

Spectroscopic Observations of Eclipsing Contact Binary Stars

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PhD

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Properties of W UMa-type stars

- Contact binary stars – common envelope
- Orbital period < 1 day
- $q = M_2/M_1 : 0.08 - 0.8$
- ΔT approximately a few hundred degrees
- Spectral type range: A – K, temperatures between 3 000 – 10 000 Kelvin
- Subtypes :
 - A-type: A – F
 - W-type: G – K



PhD

- Identify systems of interest
 - Orbital period changes
 - Light curves that vary
 - Magnetically active systems
- Model systems of interest using photometric + spectroscopic data : obtain physical parameters

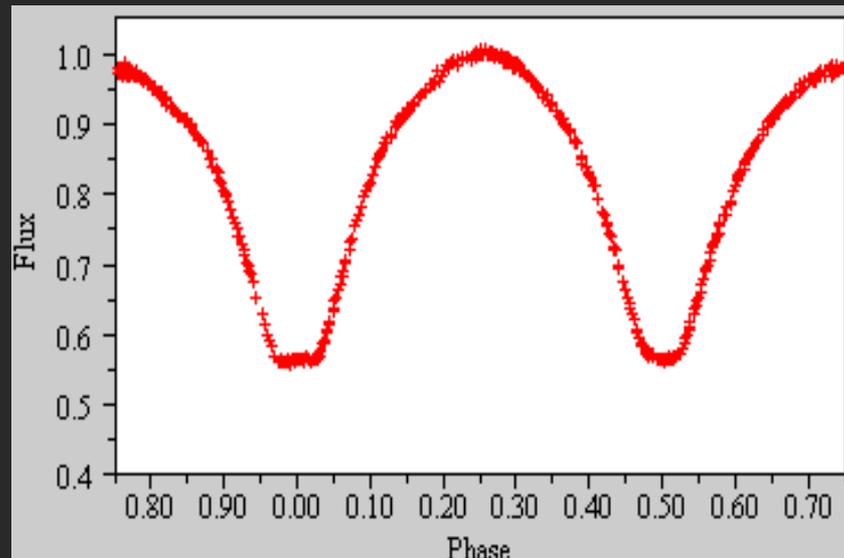


Target Stars

- All Sky Automated Survey: 50 000 variable stars
- Eclipsing contact stars: Over 5 000
- q , T_1 & T_2 , f – yet to be determined
- V-band photometric data
- SuperWASP data

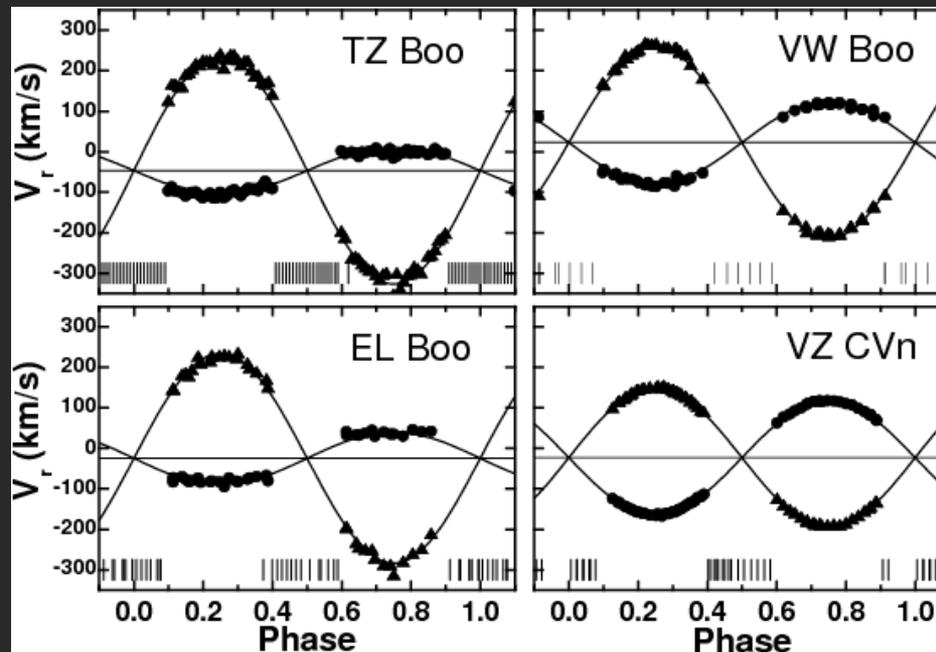
Target Stars

- Total eclipsing systems
- For TE systems, the q_{sp} found to be in good agreement with the q_{ph} (Rucinski & Lu 1999, Rucinski, Lu & Mochnacki 2000)



