Analysis and modelling of a giant transiting multiple ring system around the substellar companion J1407b

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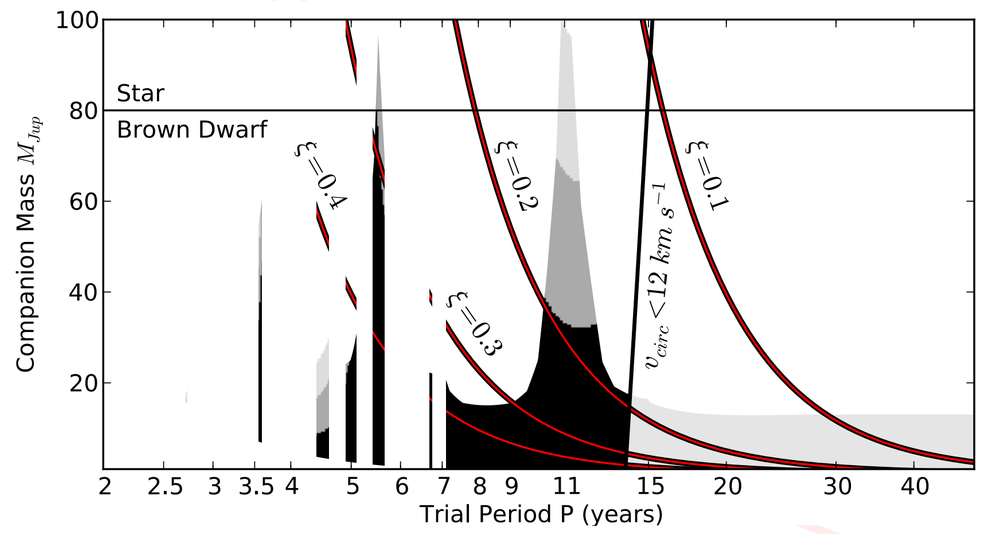
The 16 million year old star J1407 in Sco-Cen underwent a complex eclipse in May 2007 (Mamajek et al. 2012).

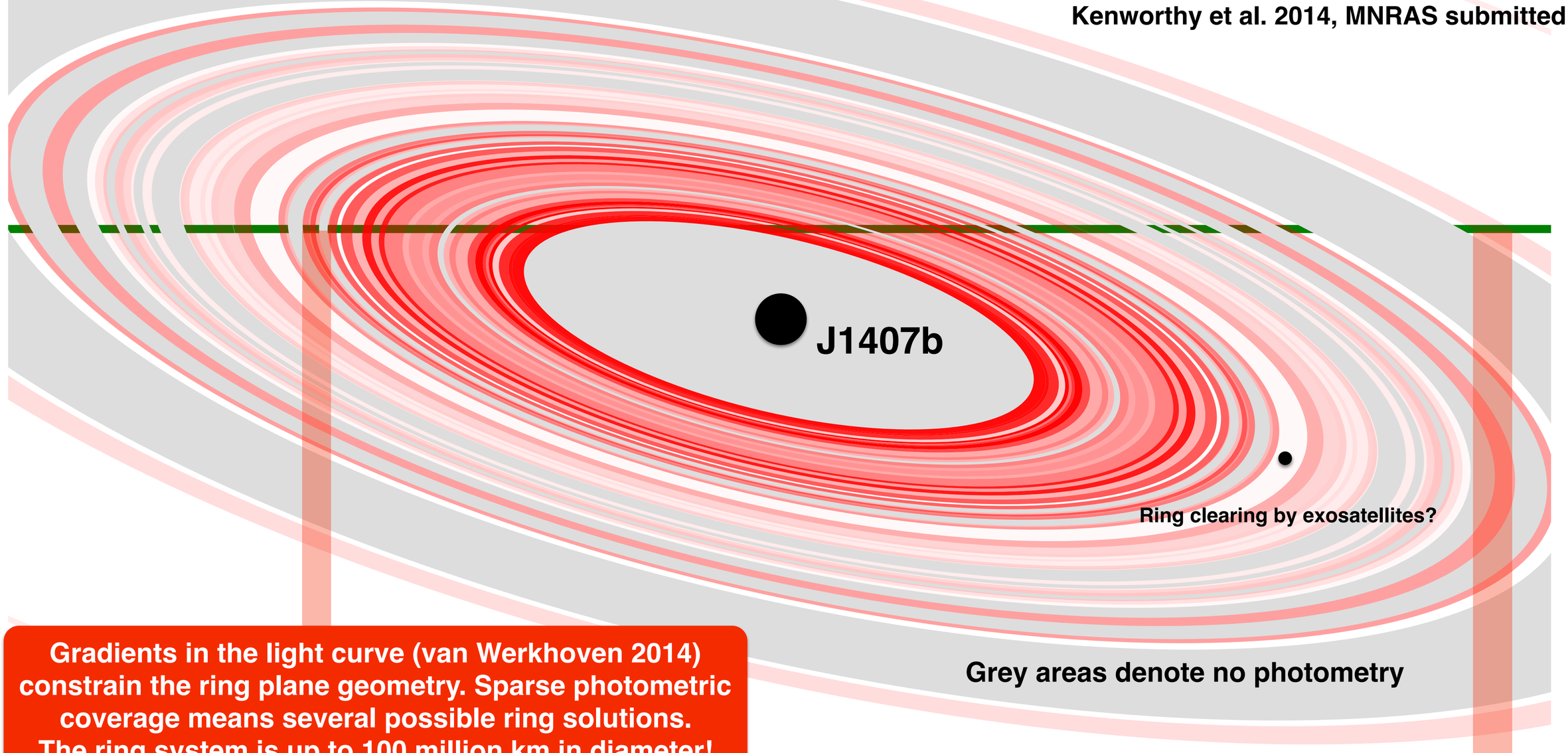
We fit the 56 day eclipse with an azimuthally symmetric ring model surrounding an unseen secondary companion J1407b.

