

High Resolution Radial Velocity Measurements of Binary White Dwarfs

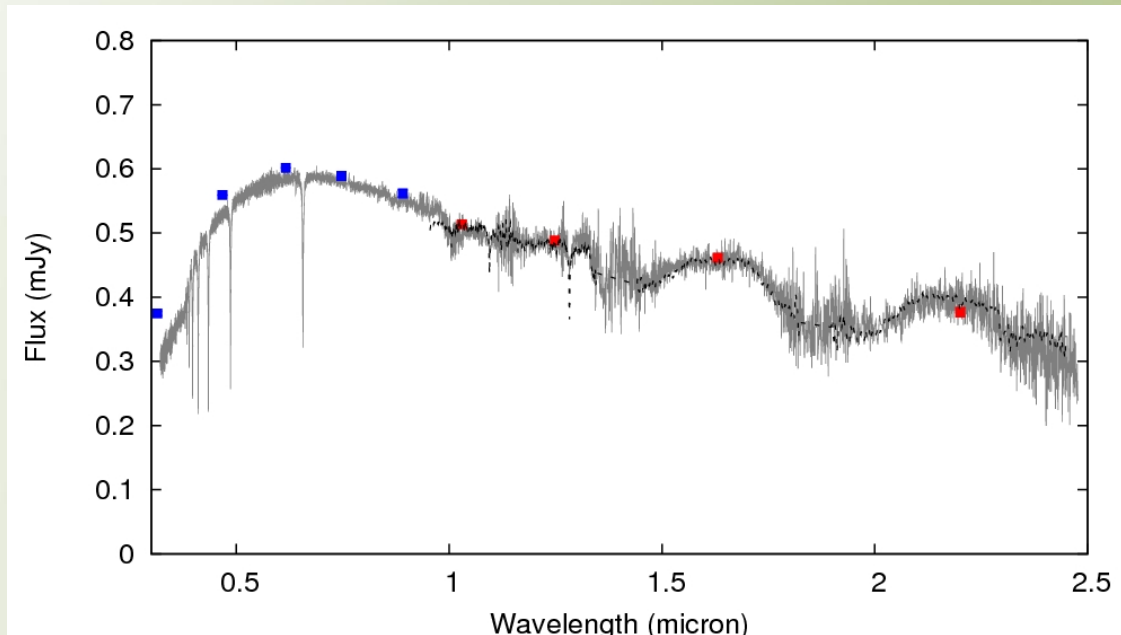
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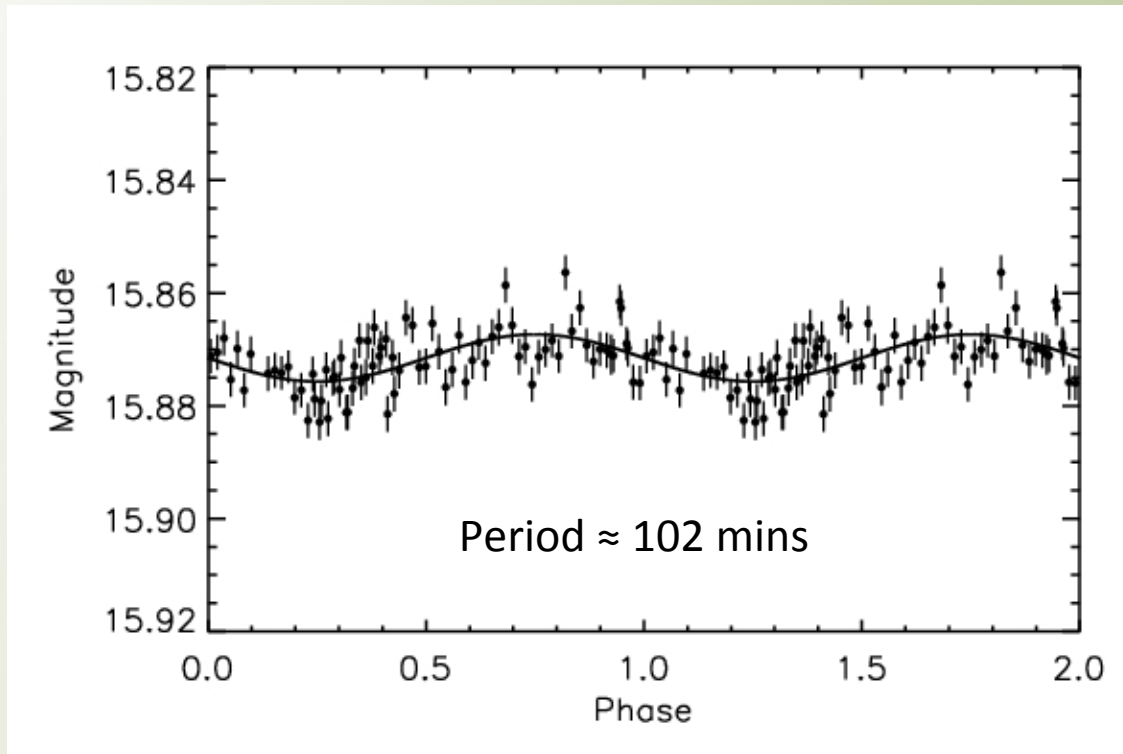
WD0132+145

