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Time scale variations of the physical parameters of the Si IV resonance lines in the case of the Be star HD 50138

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1 Introduction

As it is well known, many lines in the spectra of hot emission stars (Be, Oe) present very complex 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 is not the product of a uniform atmospherical region, but it is the result of 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, Danezis et al 2003, 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 random velocities of the thermal motions of the ions, the apparent rotational and radial velocities, as well as the full width at half maximum (FWHM) and the absorbed 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 Si IV resonance lines $\lambda\lambda$ 1393.755, 1402.77 Å in the spectra of the Be star HD 50138 in three different periods (1979/03/09, 1982/01/11, 1995/03/04) in order to investigate the presence of Discrete Absorptions Components (DACs) and to calculate the values of the above parameters.

2 Data and Spectral Analysis

The data that we used are the Si IV resonance lines $\lambda\lambda$ 1393.755, 1402.77 Å of the Be star HD 50138, taken in three different time periods 1979/03/09, 1982/01/11, 1995/03/04. The spectrograms of the stars have been taken from IUE satellite, with the Long Wavelength range Prime and Redundant cameras (LWP, LWR) at high resolution (0.1 to 0.3 Å). From our analysis we have detected that each of the Si IV spectral lines consists of two components.

The rotational velocities of the independent regions of matter which produce the Si IV resonance lines are 125 $\pm$ 9 km/s and 43 $\pm$ 4 km/s respectively. The radial velocities of the independent regions of matter which produce the Si IV resonance lines are 46 $\pm$ 0 km/s and -320 $\pm$ 17 respectively. The values of the random velocities of the thermal motions of the ions of the independent regions of matter which produce the Si IV resonance lines are 100 $\pm$ 1 km/s and 18 $\pm$ 12 km/s respectively. Finally, the absorbed energy of each one of the two independent regions of matter for the first resonance line is 1.17 $\pm$ 0.05 eV and 0.15 $\pm$ 0.04 eV. The absorbed energy of each one of the two independent regions of matter for the second resonance line is 0.98 $\pm$ 0.07eV and 0.12 $\pm$ 0.04 eV respectively.

In Figure (1.A) we present the best fit of the UV Si IV resonance lines. We note that in all three cases the best fit has been obtained using two Satellite Absorption Components. In Figures(1.B) - (1.D) we present the time scale variation of the random velocity of the thermal motions of the ions, as well as the variation of the rotational and random velocities of the independent regions of matter which produce the main and the satellite components of the studied spectral line. In Figures (1.E) and (1.F) we present the time scale variation of the the absorbed energy for each one of the resonance lines of Si IV.

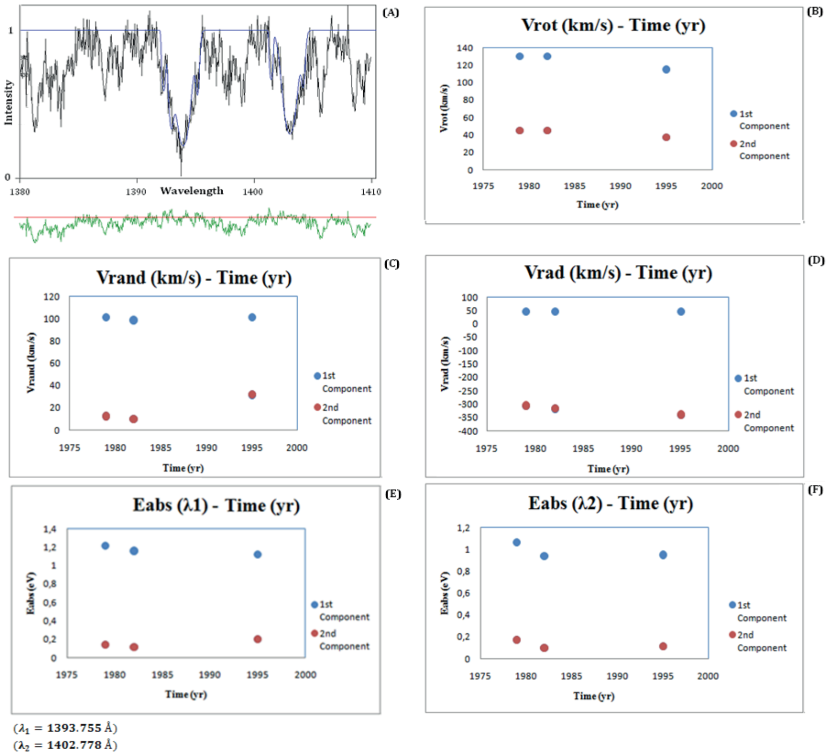

Figure 1: (A): Best fit of the UV Si IV resonance lines. (B)-(F): Time scale variations of the physical parameters of the Si IV resonance lines in the case of the Be star HD 50138.

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