A study of the structure of different ionization potential regions in the Atmosphere of AX Mon (HD 45910)

Antoniou, A.*, Danezis, E.*, Lyratzi, E.*,†, Popović, L.,Č.**, Dimitrijević, M., S**, Theodosiou, E.* and Stathopoulos, D.*

*University of Athens, Faculty of Physics Department of Astrophysics, Astronomy and Mechanics, Panepistimioupoli, Zographou 157 84, Athens, Greece

†Eugenides Foundation, 387 Sygrou Av., 17564, Athens, Greece

**Astronomical Observatory of Belgrade, Volgina 7, 11160 Belgrade, Serbia

Introduction

AX Monocerotis (HD 45910) is a binary system [1], consisting of a B2e III star and a some what fainter K0 III star, with an orbital period of 232.5 days [2, 3] and a variable spectrum [4, 5].

Danezis et al. [6] presented a study of the variation of radial velocities and of the blue edge width. In this paper, using the Gaussian-Rotational (GR) model [7, 8] we calculate the radial, rotational and random velocities in the Al II (l 1670.81 Å), Al III (λλ 1854.722, 1867.782 Å), Mg II (λλl 2795.523, 2802.698 Å), Fe II (λ 2586.876 Å), C II (λλ 1334.515, 1335.684 Å) and Si IV (λλ 1393.73, 1402.73 Å) spectral lines of AX Mon, as a function of the ionization potential.

Results and Discussion

In Figure 1 using the GR model we can see that the complex structure of the λλ 1854.722, 1862.782 Å Al III (left) and λλ 2795.523, 2802.698 Å absorption and emission Mg II (right) resonance spectral lines can be explained with SACs and DACs phenomenon.

In Figure 2, 3 and 4 we present the variation of the radial, rotational and the random velocities in the Al II (λ 1670.81 Å), Al III (λλ 1854.722, 1867.782 Å), Mg II (λλ 2795.523, 2802.698 Å), Fe II (λ 2586.876 Å) C II (λλ 1334.515,1335.684 Å) and Si IV (λλ 1393.73, 1402.73 Å) spectral lines as a function of the ionization potential, respectively. As we can see, we detected four levels of radial velocities (Fig. 2). The first level has values about -260 km/s and corresponds to ionization potential larger than 20 eV. The second level has values about -140 km/s, the third one has values about -35 km/s and the fourth one has values about 119 km/s. All these values correspond to ionization potential with values between 0 and 10 eV. The values of the rotational velocities (Fig. 3) are between 150 and 450 km/s and correspond to ionization potential larger than 10 eV. The low values of the rotational velocities (10-50 km/s) correspond to ionization potential with values between 0 and 10 eV. Finally, we also detected four levels of the random velocities of the ions (Fig. 4). The first level has values about 108 km/s and corresponds to ionization potential larger than 18 eV. The second level has values about 80 km/s, the third one has values about 47 km/s and the fourth one has values about 22 km/s. All these values correspond to ionization potential with values between 0 and 10 eV.