Spectroscopic Mass Ratio

- Ratio of amplitudes = inverse ratio of masses
- Target phases 0.25 and 0.75



Taken from Pribulla *et al.* (2008)

Spectroscopic Data: Wavelength Range

- For spectral types F – K, lines suitable for RV measurements are the Fe I, Fe II and other ‘metal’ lines (Hilditch 2001)
- Intrinsic line shapes symmetric and narrow
- Plethora of suitable lines in the blue region: 4000 – 4500 Angstroms
- Balmer lines strong at F0, decrease steadily through the subtypes of the F – G range.
- H lines: Lines broadened by the Stark Effect

Observations

- 1.9m : SpCCD

Grating	Order	Resolution (\AA)
4	1	1
5	1	1
	2	0.5

- Observations: Phases 0.25 & 0.75
- Short integrations to reduce motion blur

Observing Runs

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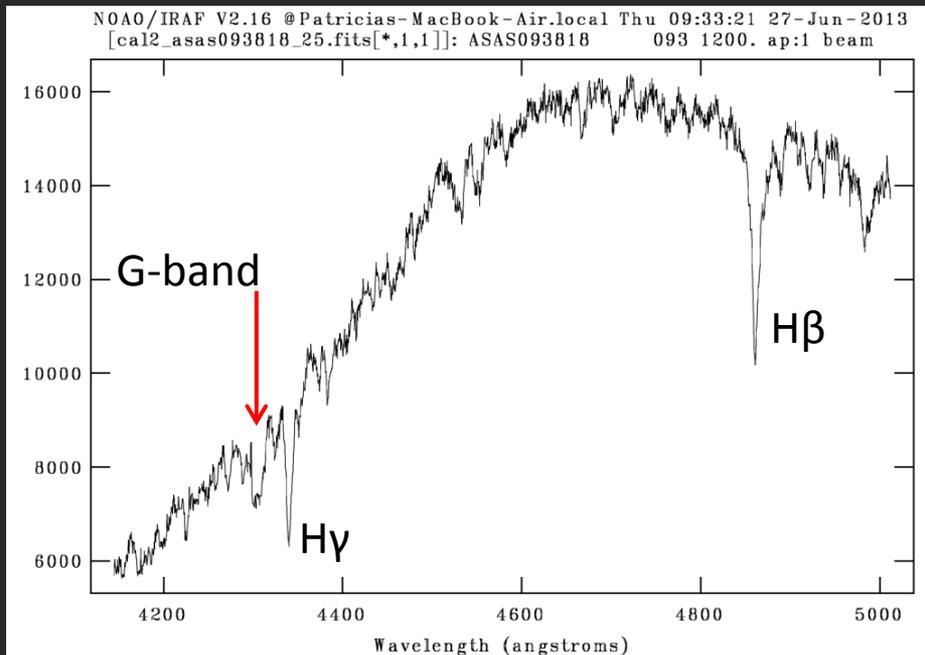
Observing Runs

- First run in March 2012: SpCCD broke
- Second run in September 2012: SpCCD fine, no filter
- Third run in February 2013: SpCCD fine, filter degraded – Grating 4
- Fourth run in May 2013: SpCCD fine, brand new filter – Grating 5

