Active OB stars: structure, evolution, mass loss, and critical limits
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Variability monitoring of OB stars during the Mons campaign

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Abstract. We present preliminary results of a 4-month campaign carried out in the framework of the Mons project, where time-resolved Hα observations are used to study the wind and circumstellar properties of a number of OB stars.

Keywords. line: profiles, stars: early-type, stars: winds, outflows, stars: individual (HD 14134)

1. Context

The Mons project is a collaboration between professional and amateur astronomers, which was primarily set up to monitor the periastron passage of the colliding-wind binary system WR 140 centred on January 12, 2009 (Fahed *et al.*, this volume).† A dedicated spectroscopic campaign was organised from December 2008 to March 2009 using the 50-cm Mons telescope at Teide Observatory. Time-resolved observations of the Hα line (6360–6950 Å, 0.34 Å pix^{-1}) were also obtained for a small sample of early B-type supergiants and Oe stars to investigate the properties of their large-scale wind structures

† See also `http://www.stsci.de/wr140/index_e.htm`

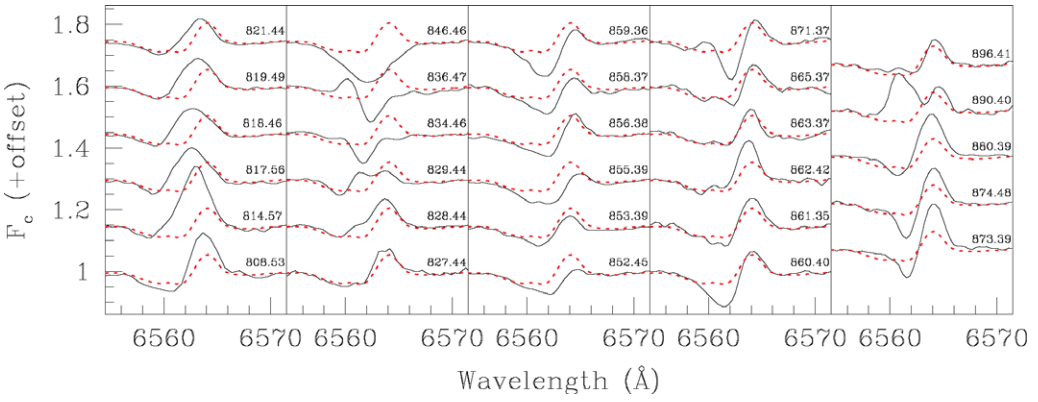

Figure 1. Variations of the Hα line in the B3 supergiant HD 14134. The mean profile is overplotted as a dashed line. The date of the observations (HJD–2,454,000) is indicated.

and circumstellar material, respectively. The B1–B3 supergiants were selected from Morel *et al.* (2004) based on previous indication of cyclical changes (HD 14134 and HD 42087) or strong variations (HD 43384 and HD 52382). Here we present an overview of the variations exhibited by these objects (the data for the Oe stars HD 45314 and HD 60848 are still being reduced) and briefly discuss forthcoming developments in the data analysis.

2. Preliminary results and perspectives

Variability studies in the UV domain have shown that the winds of OB stars are likely made up of large-scale streams (the 'co-rotating interaction regions'; CIRs) whose formation may be triggered by the existence of non-uniform physical conditions at the stellar surface (due, e.g., to magnetic structures or pulsations; Cranmer & Owocki 1996). Optical wind lines can also be used to probe the physical properties of these structures. In particular, revealing rotational modulation in these features would provide evidence that the CIRs extend relatively close to the star and are possibly directly emerging from the photosphere. Strong, daily line-profile variations are observed in all the targets, as illustrated in the case of HD 14134 in Fig.1 by the great variety of profiles observed (strong emission/absorption, double peaked, classical or even inverse P-Cygni profile). This star is of particular interest because of the previous detection of a 12.8-d periodic signal both in photometry and in spectroscopy (Morel *et al.* 2004).

Our efforts will now be directed towards the detection of a periodic behaviour that could allow us to identify the physical processes that drive the variations. For instance, a dipole magnetic field tilted with respect to the rotational axis in the Oe stars is expected to induce changes modulated by the rotational period, whereas the variations should take place on much longer timescales if they arise from some kind of disk instability. On the other hand, high-resolution spectroscopic observations of the B3 supergiant HD 14134 are scheduled in November 2010 at OHP (France) to examine the existence of pulsations and to eventually link the variations taking place in the photosphere to those in the wind.

References

Cranmer, S. R. & Owocki, S. P. 1996, *ApJ*, 462, 469
Morel, T., Marchenko, S. V., Pati, A. K., Kuppuswamy, K. *et al.* 2004, *MNRAS*, 351, 552