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STUDYING THE UV Mg II RESONANCE LINES IN 20 Be STARS

A. Antoniou[1,2], D. Stathopoulos[1], E. Danezis[1] and E. Lyratzi[1,3]

[1] *University of Athens, Faculty of Physics, Department of Astrophysics, Astronomy and Mechanics, Panepistimioupoli, Zographou 15784, Athens, Greece*

[2] *University of Peloponnese, Faculty of Science and Technology, Department of Telecommunications Science and Technology, Karaiskakis Str. 22100 Tripolis, Greece*

[3] *Eugenides Foundation, 387 Sygrou Av., 17564, Athens, Greece*

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Abstract. Using the GR model, we analyze the UV Mg II resonance lines in the spectra of 20 Be stars of different spectral subtypes, in order to detect the presence of satellite or discrete absorption components. The values of some physical parameters – rotational, radial and random velocities, as well as the FWHM and the absorbed energy, as a function of the effective temperature for the studied stars are determined.

Key words: stars: emission-line, Be – stars: fundamental parameters

1. INTRODUCTION

The Mg II resonance lines have a peculiar profile in the Be stellar spectra, which indicates a multi-component nature of their origin. Many researchers have observed the existence of absorption components shifted to the blue or red wing of the main spectral line (e.g., Doazan 1982; Danezis et al. 1991; Doazan et al. 1991; Lyratzi et al. 2007; Danezis et al. 2007). In this paper, using the GR model (Danezis et al. 2007), we analyze the UV Mg II resonanse lines at $\lambda = 2795.523$ and 2802.698 Å in the spectra of 20 Be stars of different spectral subtypes and present the values of the rotational, radial and random velocities, as well as the FWHM and the absorbed energy, as a function of the effective temperature of the studied stars.

2. DATA AND SPECTRAL ANALYSIS

The spectrograms of the stars have been taken with IUE satellite. The list of the studied stars and their spectral types are presented in Table 1.

Table 1. The list of the studied Be stars and their spectral types.

Star	Spectral type	Star	Spectral type
HD 53367	B0 IV e	HD 25940	B3 V e
HD 44458	B1 V pe	HD 183362	B3 V e
HD 58343	B2 V ne	HD 217050	B4 III pe
HD 45910	B2 III e	HD 67888	B4 III pe
HD 41335	B2 V ne	HD 89884	B5 III e
HD 52721	B2 V ne	HD 23480	B6 IV e
HD 37202	B2 IV p	HD 192044	B7 V e
HD 32991	B2 V e	HD 29866	B8 IV ne
HD 58050	B2 V e	HD 199218	B8 IV nne
HD 37490	B3 III e	HD 50138	B9 e

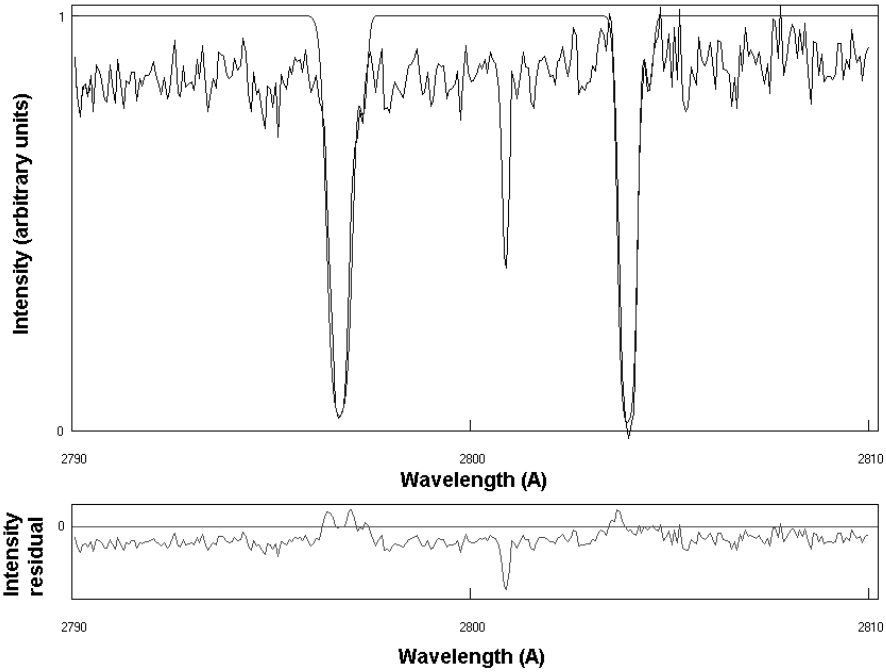

Fig. 1. The UV Mg II resonance lines in the spectrum of HD 52721 with the model fit. The model for each of the Mg II lines consists of two components. The graph at the bottom shows the differences between the model and the observed spectra.

In Figure 1 we present the best fit of the Mg II doublet model to the observed spectrum of the B2 V star HD 52721. The graph at the bottom gives the differences between the model and the observed spectral line. We note that in all investigated stars the best fit has been obtained by using one or two components.