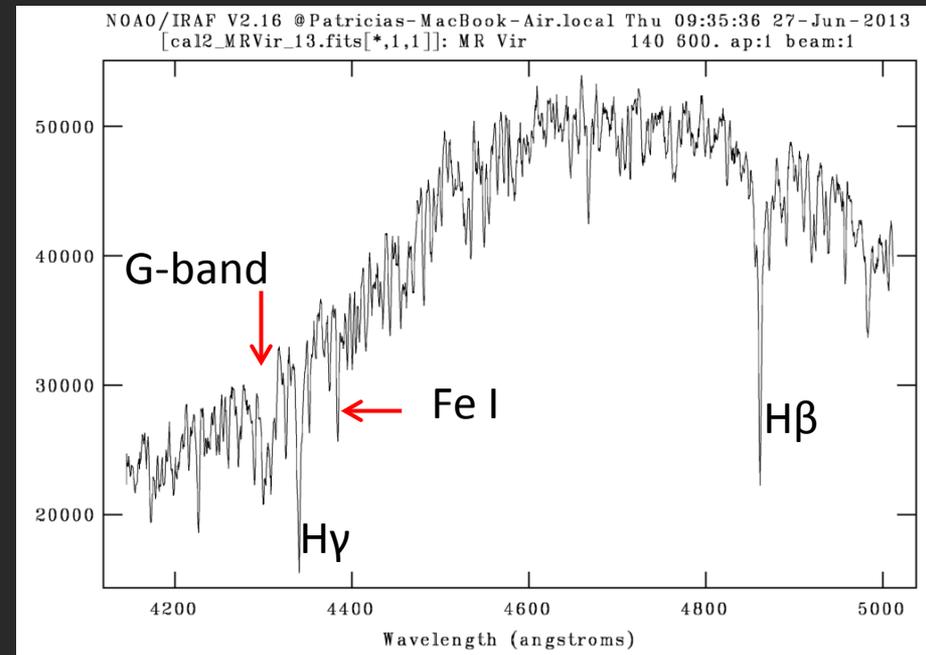
Data: Reduction

- IRAF
- Standard CCD reductions/corrections
- twospec.apextract.apall to extract the spectra
- Perform wavelength calibration