- Identified as a WD in SDSS DR4 spectroscopic catalogue of WDs (Eisenstein et al. 2006)
- X-Correlated with UKIDSS (Steele et al. 2011) where near-infrared excess was discovered consistent with a WD+dL5 brown dwarf.
- Confirmed with X-SHOOTER:



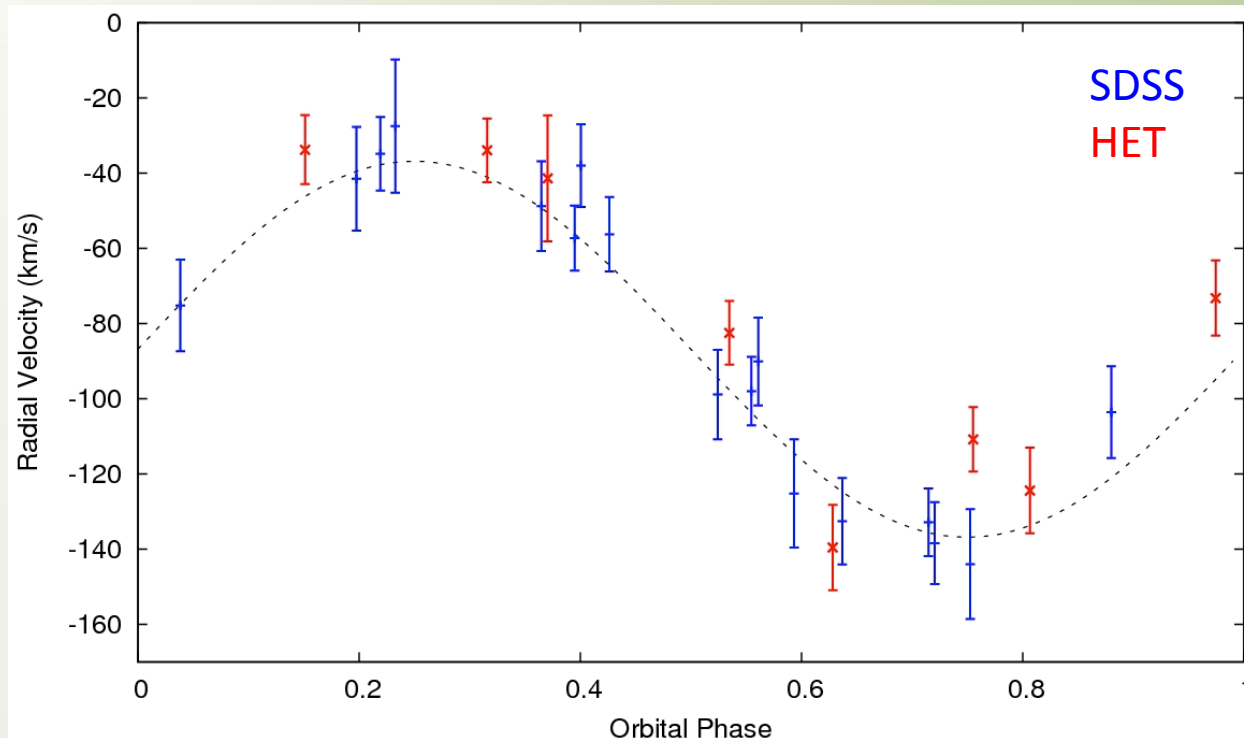
WD0132+145

- Close ($P = \text{Hours}$) or wide binary?
- Brightest in UKIDSS sample so we took 6 random HET observations.
- Shortly after i-band date from INT showed variability of order 1%:



WD0132+145

- Contacted by team at Warwick who observed radial velocity variation in SDSS data and recognised WD from [Steele et al \(2011\)](#).
