$

Our values are close, but our errors are lower than we expected.

Conclusions

- ★ Our fitted values were close to accepted values
- ★ This planet is in line with other hot jupiters
- ★ Our radius uncertainty is lower than expected

Approximate location of HD 189733 b circled