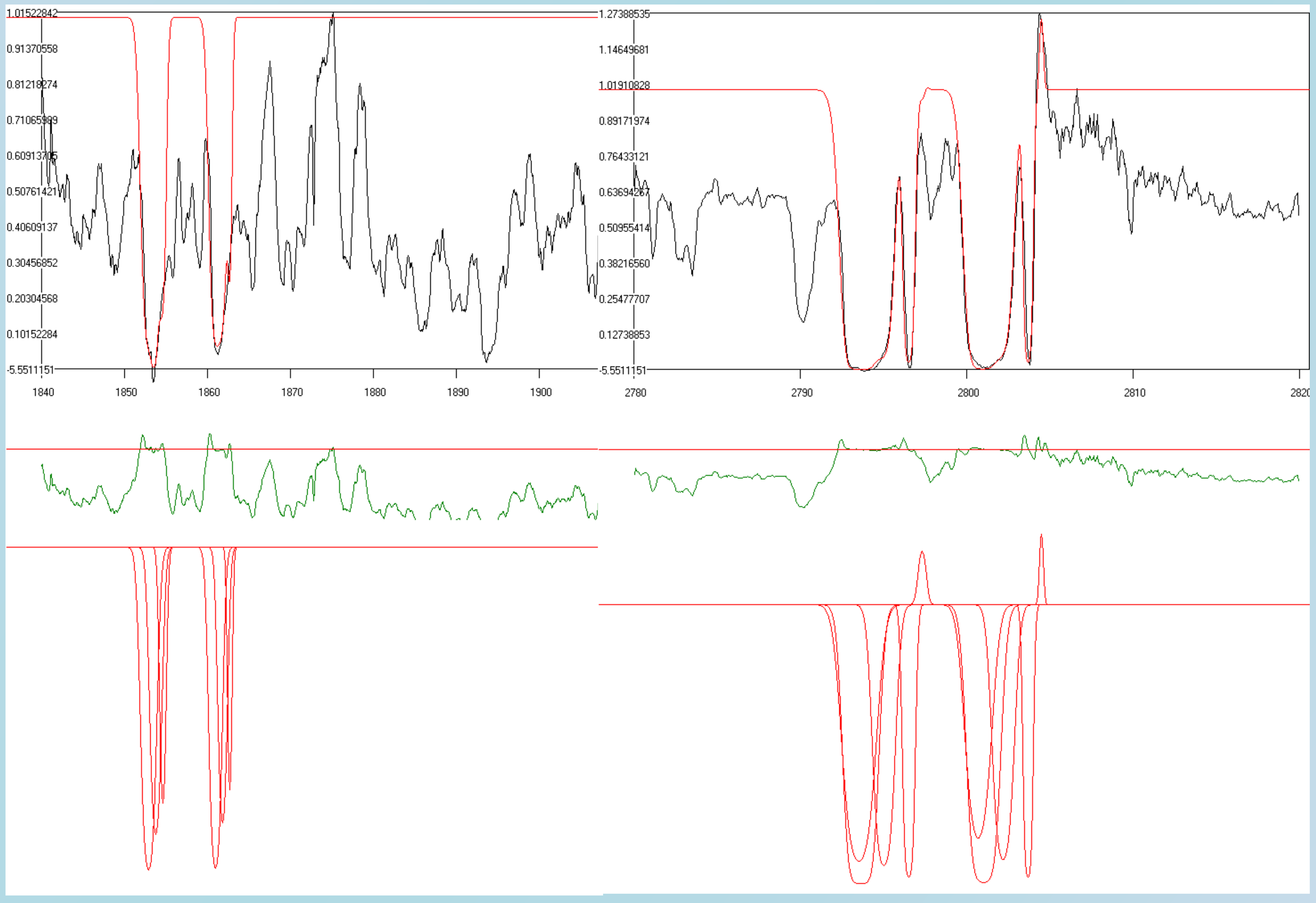

FIGURE 1. Best fit of the λλ 1854.722, 1862.782 Å Al III (left) and λλ 2795.523, 2802.698 Å absorption and emission Mg II (right) resonance spectral lines. We can explain the complex structure of these lines as a DACs or SACs phenomenon. Below the fit one can see the analysis (GR model) of the observed profile to its SACs or DACs.

