Reviews article, "... there is no substitute for careful analysis of this problem based on realistic radiative transfer calculations". Such calculations by Shine, Milkey and Mihalas, based on solar-chromosphere-like models, suggest that increasing column density broadens the separation of the minima, but not the peak separation or the half width, because these latter parameters are governed by the transition from complete redistribution (non-coherent scattering) to partial redistribution (largely coherent), but realistic calculations with other models could lead to a different result.

The Chromosphere and Corona of Procyon

By A. Brown
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IUE observations at high and low resolution have been made of the slightly-evolved F5 dwarf star Procyon. Lyman alpha and the ionized magnesium and neutral oxygen resonance lines show enhanced blue components indicative of either a decelerating expansion or down-flow in the low chromosphere. Lines formed higher in the atmosphere do not show these motions.

An analysis of emission measures derived from the observed line-fluxes has been used to construct a model of the chromosphere and corona. The resulting model has a maximum temperature of 3×10^5 K and electron pressures of 3.6×10^{14} cm^{-3} K at 10^4 K and 1.2×10^{14} cm^{-3} K at 2×10^5 K. The total emission measure over the region 1.6×10^4 K to 2.5×10^5 K is over a factor of 10 greater than the corresponding value for the quiet Sun.

Owing to the high emission measure and low electron pressure the temperature gradients are not steep. Hence conduction is a negligible component of the energy balance, which is dominated by the radiative losses. These are independent of the pressure used and depend only on the observed emission measures. Thus the mechanical energy input to the chromosphere and corona, responsible for its heating, is balanced by the radiative losses.

The line widths derived from the high resolution line profiles were used to study the non-thermal motions. The optically thin lines of *Si* IV, *C* IV and *O* VI show non-thermal velocities of the order of the sound speed. Limits on the non-thermal energy flux place restrictions on the energy deposition processes responsible for the chromospheric and coronal heating. While shock dissipation of acoustic waves may heat the low chromosphere it cannot account for the heating higher in the atmosphere. Viscous damping of short-period Alfvén waves cannot be excluded in the high chromosphere and corona. The process proposed by Osterbrock involving conversion of fast-mode shocks to Alfvén waves may well be appropriate.

Acoustic Heating in Late-Type Chromospheres

By P. Ulmschneider
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Recent empirical solar-chromosphere models made by Vernazza, Avrett and Loeser, as well as observations of ionized magnesium line emission fluxes in late-type stars by Basri and Linsky clearly show the dominant importance of magnetic fields for the physics of stellar chromospheres. In the solar bright-network model, for instance, which is valid for kilogauss-magnetic-field regions, the emitted chromospheric radiation flux is a factor of ten larger than in the model valid for a non-magnetic, dark, interior cell region. The increased radiation flux in magnetic regions is caused by considerable photospheric and chromospheric temperature enhancement. Yet, surprisingly, the height of the temperature minimum and the abrupt increase of the radiative cooling rate near this height are quite similar. Likewise stellar observations show that owing to the magnetic field coverage the magnesium line emission varies strongly in stars even of the same effective temperature and gravity, showing, however, a rather weak gravity dependence.

How can a heating mechanism explain these facts? From careful consideration of the principal heating processes, such as radiative, Joule, viscous and conductive heating, it appears that only shock dissipation can produce the large amount of heating necessary and that only shock formation can explain the abruptly rising heating rate required by the observations. This is valid both for the magnetic and the non-magnetic regions. Observations of acoustic waves by Deubner, and recent modifications of the Lighthill theory of aerodynamic sound generation by Bohn and by Stein, indicate that a large amount of acoustic flux as well as slow-mode and Alfvén-mode flux is available in late-type stars. For non-magnetic cases, theoretical calculations of shock formation based on these fluxes show relatively good agreement between empirical and theoretical low-chromosphere models. Enhanced slow-mode fluxes in magnetic regions appear to explain the remaining discrepancies. For the upper chromosphere, Alfvén-wave heating through mode coupling seems highly likely. This picture agrees nicely with the stellar magnesium observations since, as Stein has shown, both slow-mode and Alfvén-mode fluxes exhibit a weak gravity dependence.

Active Dwarfs and Flare Stars

By G. E. Bromage
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This subject provides an important intersection where the interests of classical observational astronomers overlap those of solar and atomic physicists and stellar-chromosphere specialists. I shall concentrate on reviewing observational evidence for active chromospheres and coronae in flare stars of the solar neighbourhood. In particular, I will report on new spectra of UV-Ceti stars obtained just three weeks ago by Dufton, Patchett and myself with the *International Ultraviolet Explorer* in low-resolution mode, and the 1·9-metre telescope at Sutherland with the IPCS and unit spectrograph. The stars monitored included UV Ceti, AT Microscopii, V1054 Ophiuchi and Bond's flare star.

Bond's star holds the record for optical flares: once in 1976 the optical power output increased at least a thousand-fold in less than three minutes! Our spectra cover 3700 to 7000 Ångströms at a resolution of about one Ångström and confirm that it is a normal UV-Ceti dMe star. During a flare on such stars, the 'chromospheric' emission lines are substantially enhanced and the Balmer lines broaden. In typical cases, Balmer H_{14} is the last resolvable member. Spectroscopic diagnostics generally indicate that flare densities are between 10^8 and 10^{12} electrons per cubic centimetre.