

Fighting for Telescope Time? Use the Amateurs!

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Abstract. Long-term campaigns, surveys and line monitoring of massive stars can be performed by small telescopes plus adapted spectrographs. Off-the-shelf standard spectrographs are cheap, easy to use and contain respective calibration units. Echelle spectrographs are even delivered with a complete MIDAS-XECHELLE reduction loop. In addition, amateurs design such instrumentation and use it on a professional level. However, the community is small and needs support from the professional side for mutual benefit. Amateurs can deliver design tools, observation time and data. Professionals should deliver scientific knowledge and their organizational skills.

1. Introduction

Today it seems appropriate to think about how to circumnavigate the problem of telescope time acquisition for intermediate and long-term campaigns on massive stars. It is impossible to get sufficient nights at big instruments. On the other hand, there are thousands of small telescopes available both at astronomical institutes and in the amateur scene. Also, spectroscopy is becoming popular in the amateur domain, where there is the capability to understand how a spectrograph works and even how to build their own equipment. Considering their high surface brightness, stars of up to 8th magnitude can easily be detected from urban environments with small telescopes (~ 30 cm). A resolving power of about 10 000 with a S/N of about 100 within 30 minutes can be achieved (Eversberg 2011; Eversberg & Vollmann 2011).

2. Instrument Development

To obtain maximum efficiency and spectral resolution, a spectrograph and its camera CCD pixel size need to be matched to the telescope and its focal length. Normally that means a lot of computation and careful analysis, which is not easy for a beginner. For that reason, amateurs successfully developed tools for the instrument design – the easier the better. Excel sheets for standard (C. Buil, modified by K. Vollmann: http://www.stsci.de/simspec_slit_e.xls) and Echelle spectrographs (K. Vollmann: http://www.stsci.de/simechelle_e.xls) only need basic input, e.g., telescope and CCD parameters, spectrograph optics as well as the seeing conditions for the calculation of the respective instrumental output. Beginners, students and even advanced astronomers can benefit from these public domain tools.

3. Examples of Successful Campaigns

There are a number of spectroscopic programmes in the amateur domain: e.g., the BeSS Database with almost 50 000 Be star spectra available (Neiner et al. 2007), amateur contribution to the COROT Be Star Survey (<http://www.astrosurf.org/buil/corot/data.htm>) and various monitoring and long-term projects on single stars (e.g., monitoring of γ Cas, ζ Tau, ρ Cygni). Two highlights:

- In 2008/2009 an international pro-am group successfully performed multiwavelength observations during the periastron passage of the highly excentric colliding wind binary WR 140 (Fahed et al. 2011a,b). About two dozen amateurs worked at Teide Observatory, financed by private funding or they contributed data from their home observatories.
- Robin Leadbeater and Jeff Hopkins, both amateurs, organized an international campaign on the very long-term eclipsing binary ϵ Aurigae. Every 27 years an F0 star is occulted by a thin stellar disk of a B giant. The spectacular interferometric images by CHARA (Kloppenborg et al. 2010) have been complemented by a spectroscopic density analysis of the disk (Leadbeater 2011, Fig. 1).

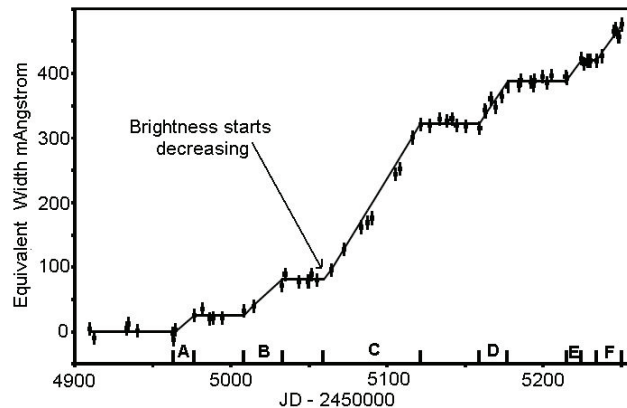


Figure 1. Excess equivalent width of KI 7699 during eclipsing disk ingress (Leadbeater 2011).

4. Prospects and Needs

Recently, Christoh Martayan, in a comment following Eversberg (2011), made an important remark: *“Currently we are closing the small professional telescopes and let us imagine that η Car explodes as a SN. It will be so bright that its luminosity will prevent the observations with the VLT or future ELTs. This kind of case will give a huge opportunity to amateurs for doing the best observations and provide scientific data of the event.”* Luckily there is one (!) southern amateur spectroscopist in the vicinity of Melbourne. Bernard Heathcote regularly takes spectra of this target (Fig. 2).

What else?

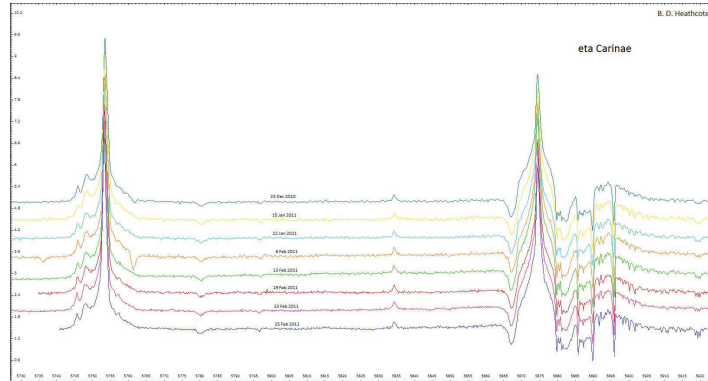


Figure 2. Spectral time series for η Carinae. Celestron C8, Shelyak LHRES III spectrograph, spectral resolving power $R = 17\,000 - 20\,000$ (Heathcote, private communication).

- Since the spring of 2011 there has been an ongoing pro-am campaign on the periastron passage of the Be star binary δ Scorpii in summer 2011. An international group is tracking the system to understand the disk behavior of the Be component (see <http://astrosurf.com/aras/surveys/deltasco/dsco.htm> and http://www.uncg.edu/~a_mirosh/Delta_Sco/).
- Presently, the pro-am ConVento Group (<http://www.stsci.de/convento>) is planning a long-term investigation of the surface behavior of some bright WR stars in 2013.

Professional astronomers can easily get useable data from amateurs but they should guide them through the scientific aspects of the particular targets and the observational needs. This can be done in the discussion forums at http://spektroskopie.fg-vds.de/index_e.htm. As Tony says: DO IT! NOW!

Acknowledgments. Hi Teggoneggy! Was great fun to be at your fest and I hope that I could support your unbeatable work at least a bit. Thanks again for ‘convincing by arguments’ and your friendship. Thanks to Bernard and Robin for their great data.

References

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