- Combined observations confirming period = $0.0707354 \pm 9.92452 \times 10^{-6}$ days (≈ 102 mins), and Mass = 54-56Mj consistent with previous spectral typing:



WD0132+145

- Shortest period spectroscopically identified WD+BD binary and 2nd system of its kind.
- Period = 102 mins giving Orbital radius = 396,000 km,
- Distance to system = 60 ± 10 pc.
- Likely to have survived a stage of common envelope evolution like its counterpart WD0137-349 (Maxted et al. 2006).
- Paper now in progress...



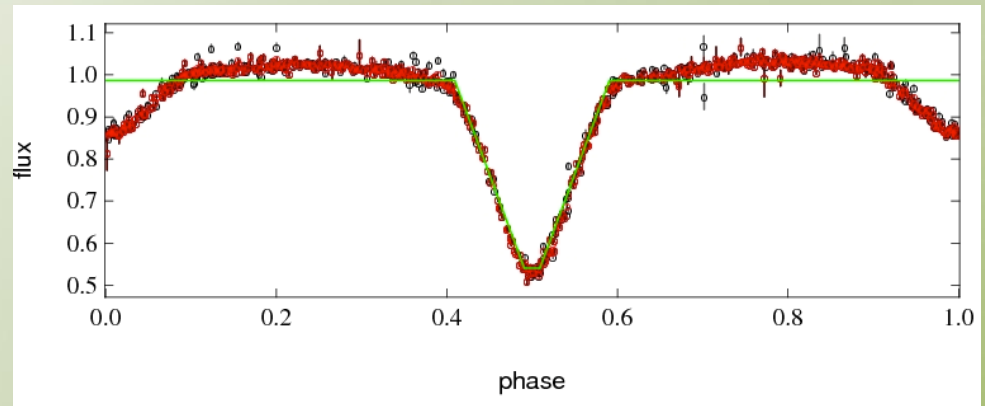
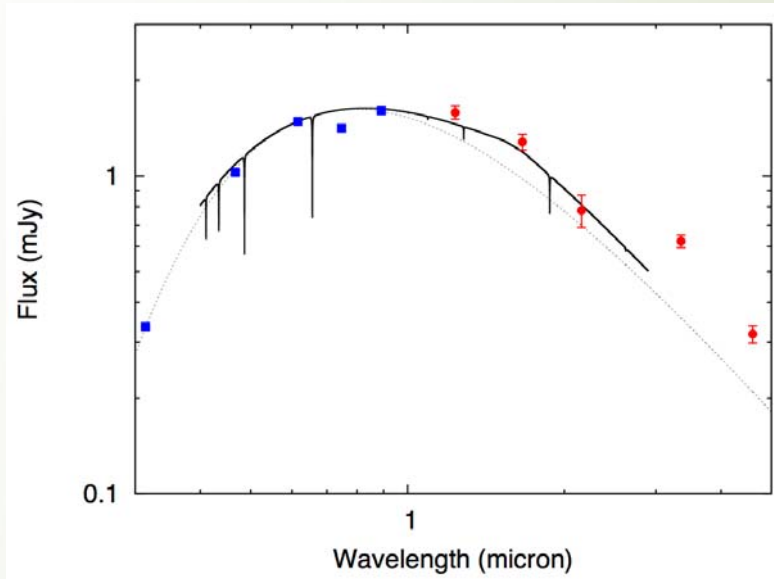
White Dwarfs in the WTS