In Figure 2 we present the rotational and radial velocities of all the components determined from the Mg II spectra for 20 Be stars as a function of the star effective temperature. Figure 3 shows the the random velocities and the FWHM of the Mg II lines and Figure 4 – the absorbed energy in each of the Mg II lines.

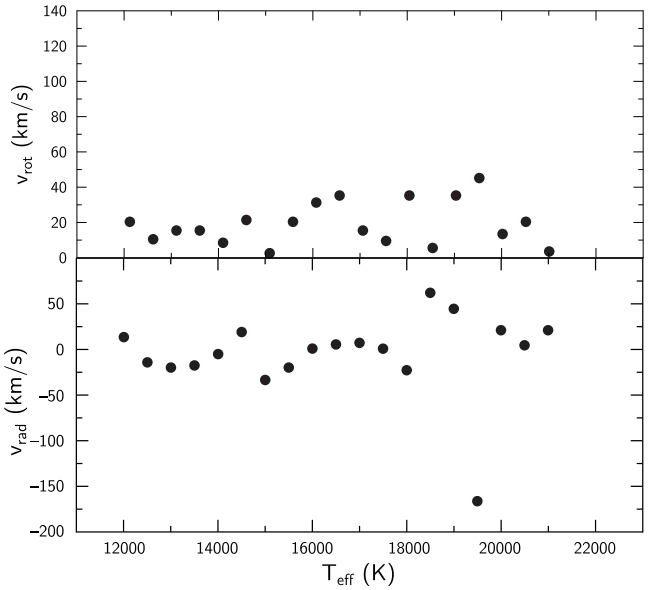

Fig. 2. Rotational (top) and radial (bottom) velocities of all components of the Mg II resonance lines vs. $T_{\rm eff}$.

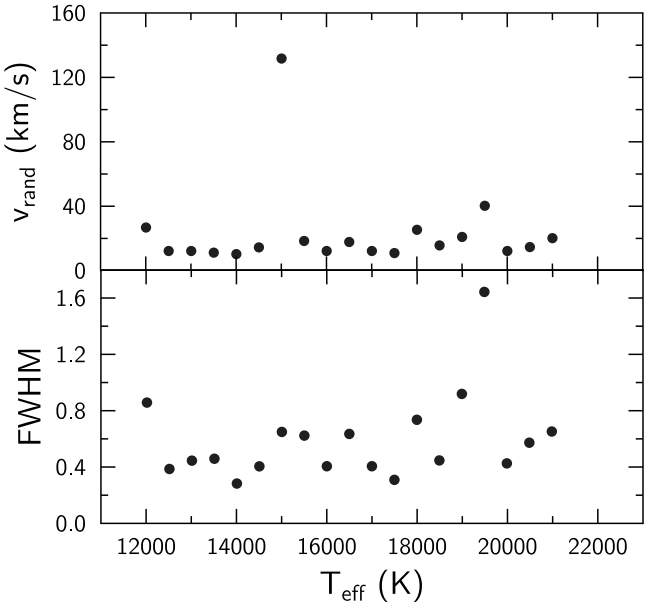

Fig. 3. Random velocities (top) and the FWHM (bottom) of the Mg II resonance lines vs. $T_{\rm eff}$.

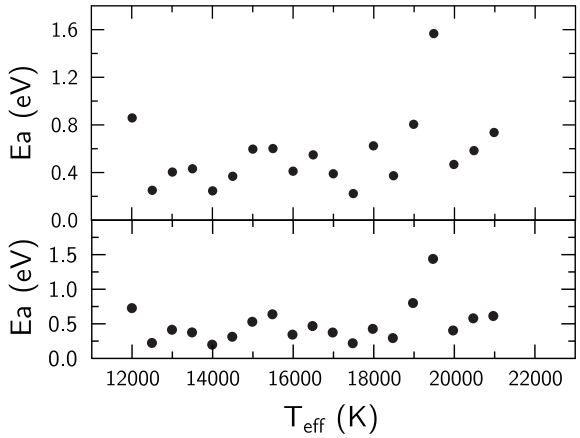

Fig. 4. Absorbed energy of the Mg II lines at $\lambda = 2795.523$ Å (top) and $\lambda = 2802.698$ Å (bottom) vs. $T_{\rm eff}$.

4. RESULTS

Rotational velocities. The values of the rotational velocities are between 5 and 40 km/s.

Radial velocities. The radial velocities are between –50 and +50 km/s, apart from the case of the star HD 45910, for which we have detected an absorption component with a radial velocity of about –170 km/s. These values are in agreement with the values found in Lyratzi et al. (2007).

Random velocities. The values of the random velocities are between 10 and 40 km/s, except of the star HD 217050, for which a value of 140 km/s is found. This means that in the case of HD 217050 the main reason of the line broadening are thermal motions of the ions, while the contribution of the rotation of is much lower. In this case we expect a low value of the projected rotational velocity, which is about 2 km/s (see Figure 2).

FWHM and the absorbed energy. The temperature dependences of the FWHM and the absorbed energy of the Mg II resonance lines are similar.

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