

SPECTRAL LINE SHAPES IN COOL STARS

Gillian Peach¹ and Ian B. Whittingham²

¹*Department of Physics and Astronomy, University College London
Gower Street London WC1E 6BT, UK*

²*School of Mathematics, Physics and Information Technology,
James Cook University, Townsville 4811, Australia*

Accurate pressure broadened profiles of alkali resonance doublets are needed for modelling of the atmospheres of late M, L and T type brown dwarfs and for generating their synthetic spectra in the region 600 - 900 nm. In the solar spectrum, many transitions in sodium have been observed for which atomic hydrogen is the main perturbing species.

When the usual impact theory of line broadening is used, the profile is simply Lorentzian and the widths and shifts of the lines can be calculated, provided that interaction potentials for the emitter-perturber system are available. However when the lines utterly dominate their region of the spectrum, it becomes important to be able to obtain complete profiles in which the line-wing profiles are accurately represented where the impact theory is no longer valid. The original development of line broadening theory as presented in the papers by Baranger (1958a-c) is reexamined and calculations have been carried out in which it is shown that it is not necessary to invoke the impact approximation. Allowance is also made for a varying dipole moment which can be important for the line-wing shapes.

Results will be presented at the Conference.

References

- Baranger, M.: 1958a, *Phys. Rev.*, **111**, 481.
- Baranger, M.: 1958b, *Phys. Rev.*, **111**, 494.
- Baranger, M.: 1958c, *Phys. Rev.*, **112**, 855.