- Candidate white dwarfs selected using a colour vs. reduced proper motion diagram. Sample likely to include a large number of sub-dwarfs.
- Candidates run through Johannes' analysis programs to look for eclipses/transits/variability.
- HET observations prioritised using RPM diagram + Colours + SED shape.



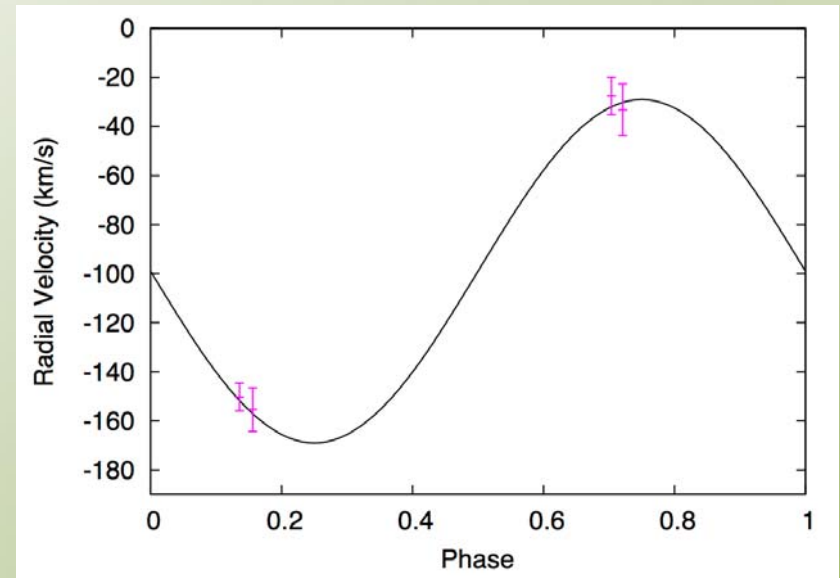
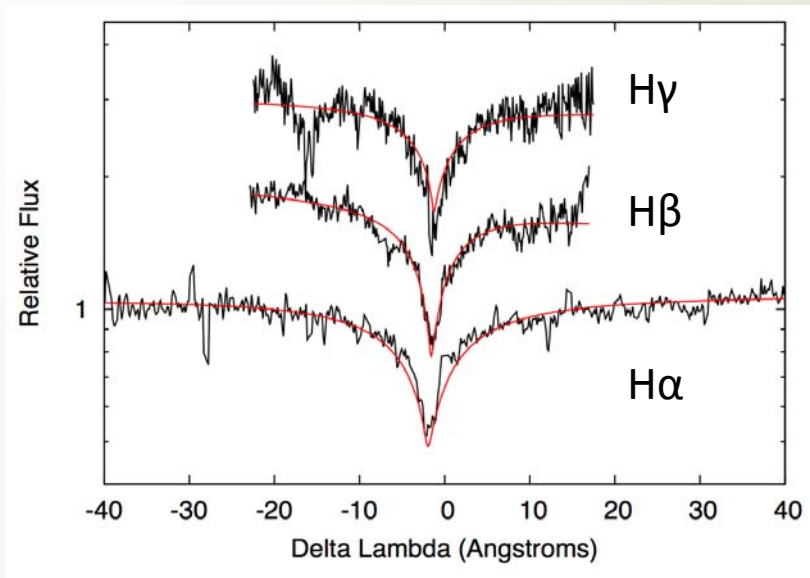
SDSS193252

- Eclipsing binary observed using HRS on HET at phases 0.25 and 0.75.



- Model fitting gives $T_{\text{eff}} = 6443 \pm 12 \text{K}$ and $\log(g) = 7.70 \pm 0.02$ giving a mass for the WD = $0.44 \pm 0.01 M_{\odot}$ and distance to system $\approx 35 \text{ pc}$.

