TEMPERATURE STRUCTURE OF THE CHROMOSPHERE-CORONA TRANSITION REGION

G. ELWERT and P. K. RAJU
Lehrstuhl für Theoretische Astrophysik, Tübingen, Germany

Starting from the formula for line intensities E for a spherically symmetric atmosphere, considering the pressure parameter $P_0 = N_e T_e$ to be constant the inverse temperature gradient can be determined by taking it out from the integral for E. In this way Dupree and Goldberg (1967) found that the temperature gradient varies considerably whereas the conductive flux factor $F = T_e^{5/2}(\mathrm{d}T_e/\mathrm{d}h)$ is nearly constant for T_e above 10^5 K. The best fit was obtained by using photospheric abundances. As the inverse temperature gradient varies considerably in the line forming region, it is, however, not satisfactory to take it out from the integral.

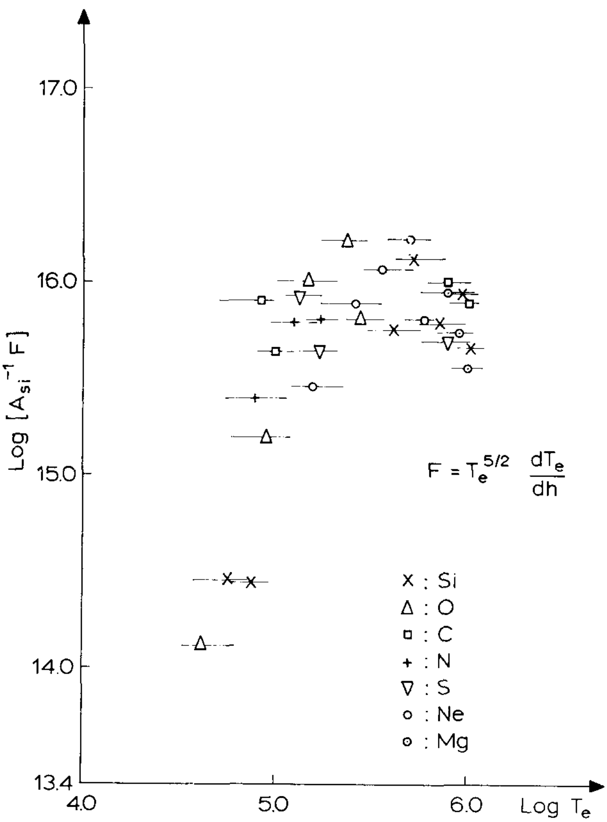

Fig. 1. With density dependent ionization equilibrium and incorporating pressure decrease at high temperatures (using chromospheric abundances by Pottasch).

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We therefore, removed F from the integral. Then F can be determined as a function of T_e. Moreover, more recent values of the ion population given by Jordan (1969) which include density effects were used. For $T_e > 10^6$ K the pressure decrease under hydrostatic equilibrium conditions was considered. These modifications lead to changes of the effective temperature for line formation and to a reduction of F. The results for F as a function of T_e are represented in Figure 1 using chromospheric abundances. It turns out that this fit is better than with photospheric ones. The starting assumption of the approximate constancy of F is justified for T_e between 10^5 and 10^6 K. Instead of the scattered points below 10^5 K which lie above the constant flux line in the diagram of Dupree and Goldberg (1967) one obtains now the points below 10^5 K which can be smoothly connected to the points above 10^5 K. Taking the mean value of F between 10^5 and 10^6 K a model giving T_e as a function of the height can be calculated. Using the chromospheric value of the Si abundance A_{Si} the thickness of the transition layer is increased with respect to the model of Dupree and Goldberg by a factor of about 2.

References

Dupree, A. K. and Goldberg, L.: 1967, *Solar Phys.* **1**, 229.
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