A TEMPERATURE-CORRECTION PROCEDURE

The Avrett and Krook (1963) method of improving the temperature distribution in a stellar atmosphere has the disadvantage of being rather complicated. A simplification suggests itself, at least for stars of moderate temperature in which the negative hydrogen ion is the dominant absorber over most of the frequency regions of importance.

If the absorption coefficient does not depend on frequency, the Avrett-Krook equations (see also Gingerich 1963, eqs. [26] and [27]) would reduce to

$$\frac{d\tau_1}{dt} = 1 - \frac{F(t)}{F^{(0)}(t)}, \qquad \tau_1(0) = 0 \tag{1}$$

and

$$4T_1 \frac{dB}{dT} = 2[F(0) - F^{(0)}(0)] - \frac{dF(t)}{dt} + \left[2 - \frac{F(t)}{F^{(0)}(t)}\right] \frac{dF^{(0)}(t)}{dt}. \tag{2}$$

In these equations t is the old optical depth, τ_1 is the correction to t, and T_1 is the correction to the old temperature. B is the integrated Planck function, while F and $F^{(0)}$ are the desired and the old fluxes (divided by π), respectively. Even if the absorption does depend on frequency, the above equations might be reasonably accurate if t were defined in terms of an opacity which is some average of κ_ν.

Equations (1) and (2) involve only integrated quantities, and the solution for τ_1 and T_1 is trivial. They have the further virtue of having the corrections vanish identically if the flux conditions are satisfied. The usefulness of these equations was tested as follows:

Optical depth was based on a monochromatic absorption, rather than a mean. The two corrections were computed at ten depths in the model (eq. [1] was integrated over these ten points by the simple trapezoid rule), and the net temperature change for all layers was found by linear interpolation from these ten depths.

This procedure was surprisingly successful for solar-type models. Two applications of the procedure reduced errors in the integrated fluxes from of the order of 5 per cent to less than 0.2 per cent for models without strong blanketing. Models with strong blanketing required three or four iterations for the same improvement. Rather large deviations from radiative equilibrium seemed to make little difference in the rate of convergence. The procedure was also successfully tried on an atmosphere of effective temperature 8400 degrees, although the convergence was slightly slower. The use of an appropriate mean opacity would undoubtedly improve the rate of convergence.

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THOMAS L. SWIHART

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STEWARD OBSERVATORY
UNIVERSITY OF ARIZONA

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THE COLORS OF SOME HIGH-LATITUDE BLUE STARS

Photoelectrically determined colors, on the (*UBV*) system, for some stars in the lists of Feige (1958) and of Slettebak and Stock (1959, SS I = Table 1 and SS II = Table 2) have been observed during the course of several photometric programs with the Mount