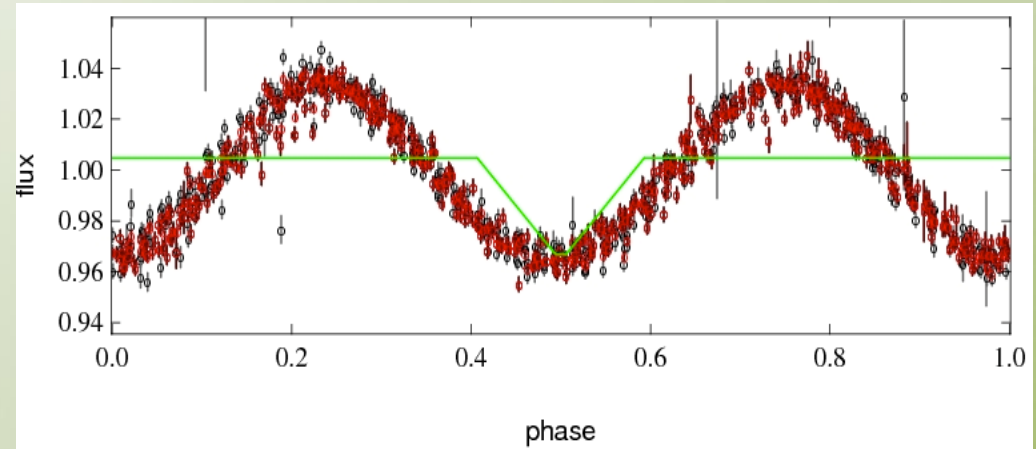
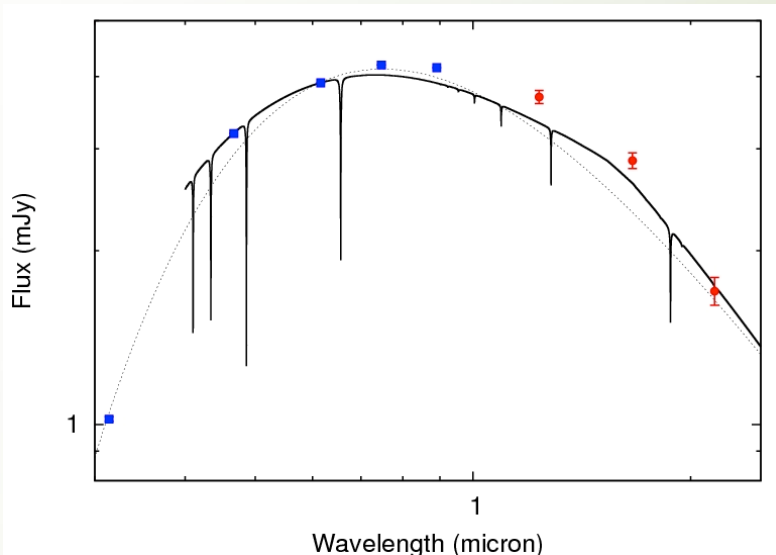
SDSS193252



- Fitting the RV curve gives $K_1 \approx 70 \text{ km/s}$ implying a secondary mass of $0.17 M_{\odot}$.
- Implies orbital distance $\approx 0.014 \text{ AU}$ giving merger timescale $\approx 275 \text{ Gyr}$.
- This would likely mean a second Helium-core white dwarf, the 3rd eclipsing double WD system to be found.
- Still a number of concerns to be addressed.

