M_{min} calculation, Feng+ 2015, are the units correct? | 2020/01/31.0

Feng+ 2015 quoted

$$M_{min} \approx (0.0164\ M_{jup}) \left(\frac{\tau}{yr}\right)^{4/3} \left|\frac{\dot{\gamma}}{ms^{-1}yr^{-1}}\right| \left(\frac{M_\star}{M_\odot}\right)^{2/3}$$

where the surprising thing is that $\dot{\gamma}$ is typically given in $ms^{-1}\ day^{-1}$.

The origin of this eqn is stated by Feng+ 15 to be the mass function, assuming $e \simeq 0.5$, $P = 1.25\,T$, $K \sim \tau\dot{\gamma}$, & they cite Wright & Howard 2008.

Looking at Wright & Howard 2008, Eq 11 is the mass func^n:

$$K^3 = \frac{2\pi G}{P(1-e^2)^{3/2}} \frac{m^3 \sin^3 i}{(m_\star + m)^2}$$

$$m^3 \sin^3 i = \frac{P(1-e^2)^{3/2}}{2\pi G} (m_\star + m)^2 K^3$$

$$m \sin i = \left(\frac{P}{2\pi G}\right)^{1/3} (1-e^2)^{1/2} (m_\star + m)^{2/3} K$$

$$\approx \left(\frac{1.25\,\tau}{2\pi G}\right)^{1/3} (1-e^2)^{1/2} (M_\star)^{2/3} (\tau\dot{\gamma})$$

$$= \left(\frac{1.25}{2\pi G}\right)^{1/3} (1-e^2)^{1/2} M_\star^{2/3} \tau^{4/3} \dot{\gamma}$$

$$= \left(\frac{1.25}{2\pi G}\right)^{1/3} (1-e^2)^{1/2} \left(M_\odot^{2/3}\ 1\,ms^{-1}yr^{-1} \cdot (1\,yr)^{4/3}\right) \cdot \left(\frac{\tau}{yr}\right)^{4/3} \left|\frac{\dot{\gamma}}{ms^{-1}yr^{-1}}\right| \left(\frac{M_\star}{M_\odot}\right)^{2/3}$$

$$m \sin i \simeq (0.03281\ M_{jup}) \cdot \left(\frac{\tau}{yr}\right)^{4/3} \left|\frac{\dot{\gamma}}{ms^{-1}yr^{-1}}\right| \left(\frac{M_\star}{M_\odot}\right)^{2/3}$$

factor of half presumably comes fr[om] sayi[ng] $K = \frac{1}{2}\tau\dot{\gamma}$.