

A study of the atmospheric structure of AX Mon (HD 45910)

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Abstract

In this paper we apply the GR model to find kinematic parameters (radial, rotational and random velocities) as well as FWHM, the absorbed energy and the Gaussian Typical Deviation (σ) for a group of FeII spectral lines from AX Mon spectra obtained with IUE. In order to find possible stratification in the FeII absorbing region of AX Mon we present these parameters as a function of the excitation potential of the lines. We found that the obtained parameters are not too sensitive to the excitation potential of the FeII lines. In addition, we calculate the above mentioned parameters for the AlII (λ 1670.81 Å), AlIII ($\lambda\lambda$ 1854.722, 1867.782 Å), MgII ($\lambda\lambda$ 2795.523, 2802.698 Å), FeII (λ 2586.876 Å), CII ($\lambda\lambda$ 1334.515, 1335.684 Å) and SiIV ($\lambda\lambda$ 1393.73, 1402.73 Å) spectral lines of AX Mon, and we present their relation with the ionization potential.

Individual Objects: AX Mon, HD 45910

Results and discussion

Using the Gauss Rotation (GR) model (Danezis et al. 1991, 2007) we accomplished the best fit of the AlII (λ 1670.81 Å), AlIII ($\lambda\lambda$ 1854.722, 1867.782 Å), MgII ($\lambda\lambda$ 2795.523, 2802.698 Å), FeII (λ 2586.876 Å), CII ($\lambda\lambda$ 1334.515, 1335.684 Å) and SiIV ($\lambda\lambda$ 1393.73, 1402.73 Å) spectral lines of HD 45910 (AX Mon). The complex structure of these spectral lines can be explained with Discrete Absorption components (DACs) and Satellite Absorption components (SACs, Danezis et al. 2007).

Variation of parameters as a function of the excitation potential

The radial and rotational velocities of the studied group of FeII lines show small changes as a function of the excitation potential. The radial velocities present three levels. The first level has values of about -260 km/s, the second one has values of about -125 km/s and the third one has values of about -18 km/s. These values are in agreement with the respective values found by Danezis et al. (1991). The values of the rotational velocities for all SACs are between 20 and 60 km/s. In the case of the random velocities of the ions of the studied group of FeII lines, we detected three levels of random velocities. The first level has values of about 115 km/s, the second one of about 70 km/s and the third one is about 35 km/s. The variation of the typical Gaussian deviation has the same form as the variation of the random velocities. There are also three levels of values. The first level has values of about 0.8, the

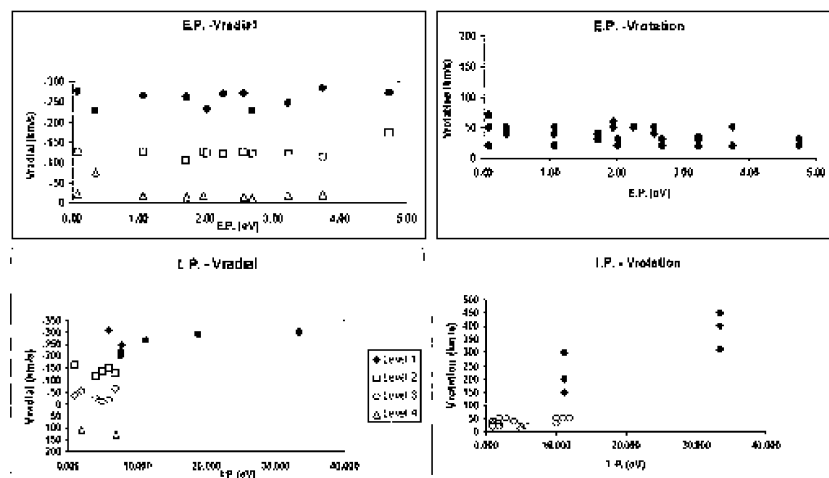


Figure 1: Radial and rotational velocities of the studied group of Fe II lines as a function of the excitation potential and radial and rotational velocities of the studied group of Al II (λ 1670.81 Å), Al III ($\lambda\lambda$ 1854.722, 1867.782 Å), Mg II ($\lambda\lambda$ 2795.523, 2802.698 Å), Fe II (λ 2586.876 Å), C II ($\lambda\lambda$ 1334.515, 1335.684 Å) and Si IV ($\lambda\lambda$ 1393.73, 1402.73 Å) spectral lines as a function of the ionization potential.

second one of about 0.4 and the third one of about 0.2. The Full Width at Half Maximum (FWHM, Å) of the studied group of Fe II lines presents also three levels of values. The first level has values of about 2 Å, the second one of about 1.3 Å and the third one of about 0.6 Å. Finally, in the case of the absorbed energy (E_a , eV) of the studied group of Fe II lines we also found three levels of values. The first level is about 1 eV, the second one about 0.4 eV and the third one about 0.14 eV.

Variation of kinematic parameters as a function of the ionization potential

Here we present the variation of the radial and rotational velocities in the Al II ($\lambda\lambda$ 1670.81 Å), Al III ($\lambda\lambda$ 1854.722, 1867.782 Å), Mg II ($\lambda\lambda$ 2795.523, 2802.698 Å), Fe II (λ 2586.876 Å), C II ($\lambda\lambda$ 1334.515, 1335.684 Å) and Si IV ($\lambda\lambda$ 1393.73, 1402.73 Å) spectral lines as a function of the ionization potential. We detected four levels of radial velocities. The first level has values of about -260 km/s and corresponds to an ionization potential larger than 20 eV. The second level has values of about -140 km/s, the third one of about -35 km/s and the fourth one of about 119 km/s. All these values correspond to ionization potential with values between 0 and 10 eV. The values of the rotational velocities are 150 – 450 km/s and correspond to ionization potentials larger than 10 eV. The low values of the rotational velocities (10 – 50 km/s) correspond to ionization potentials with values between 0 and 10 eV.

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