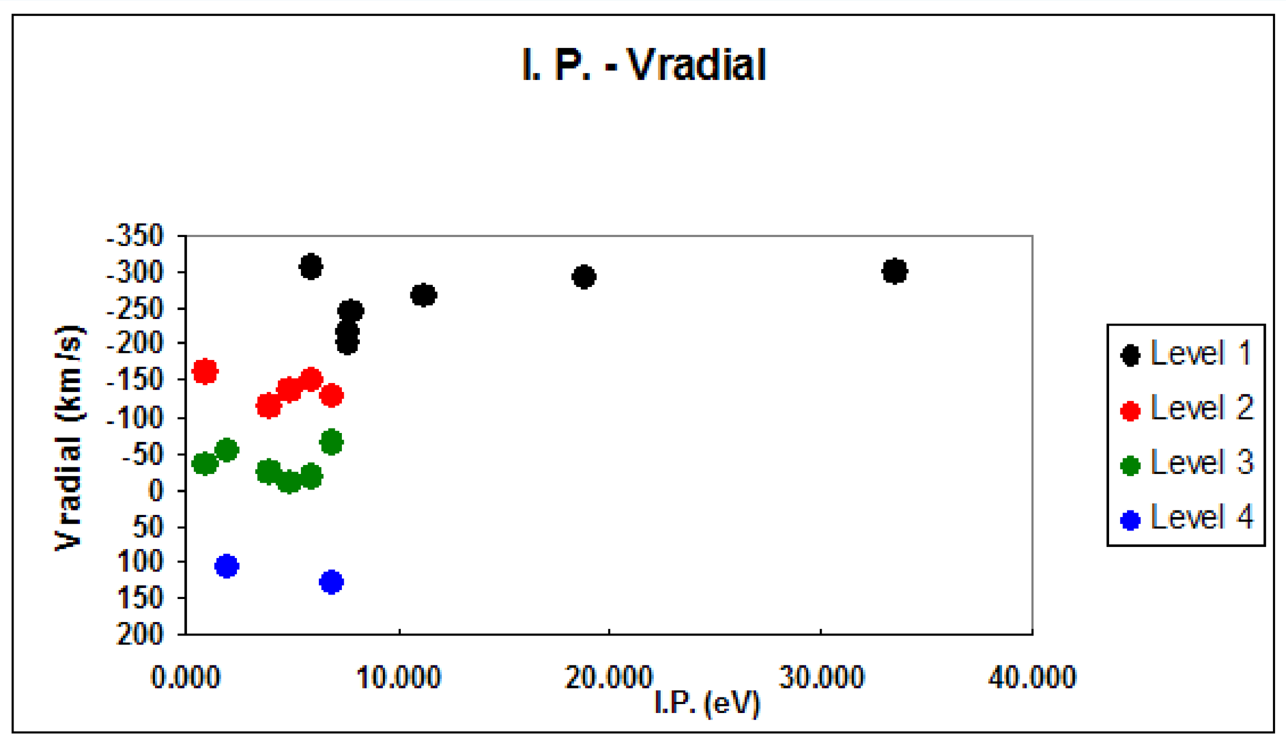

FIGURE 2. Radial velocities in the atmosphere of AXMon (HD 45910) spectral lines as a function of the ionization potential.

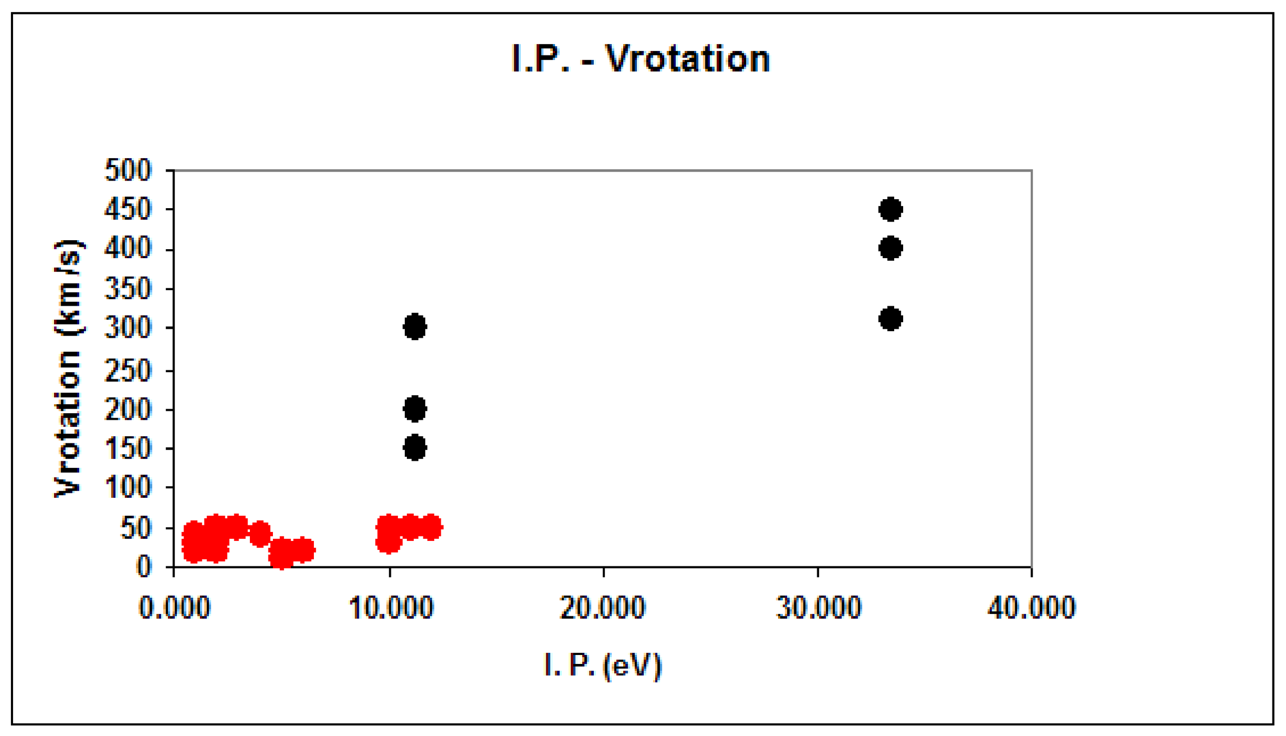

FIGURE 3. Rotational velocities in the atmosphere of AXMon (HD 45910) spectral lines as a function of the ionization potential.

