DENSITY DIAGNOSTICS OF SOLAR EMISSION LINES FROM THE NITROGEN-LIKE Mg VI ION

P.K.Raju and R.Vasundhara
Indian Institute of Astrophysics
Bangalore-560034, India

Abstract The variation of theoretical line intensity ratios with electron density for Mg VI ion are presented. This study indicates that the line intensity ratios for Mg VI can be used to infer electron density for solar plasma.

Introduction

The solar Extreme Ultraviolet spectrum is rich with emission lines in the range 200 Å to 2000 Å. These lines are representative of the solar, chromosphere-corona transition region and the corona. The analysis of such a spectrum would enable us to know the physical parameters, like electron density and temperature, within the emission regions. Knowledge of these parameters are essential to understand the physical processes within the solar plasma. In recent years, an important result from the study of emission line solar spectrum is the development of techniques which allow direct determination of the physical parameters independently of the detailed model of the solar atmosphere. One such technique involves the effect of electron density on line intensities. In this respect, lines belonging to nitrogen-like ions have received little attention as compared to lines of ions belonging to other isoelectronic sequences. In this brief study we have considered the feasibility of using emission lines from Mg VI ion for electron density determination. The detailed investigation on the nitrogen-like ions Ne IV, Mg VI and Al VII would be published elsewhere. The results for the ions Si VIII and S X and the references to the earlier literature are given in the paper by Dwivedi and Raju (1988).

Discussion

The electron density determination, by using emission lines of nitrogen-like ions, becomes possible because the lines are excited by electron collisions with the metastable levels of the ground term. The collisional and radiative de-excitation rates among these levels would become comparable for appropriate electron densities. In such cases the population for these levels and in turn the line intensity ratios become sensitive to density. Fig.1 for Mg VI ion illustrates this point. The schematic energy level diagram

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for nitrogen-like ions is shcwn in Fig.2.

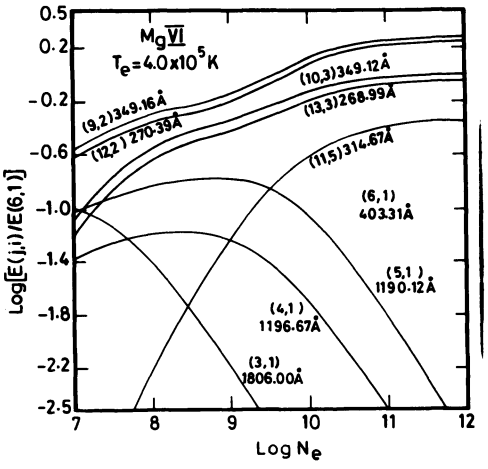

Fig.1. Line intensity ratios E(j,i)/E(6,1) as a function of electron density N_e. T_e is the temperature for maximum relative ion abundance for Mg VI.

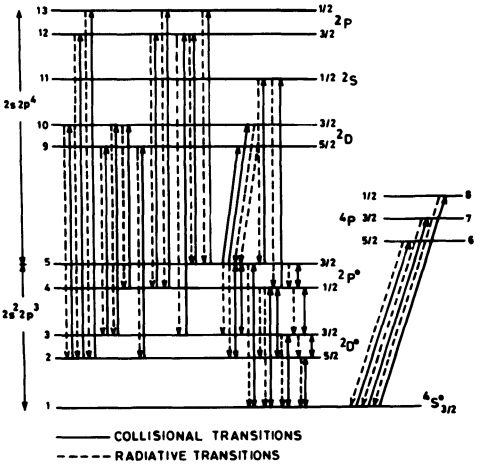

Fig.2. Energy level scheme for nitrogen like ions.

Conclusion

The line intensity ratios for Mg VI, as discussed here, should be useful to infer electron densities in the emission regions of the solar atmosphere.

Acknowledgements

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References

Dwivedi,B.N. and Raju,P.K. (1988) 'Density diagnostics of solar emission lines from introgen-like ions', Adv. Space Res. 8, 11 (179)-11 (183).