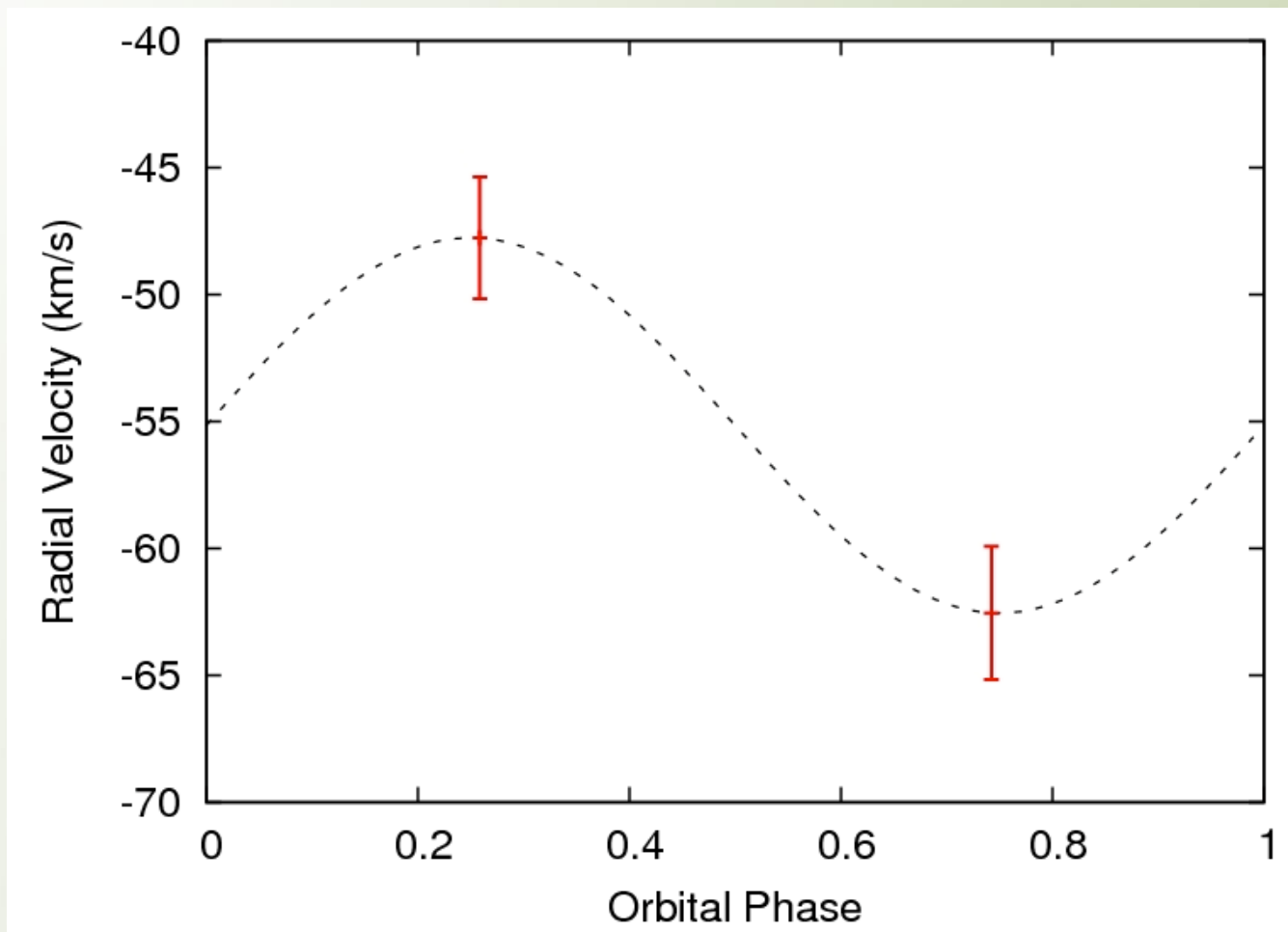
SDSS193455

- Variable WD(?) observed using HRS on HET at phases 0.25 and 0.75.



