File "rv4.dat" has radial velocities with a very noisy period of

$$P \sim 8.8 \text{ days}$$

See Fig 8 and Forveille et al., A&A 493, 645 (2009).

This is very noisy, period uncertain. Using assumptions

- $M_s = M_\odot \gg M_p$

- circular orbit

We find

$$r_s = \frac{V_{max} \, P}{2\pi} = \frac{\left(8 \frac{m}{s}\right)\left(8.7836^d\right)}{2\pi}$$

$$= 9.66 \times 10^5 \text{ m}$$

Kepler says

$$\boxed{\begin{array}{l} a = 0.0833 \text{ AU} = 1.246 \times 10^{10} \text{ m} \\ r_p = a - r_s \approx a \end{array}}$$

So

$$M_p = M_s \left(\frac{r_s}{a - r_s}\right) = 7.8 \times 10^{-5} \, M_\odot$$

$$= 0.08 \, M_J$$

$$\boxed{M_p = 1.5 \, M_{Neptune}} \qquad \text{big, big uncertainties!}$$

Bonus! Gliese 176 b

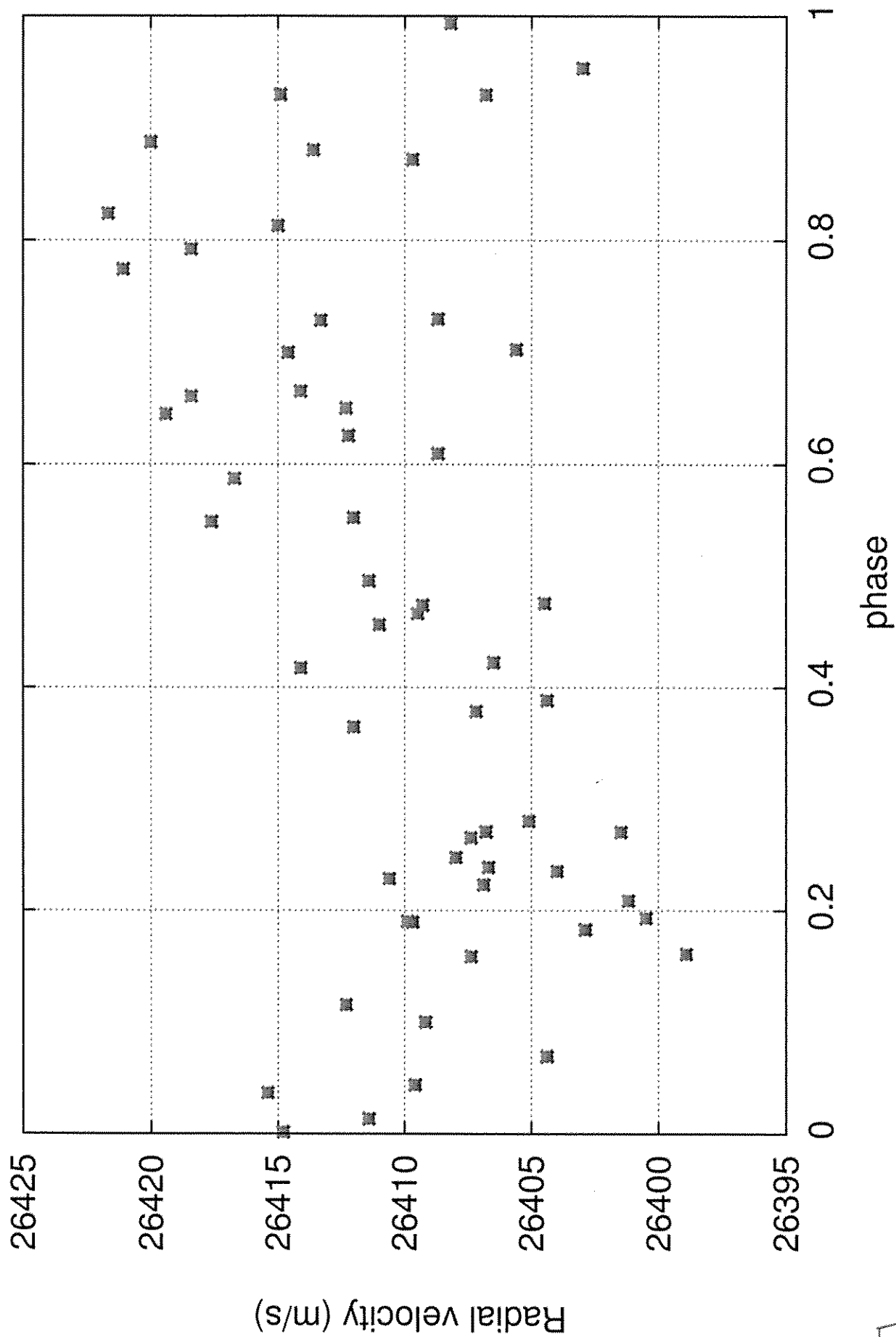GI 176 with period 8.7836 days; Forveille et al., A&A 493, 645 (2009)

Radial velocity (m/s)

phase

Fig 8
4/4/2014