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Time scale variations of MgII resonance lines in HD 41335

I. Nikolaou
University of Athens, Faculty of Physics, Department of Astrophysics, Astronomy and Mechanics, Panepistimioupoli, Zografou 157 84, Athens, Greece

1 Introduction

It is known that hot emission stars (Be and Oe) present peculiar and very complex spectral line profiles. In order to explain this complexity Danezis et. all (2007) constructed a model (GR model)that had as fundamental idea that the whole observed feature of these complex profiles are not the product of a uniform atmospherical region, but by a number of components, which are created in different regions that rotate and move radially with different velocities (Danezis et al. 1991, Lyratzi et al. 2003, 2007, Danezis et al. 2007).These components were named Discrete Absorption Components or Satellite Absorption Components (e.g. Doazan 1982, Danezis et al. 1991, Doazan et al. 1991, Lyratzi et al. 2007, Danezis et al. 2007).Using the GR model we can calculate the values of a group of physical parameters, such as the radial and apparent rotational velocities, the random velocities of the thermal motions of the ions, as well as the full width at half maximum (FWHM) and the absorption energy of the independent regions of matter which produce the main and the satellite components of the studied spectral lines.In our study, using the GR model (Danezis et al., 2007), we analyze the UV MgII resonance lines $\lambda\lambda$ 2795.523, 2802.698 $\AA$ in the spectra of HD 41335 in three different time periods (1987/01/25, 1990/02/22, 1993/11/14) in order to investigate the presence of Discrete or Satellite Absorption Components (DACs, SACs), as well as to calculate the values of the above physical parameters and their time scale variations.

2 Data and Spectral Analysis

The data we have used are the MgII resonance lines $\lambda\lambda$ 2795.523, 2802.698 $\AA$ of HD 41335, taken in three different time periods 1987/01/25, 1990/02/22, 1993/11/14. The spectrograms of the star have been taken by IUE satellite, with the Long Wavelength range Prime (LWP) at high resolution (0.1 to 0.3 $\AA$). From our analysis we have detected that each Mg II resonance line consists of two absorption components.

Rotational velocities: The values of the rotational velocities are all at 0,5 ± 0 km/s. Radial velocities: The calculated value of the independent regions of matter are 127,810 ± 5,496 km/s and 117,8131667 ± 10,71 km/s respectively. We observe interstellar absorption from the spectral lines. Therefore, we calculate and we make the appropriate correction at the radial velocities. The calculated values of the radial velocities after the interstellar correction is 1,59 ± 5,496 km/s respectively. These values are in agreement with the values found in A. Antoniou et al. (2008) and in Lyratzi et al. (2007). Random velocities: The values of the random velocities are 28,183 ± 3,176 and 18,088 ± 2,627 km/s respectively. Full Width at Half Maximum (FWHM): The variation of the FWHM of the Mg II af the resonance lines are similar to each other. The calculated values for the $\lambda\lambda$ 2795.523 $\AA$ are 0,707 ± 0,05215 and 0,428 ± 0,06236 respectively. Similar for the $\lambda\lambda$ 2802.698 $\AA$ are 0,745 ± 0,05278 and 0,448 ± 0,06711 respectively. Absorbed Energy: The values of absorbed energy for the $\lambda\lambda$ 2795.523 $\AA$ resonance line are -6,15 ± 0,238 and -3,31 ± 0,978 eV respectively. Also for the $\lambda\lambda$ 2802.698 $\AA$ are -7 ± 0,288 and -3,75 ± 1,0303 eV respectively. We can see that the values are negative, which indicates that there is adsorption at the HD 41335.

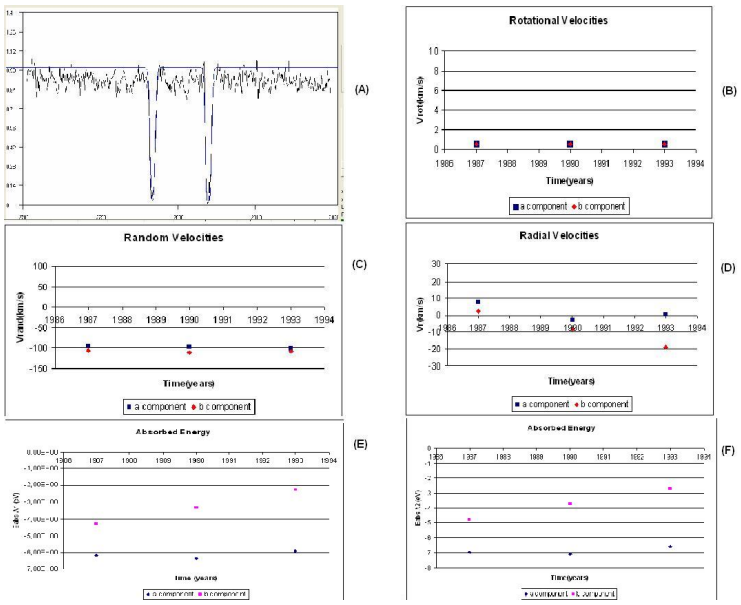

Figure 1: (A): Best fit of the Mg II resonance lines in HD 41335. (B)-(F): Time scale variations of the physical parameters estimated, for the 2 absorption components of the Mg II resonance lines ($\lambda\lambda$ 2795.523, 2802.698 $\AA$)

In Figure (1.a) we present the best fit of the UV Mg II resonance lines. We note that in all three cases the best fit has been obtained using two absorption components. In Figures(1.b-d) we present the time scale variations of the radial, rotational and random velocities of the independent regions of matter which produce the main and the satellite components of the studied spectral lines. Finally, in Figures (1.e)and (1.f) we present the time scale variation of the absorption energy for each one of the resonance lines of the Mg II of the HD 41335.

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