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A search for pulsational line profile variations in the δ Scuti star HD 21190 and the Ap Sr star HD 218994

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Abstract. We present the results of our recent search for pulsational line profile variations in high time resolution UVES spectra of the most evolved Ap star known, the δ Scuti star HD 21190, and of the Ap Sr star HD 218994. We found that HD 218994 is an roAp star with a pulsation period of 5.1 min, which makes it the 36th star known to be a roAp star. No rapid pulsations have been found in the spectra of the δ Scuti star HD 21190. However, we detect moving peaks in the cores of spectral lines, which indicate the presence of non-radial pulsations in this star.

Key words: stars: chemically peculiar – stars: magnetic fields – stars: oscillations

1. The δ Scuti star HD 21190

This star is a known δ Scuti star with a variability period of 3.6 h, discovered by the Hipparcos mission. Koen *et al.* (2001) reported the spectral type as F2 III SrEuSi, making it the most evolved Ap star known. Our UVES observations covered $\sim 1/4$ of the known δ Scuti pulsation period. The star shows broad spectral lines ($v \sin i \sim 72\,\mathrm{km\,s^{-1}}$) with small variable peaks in the line profiles (top of Fig. 1). In the bottom of Fig. 1 we present all observed spectra, stacked in two-dimensional images, for the same two spectral regions. It is clearly seen that three peaks are moving evenly towards the red with a speed of $21\,\mathrm{km\,s^{-1}}$ per hour. However, no spectral features moving at higher frequencies were found in our spectra. To measure the radial velocities of these peaks we filtered lower spectral frequencies and used the cross-correlation method. Similar splitting in line profiles has recently been detected by Yushchenko *et al.* (2005) in two other δ Scuti stars, δ Scuti itself and HD 57749.

2. The Ap Sr star HD 218994

The spectral type in the catalogue of Renson *et al.* (1991) is given as A3 Sr and from Strömgren photometry we obtained $T_{\mathrm{eff}} = 7568\,\mathrm{K}$ (Hubrig *et al.*,

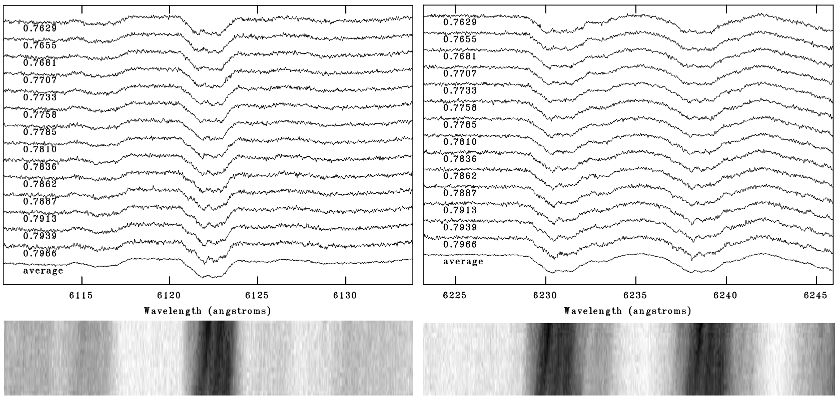

Figure 1. Spectral profile variability of the Mn II 6122 Å, Fe I 6231 Å, and Fe II 6238 Å lines in the UVES spectra of HD 21190. Spectra are labelled with Julian dates (e.g. HJD 2454047). The average spectra are plotted in the bottom of each panel. The two-dimensional images present, for the same spectral regions, the 14 observed spectra stacked. Three moving peaks are clearly visible in the cores of all presented spectral lines.

2000). This Ap star is located in the same region of parameter space in which rapid pulsations have been detected, but an earlier search for pulsations in the Cape Survey yielded no detection (Martinez, Kurtz 1994). We obtained for this star 15 high time resolution UVES spectra. From these spectra we estimated $v \sin i = 5.2 \pm 0.6\,\mathrm{km\,s^{-1}}$ using the first zero of the Fourier transform of the spectral line profile of the magnetically insensitive lines. Our analysis of radial velocity variations of Nd III lines revealed a pulsation period of 5.1 min. However, there is a potential ambiguity for the pulsation period indicating that also a 14.2 min period is possible. Longer time series with higher temporal resolution are needed for a more detailed analysis of the pulsational frequencies. From fitting the radial velocity variations of the Nd III line at $\lambda\,6327$ with a sinusoidal curve we obtained a semi-amplitude of $0.51\,\mathrm{km\,s^{-1}}$.

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