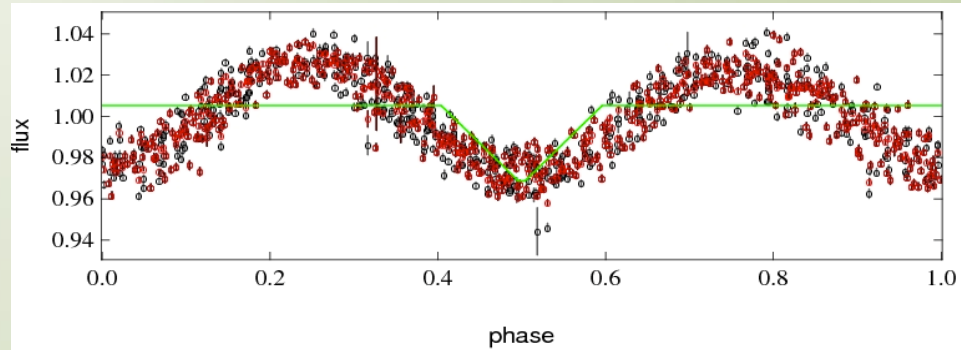
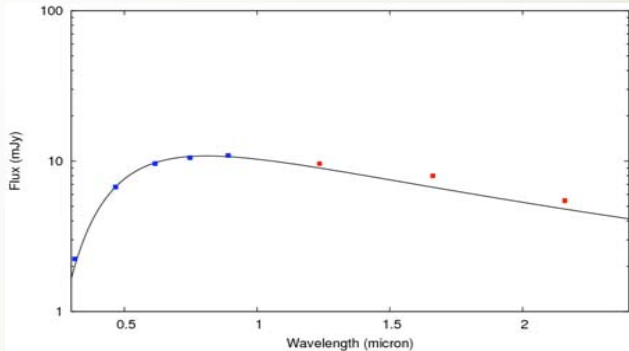
- Model fitting gives $T_{\text{eff}} \approx 7000\text{K}$ and $\log(g) > 6.5$ – Trouble converging model for surface gravity (Sub-dwarf?).
- $K_1 \approx 10\text{km/s}$ which would give $M \sin(i) \approx 15\text{M}_j$ (?!) for $WD = 0.36\text{ M}_s$
- Fitting being refined.

SDSS193455

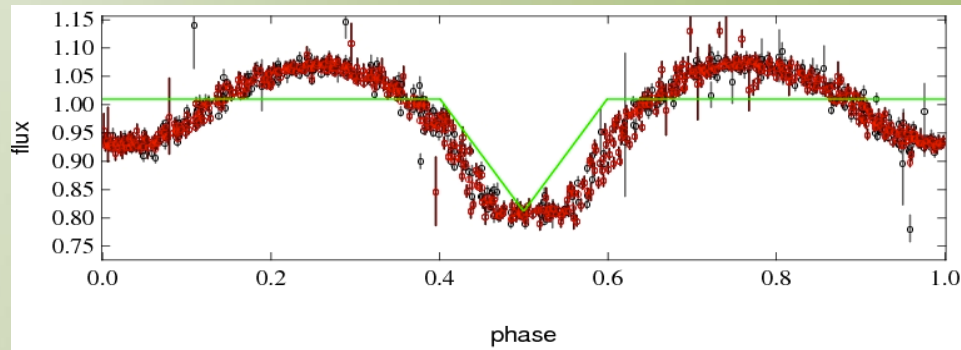
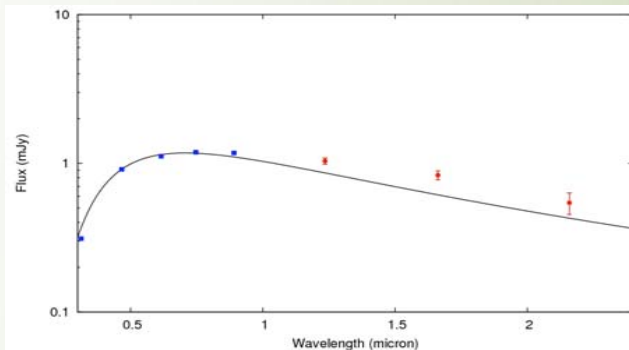


SDSS193144/SDSS193704

- SDSS193144 (Variable WD?) observed using HET at phases 0.25/0.75:



- SDSS193704 (Variable WD with eclipse?):



- Reduction ongoing, but both show Hydrogen lines (WD/SD).