HW #4

3

File "rv3.dat" has radial velocities with period

$$P = 8.158715 \text{ days}$$

See Fig 7 and Queloz et al., A&A 517, L1 (2010).

Assume

- $M_s = 1 M_\odot$

- $M_s \gg M_p$

- circular orbit — not good in this case!

To find

$$r_s = \frac{V_{max} \cdot P}{2\pi} \simeq \frac{(200 \text{ m/s})(8.158715 \text{ days})}{2\pi}$$

$$= 2.243 \times 10^7 \text{ m}$$

Using Kepler's 3rd Law

$$\boxed{\begin{aligned} a &= 1.1866 \times 10^{10} \text{ m} \qquad = 0.079 \text{ AU} \\ \rightarrow \quad r_p &= a - r_s = 1.1843 \times 10^{10} \text{ m} \end{aligned}}$$

and

$$M_p = M_s \left(\frac{r_s}{a - r_s} \right)$$

$$= 1.89 \times 10^{-3} M_\odot$$

$$\boxed{M_p \simeq 2.0 M_J}$$

Bonus: WASP-8b

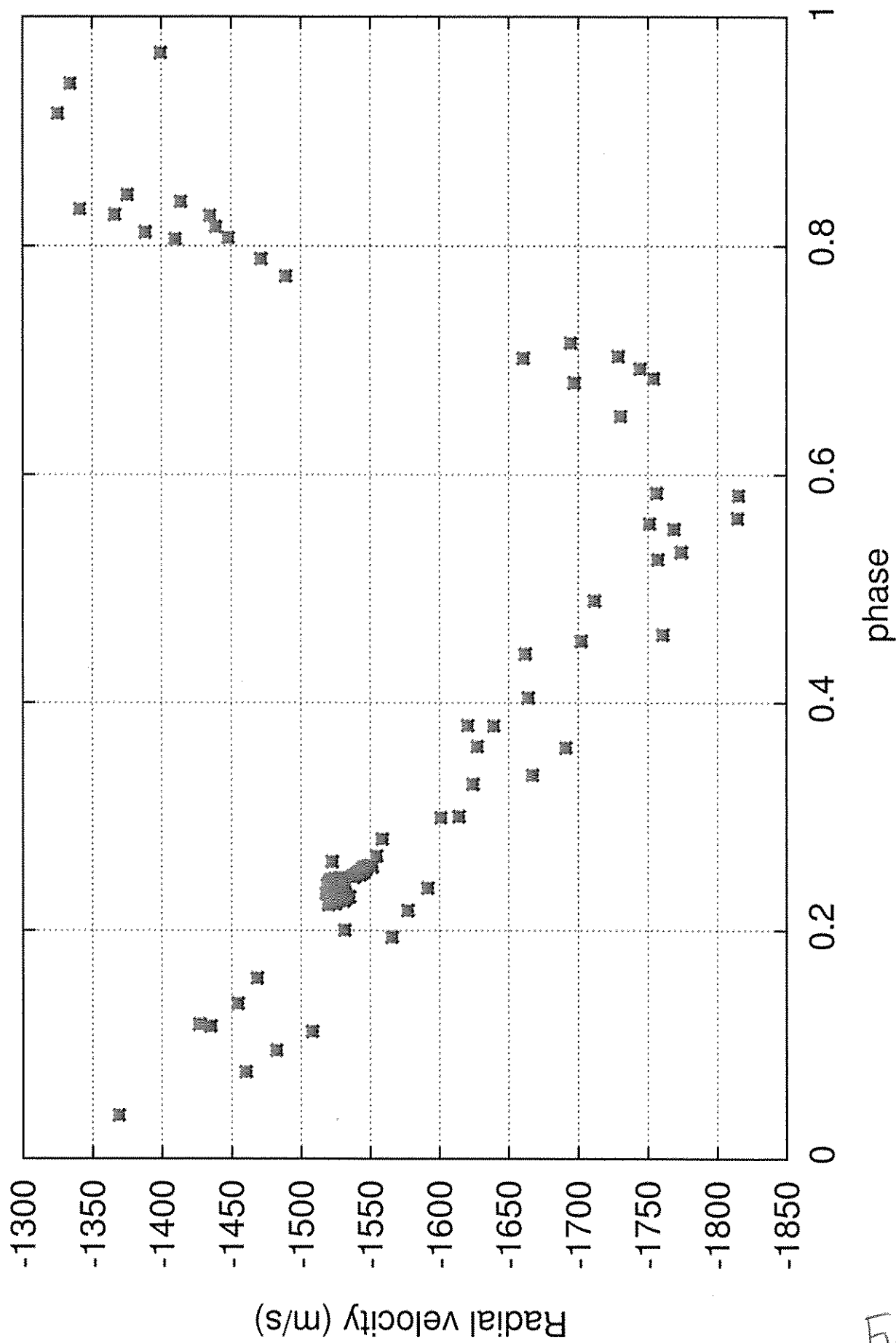WASP-8b with period 8.158715 days; Queloz et al., A&A 517, L1 (2010)

Radial velocity (m/s)

phase

Fig 7
4/4/2015