THE QUADRATIC ZEEMAN EFFECT FOR CI LINES- APPLICATION TO THE SPECTRUM OF EG 129

I. Bues

and

G. Varvatis

I. Mathem. Inst. Freie Universität Berlin F.R.G.

Garstang and Kemic (1974) derived formulae for the splitting of hydrogen and helium lines in the presence of large magnetic fields. We applied their method in calculating the eigenvectors for some transitions of neutral carbon, where a correction factor for the coupling and mixing of the energy levels has to be applied. For CI - lines in the visible region of the spectrum, well separated components can be expected for a field strength up to $2 \cdot 10^7$G. Fig. 1 shows the splitting of three lines for $B = 10^7$ G.

We applied these results to a helium-rich model atmosphere of T_{eff} = 12000 K, log g = 8, He/C = 1000 and took special care of the region around 7000 Å. The blend of the lines 7111.5Å, 7113.2Å, 7115.2Å, 7115.3Å, 7116.99Å and 7119.7Å is very strong in the spectrum of the non-magnetic λ4670 star G47-18 (W_λ = 45Å).
With a field strength of 10^7G it is possible to reproduce the shape of the scanner observations of EG 129 (Grw+70°8247) between 6500 and 7800Å. (see Fig. 2) But in the region of shorter wavelengths, a large magnetic field would be needed to explain the λ4135 feature as due to a component of the HeI line 3889Å.

Reference

Garstang, R.H., Kemic, S.B. 1974, Astrophys. Space Sc. 31, 103.

https://doi.org/10.1017/S0252921100076120 Published online by Cambridge University Press

Fig. 1: Linestrengths (atomic units) of the Zeeman components of 3 CI lines

CI χ_{ex} = 8.64 eV

B = 10^7 Gauss

$^3D_3 - {}^3F_4$ 7143.2A°

$^3D_2 - {}^3F_3$ 7115.2A°

$^3D_1 - {}^3F_2$ 7111.5A°

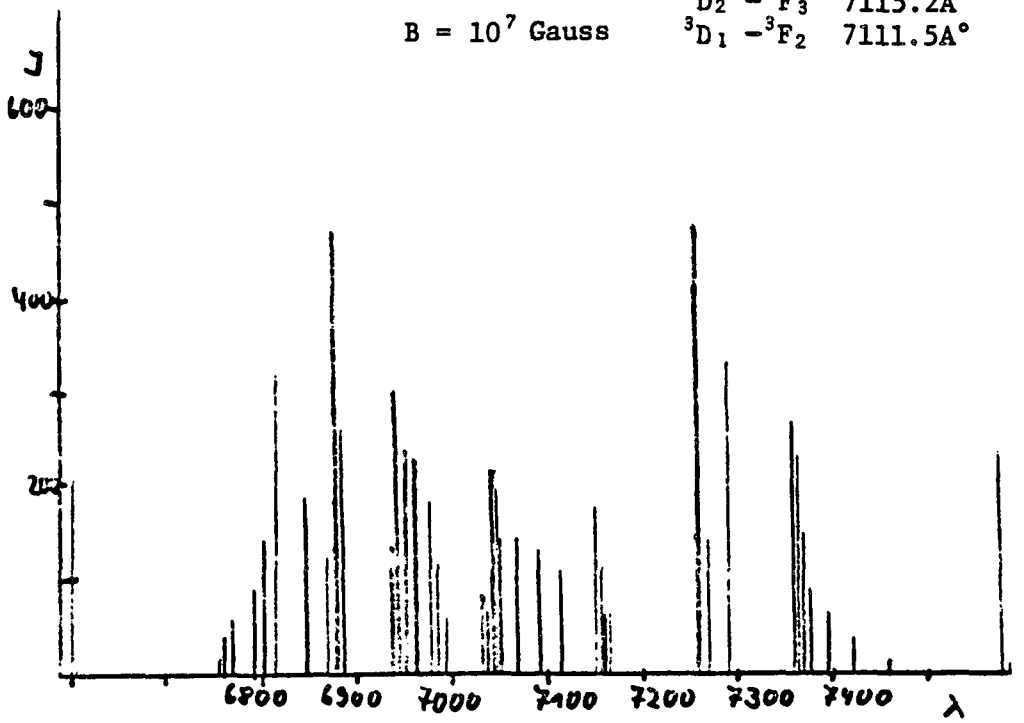
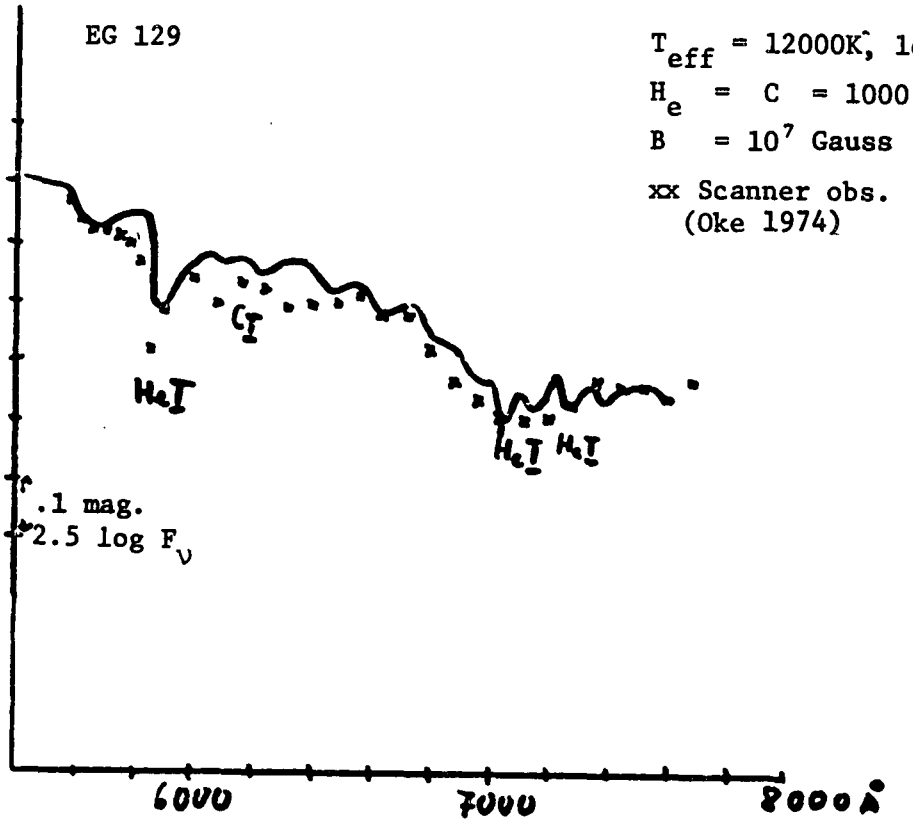


Fig. 2: Comparison of the synthesized spectrum with observations.



https://doi.org/10.1017/S0252921100076120 Published online by Cambridge University Press