

NGTS clusters survey - III:

A low-mass eclipsing binary in the Blanco 1 open cluster spanning the fully convective boundary



Gareth Smith^{1,*}
¹ University of Cambridge

Edward Gillen^{2,1}

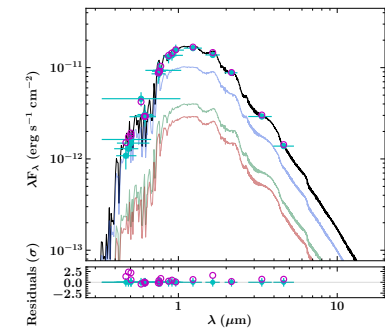
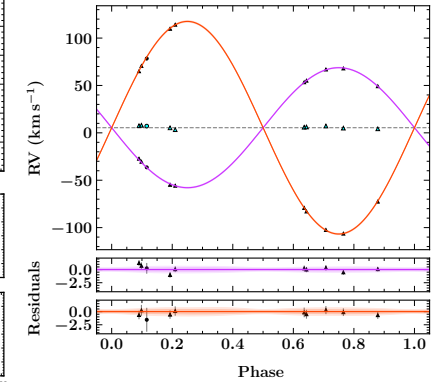
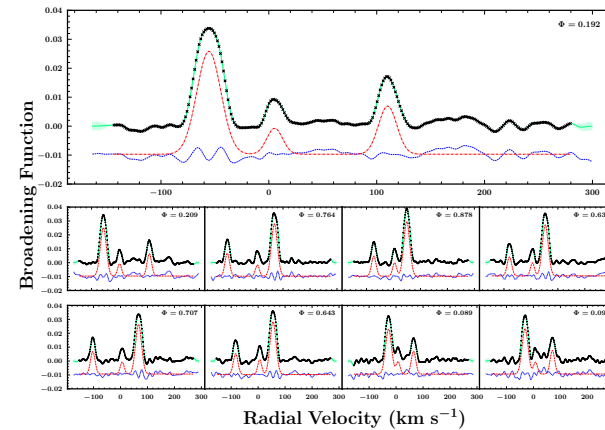
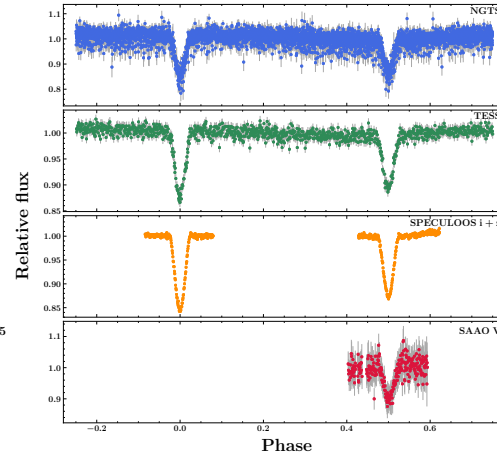
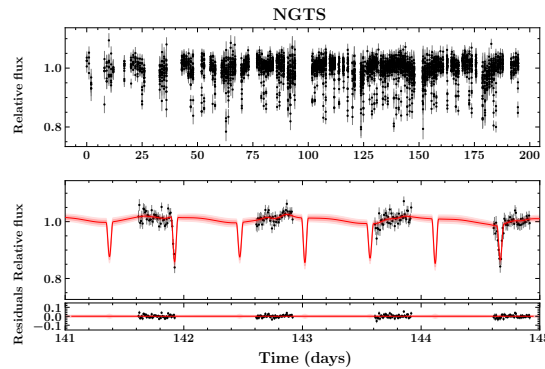
Didier Queloz¹
² Queen Mary University London

Simon Hodgkin¹

& the NGTS consortium
 *gds38@cam.ac.uk

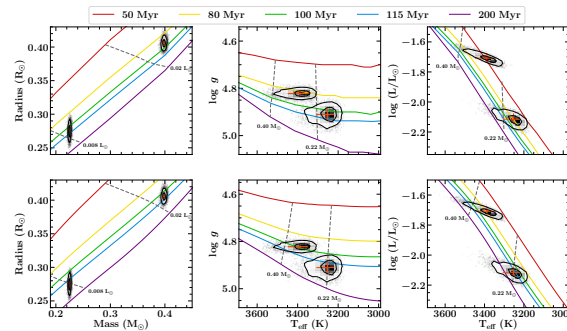


We present the discovery and characterisation of a $P \sim 1.1$ day, low-mass eclipsing binary found by the Next Generation Transit Survey in the ~ 115 Myr old Blanco 1 open cluster. The system is the first well-characterised EB in Blanco 1; it has a low-mass tertiary companion, a low mass ratio, and components that straddle the fully convective boundary.



We simultaneously model:

- Light curves from NGTS, TESS, SPECULOOS and SAAO using a Gaussian process framework to model the out-of-eclipse variations and stellar activity.
- Radial velocities from VLT/UVES and Keck/HIRES via broadening functions modelled with a 3-Gaussian + Gaussian process model.
- The system SED as informed by available broadband photometry and BT-Settl model atmospheres.



BHAC15

Feiden mag

We find:

- $M_1 = 0.3981 \pm 0.0029 M_\odot$, $M_2 = 0.2247 \pm 0.0016 M_\odot$
- $R_1 = 0.4036 \pm 0.0042 R_\odot$, $R_2 = 0.2760 \pm 0.0041 R_\odot$
- $T_1 = 3391^{+68}_{-47}$ K, $T_2 = 3247^{+60}_{-39}$ K

We compare the EB's properties to the predictions of 7 stellar evolution models, finding an apparently inflated primary. This new system joins a list of 20 well-characterised, low-mass, sub-Gyr EBs, which constitute some of the strongest observational tests of stellar evolution theory at low masses and young ages.

