

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

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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 ~ 6.8 d and $v_{\text{ini}} \sim 67$ 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 $v_{\text{ini}} \sim 67$ km/s, $T_{\text{eff}} \sim 5660$ K and $M = 2.6M_{\odot}$ (Strassmeier *et al.* 2010). The star is variable with a very low light curve amplitude and rotational modulation with a period of ~ 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 $Lx = 6.325 \times 10^{30}$ 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.

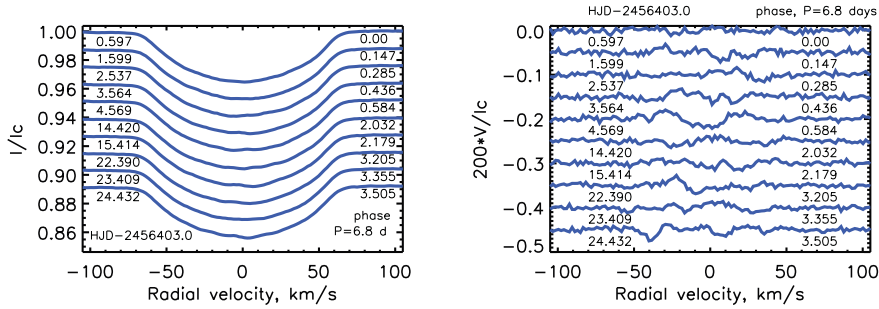


Figure 1. LSD Stokes I (left panel) and Stokes V, (multiplied by 200) photospheric line profiles.

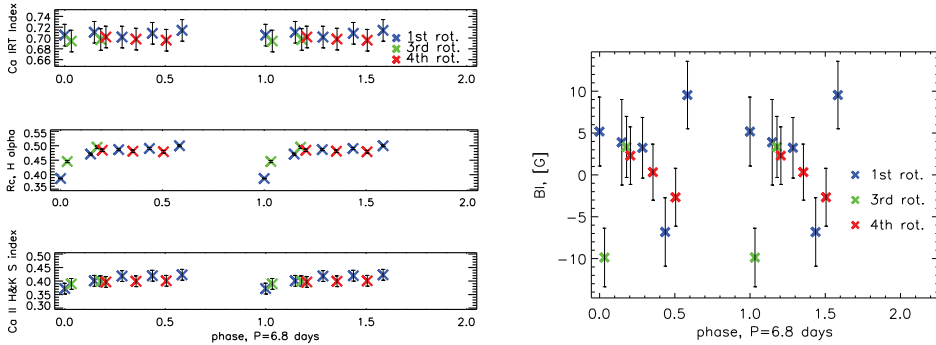


Figure 2. Variations of activity indicators (left panel) and BI with rotational phase.

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 BI 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 H α 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.

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