Data: Preliminary results



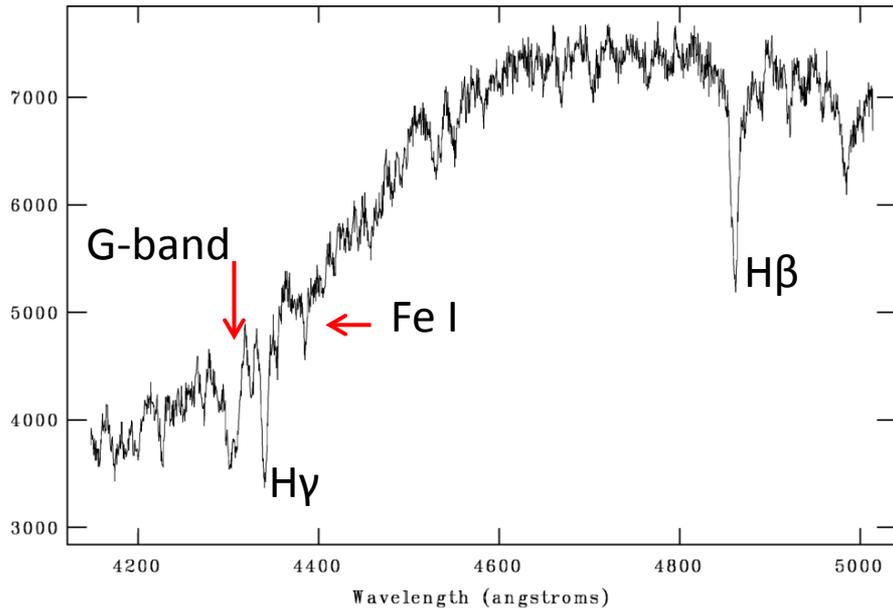
ASAS 093818-6755.4



MR Vir

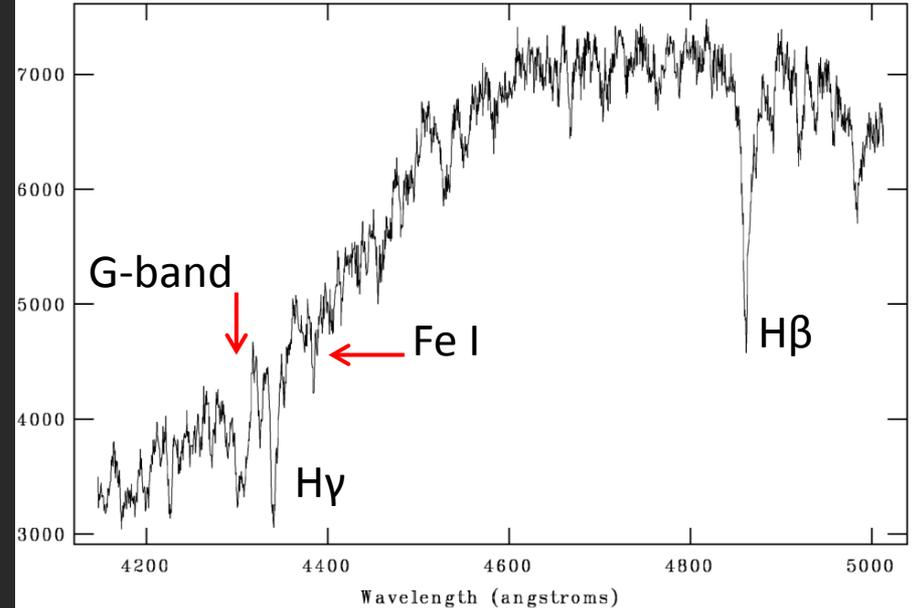
Data: Preliminary results

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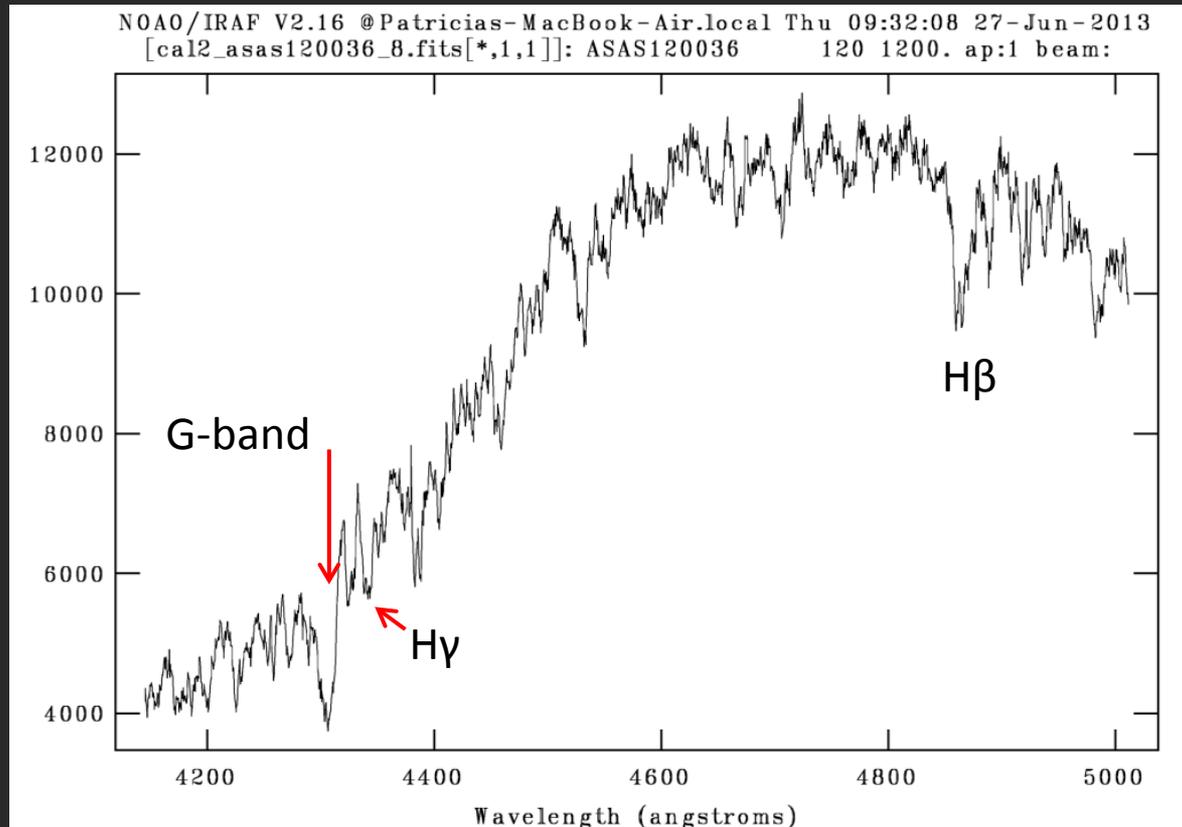
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ASAS 134841-4012.9

Data: Preliminary results



ASAS 120036-3915.6

To do list

- Continuum normalisation
- FXCOR : Radial velocities
- Temperatures
- Construct RV curves & use this in conjunction with photometric data to create accurate models of the systems



Thank you