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SOLAR *LOG GF* VALUES FOR THE SPECTRAL LINES IN THE RANGE $\lambda\lambda$ 6209 - 6273 Å

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ABSTRACT

We present here the solar *LOG GF* values obtained using the Liege solar at las and the standard solar photospheric models for the spectral lines in the wavelength range $\lambda\lambda$ 6209 - 6273 Å. These *log gf* values shall be used to interpret a high resolution spectra of the star γ Draconics.

Key Words : log gf- Oscillator strengths - Photosperic models - Solar spectrum

I. INTRODUCTION

Accurate *gf*values are one of the most important kind of atomic parameters needed for a reliable datermination of chemical abundances in stellar atmospheres. Unfortunately, accurate *gf*values exist only for a small percentage of lines observed in stellar spectra.

Our present interest in a small spectral range lies because we have a programme to interpret a high resolution spectra of the star γ Draconics. A largeset of theoretically derived *gf* based upon various approximation exist. Developments in experimation exist. Developments in experimental techniques have provided good *gf*values for a considerable amount of lines. But when results from different studies on *gf*values are compared, the dispersion in the *gf*values of a particular line is large. The result is a chaotic situation when *gf*values available in literature are used for spectral synthesis, the agreement with stellar spectra is rather disappointihg.

Owing to these difficulties, we decided to derive an internally consistent set of *gf*values for all the clean lines in the region of our current interest.

II. METHODOLOGY

(a) Astrophysical Method

Closely following Gurtovenko & Kostik (1981), we believe that the central line depths taken from the Liege atlas (Delbouille et al., 1973) of the solar spectrum when matched with the calculations for the same quantity using the HM model (Holweger & Muller, 1974) should yield fairly accurate *gf* values. Particular emphasis upon this technique has been laid by Fuhr (1987) and Blackwell (1990). Besides the simplicity of the small computer time needed for calculations, the D values are considerably less blended in comparision with line profiles. Also, this method is practically insensitive to the choice of collisional damping parameter. This procedure, however, is sensitive to the choice of macroturbulence and to departures from LTE.

(b) Our Approach

The Liege atlas of the solar spectrum and an atlas of the solar spectrum wavelengths due to Moore et al. (1966) helped us identify the lines. A realistic continuum which is 1.25 % lower than that in Liege atlas was used. Synthetic spectrum was generated using the spectrum synthesis code ADRSL. The input table of abundance were from Anders & Grevesse(1989) and Grevesse & Noels (1993). Iterations were performed on *log gf* values till the absorption peaks in the synthetic spectra matched with the observed solar models. For the HM model we used a depth independent microturbulence of 1.00 kmsec^{-1}, whereas for the MACKKL model due to Maltby et al.(1986) the depth dependent values as given in the model was used. Macroturbulence was assumed to be 1.52 kmsec^{-1}. Calculations were performed in LTE.

III. RESULTS AND DISCUSSIONS

The detailed results of our calculations are being published elsewhere. We note that the *log gf* values derived here are slightly dependent upon the chosen model atmospheres. An intercomparision of HM based results with that of MACKKL shows that Fe lines are more sensitive than lines due to other atoms. The van der Waals coefficients for iron lines are enhanced following Holweger et al. (1990) and Holweger et al. (1991). For atomic lines other than those due to Fe, collisional damping parameter was obtained from Unsold (1995). Our results also clearly illustrate that (i) the selection of damping constant is inconsequential in the method of fits for lines with large central depths and (ii) the differences in the inputted abundances are reproducible.

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