Magnetic Fields throughout Stellar Evolution
Proceedings IAU Symposium No. 302, 2013
P. Petit, M. Jardine & H. Spruit, eds.

doi:10.1017/S174392131400249X

The Hertzsprung-gap giant 31 Comae in 2013: Magnetic field and activity indicators

Ana P. Borisova[1], Renada Konstantinova-Antova[1,2], Michel Aurière[2], Pascal Petit[2] and Corinne Charbonnel[3,2]

[1]Institute of Astronomy and NAO, Bulgarian Academy of Sciences
72 Tsarigradsko shosse blvd., BG-1784, Sofia, Bulgaria
email: aborisova@astro.bas.bg

[2]Institut de Recherche en Astrophysique et Plantologie, CNRS, Universitè de Toulouse, France,
[3] Universitè de Genève, Switzerland

Abstract. We have observed the giant star 31 Comae in April and May 2013 with the spectropolarimeter Narval at Pic du Midi Observatory, France. 31 Comae is a single, rapidly rotating giant with rotational period $\sim$ 6.8 d and $vsini \sim 67$ km/s. We present measurements and discuss variability of the longitudinal magnetic field (Bl), spectral activity indicators H_α, CaII H&K, Ca II IR triplet and evolutionary status. Our future aim is to perform a Zeeman-Doppler imaging study for the star.

Keywords. Stars: activity, Stars:individual:31 Comae,Stars:magnetic fields

1. Introduction

31 Comae (HD 111812) is a single *G0III* (Gray *et al.* 2001), rapidly rotating giant with $vsini \sim 67$ km/s, $Teff \sim 5660$ K and $M = 2.6 M_\odot$ (Strassmeier *et al.* 2010). The star is variable with a very low light curve amplitude and rotational modulation with a period of $\sim$ 6.8 d. The star displays chromospheric and coronal activity with CaII H&K line emission, super-rotationally broadened coronal and transition-region lines, and X-ray emission of Lx=$6.325 * 10^{30}$ erg s^{-1} (Gondoin 2005). The magnetic field of 31 Comae is interesting to be investigated because of its position in the Hertzsprung-gap region and because of its possible membership of the Coma-Berenices cluster, (Bounatiro 1993).

2. Observations, Results and Conclusions

Observations and Data Processing: Ten Narval spectra, with resolution power of 65 000 and wavelength range from 370 to 1050 nm have been obtained. Libre Esprit (Donati *et al.* 1997) software for automatic extraction of spectra and Least-squares Deconvolution technique (LSD, Donati *et al.* 1997) were used for computing the mean Stokes V and I photospheric profiles. Mean longitudinal field Bl was estimated by the use of the first order moment method (Donati *et al.* 1997, Rees & Semel 1979 Wade *et al.* 2000).

Results: We have detected Zeeman signatures in Stokes V LSD profiles and calculated the corresponding surface Bl of 31 Comae, with values up to 9.5 G and $\sigma_{Bl} < 5.1$ G, (Fig. 1). Very broad CaII H&K absorption profile with a weak chromospheric emission core and S_*index* variations from 0.37 to 0.42 are observed. H_α and CaII IRT are partially filled-in by emission. Activity indicators display moderate variations in the observed period, most pronounced in H_α, (Fig. 2). Variations of Bl do not follow activity indicators changes.

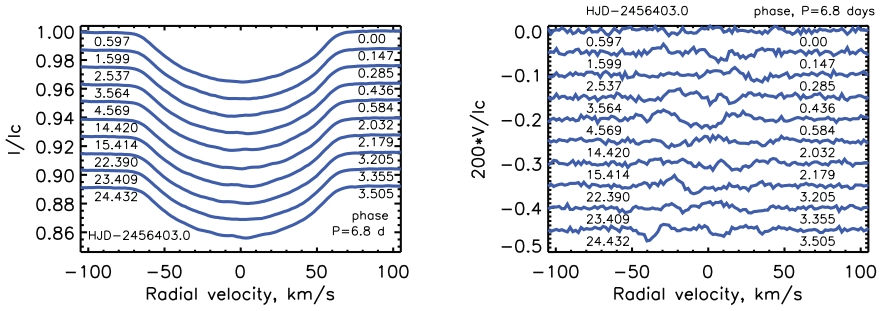

Figure 1. LSD Stokes I (left panel) and Stokes V, (multiplied by 200) photospheric line profiles.

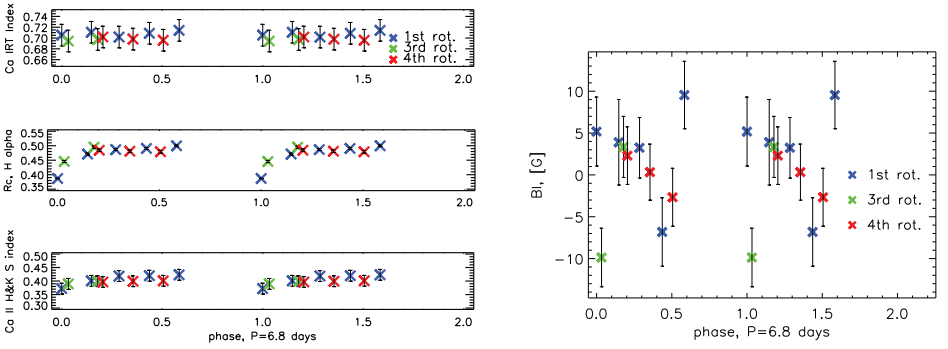

Figure 2. Variations of activity indicators (left panel) and Bl with rotational phase.

Conclusions: Stokes V LSD profiles show composite and variable behaviour thus we might propose a complex structure of its magnetic field. Fast rotation of the star is similar to FK Comae type stars, but Bl is weaker, compared to FK Comae (60 to 272G) (Korhonen *et al.* 2009). The star is also in a different activity level with emission components in Hα and CaII H&K lines not so strong as in FK Comae (Korhonen *et al.* 2009, Strassmeier *et al.* 1990).

Acknowledgements . We are thankful to the TBL team for providing service observations with Narval spectropolarimeter. Observations were funded under the project BG051PO001-3.3.06-0047 financed by the EU, ESF and Republic of Bulgaria. A. B. acknowledge Bulgarian NSF contract DMU 03-87, partial financial support of the TBL, France and the project BG051PO001-3.3.06-0047 for attending the conference.

References

Bounatiro, L. 1993, *A&AS*, 100, 53
Donati, J.-F. *et al.* 1997, *MNRAS*, 291, 658
Gondoin, P. 2005, *A&A*, 444, 531
Gray, R. O. *et al.* 2001, *AJ*, 121, 2148
Korhonen *et al.* 2009, *MNRAS*,395,282
Rees, D. E. & Semel, M. D. 1979, *A&A*, 74, 1
Strassmeier, K. G. *et al.* 1990, *ApJS*, 72, 191
Strassmeier, K. G. *et al.* 2010, *A&A*, 520, A52
Wade, G. *et al.* 2000, *MNRAS*, 313, 823

https://doi.org/10.1017/S174392131400249X Published online by Cambridge University Press