J1407b upper limits indicate it is substellar



Kenworthy et al. 2014, MNRAS submitted

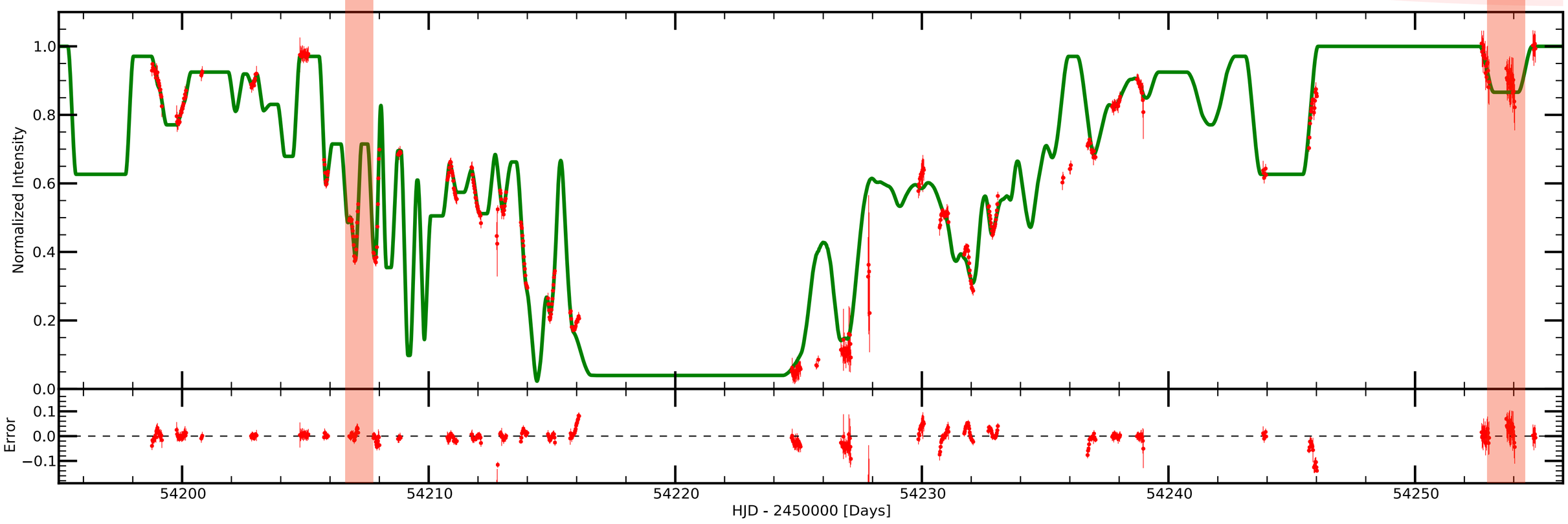
Green line is the path of J1407 behind the rings



Grey areas denote no photometry

Gradients in the light curve (van Werkhoven 2014) constrain the ring plane geometry. Sparse photometric coverage means several possible ring solutions. The ring system is up to 100 million km in diameter!

J1407 light curve observed by SuperWASP in 2007 with ring model



References

First detection of eclipse : Mamajek et al. (2012) AJ 143 72
Detailed light curve of J1407 : van Werkhoven et al. (2014) MNRAS 441 2845
Upper limits on mass and period of J1407b : Kenworthy et al. (2014) MNRAS submitted