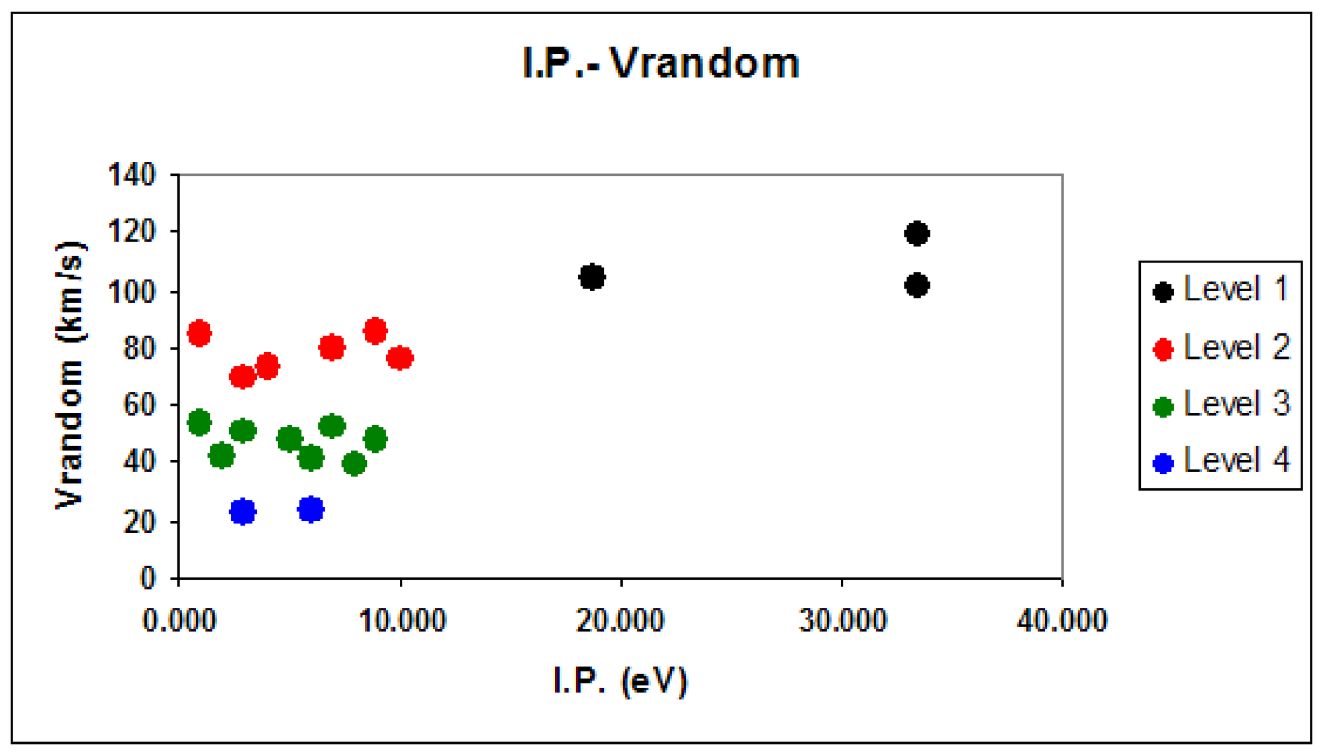

FIGURE 4. Random velocities of the ions in the atmosphere of AXMon (HD 45910) spectral lines as a function of the ionization potential.

Acknowledgments

This research project is progressing at the University of Athens, Department of Astrophysics, Astronomy and Mechanics, under the financial support of the Special Account for Research Grants, which we thank very much. This work also was supported by Ministry of Science of Serbia, through the projects "Influence of collisional processes on astrophysical plasma line shapes" and "Astrophysical spectroscopy of extragalactic objects".

References

1. P. W. Merrill, *ApJ*, **115**, 145 (1952).
2. N. L. Magalashvili, and Ya. I. Kumsishvili, *Bull. Abastumani Astrophys. Obs.*, **37**, 3 (1969).
3. J. Papousek, *Scripta Fac. Sci. Nat. Purkyne Yniv. Brunensis, Physica 2*, **9**, 75 (1979).
4. P. W. Merrill, *PASP*, **35**, 303 (1923).
5. J. S. Plaskett, *PASP*, **35**, 145 (1923).
6. E. Danezis, E. Theodossiou and P. Laskarides, *Ap&SS*, **179**, 111 (1991).
7. E. Danezis, D. Nikolaidis, E. Lyratzi, A. Antoniou, L. Č. Popović, and M. S. Dimitrijević, *MSAIS*, **7**, 107 (2005).
8. E. Danezis, D. Nikolaidis, E. Lyratzi, L. Č. Popović, M. S. Dimitrijević, A. Antoniou and E. Theodossiou, *PASJ*, **59**, 827 (2007).

19th International Conference on Spectral Line Shapes
June 15 - 20, 2008
University of Valladolid, Spain