Short Research Communications:

SH ON THE SUN

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The theoretical estimates of the abundances and the intensities of the Fraunhofer lines for various atomic and molecular species facilitate identification and clarify the role of blending produced by the nearby lines in the solar spectrum. Results of the partial pressure calculations of the molecules SH, CS, SO, NS and S_2, carried out by us for the HSRA photospheric model (Gingerich et al., 1971) indicate that the abundances of these molecules are successively smaller by at least an order of magnitude. Equivalent width calculations for the intense lines of the Q_2 branch of the (0-0) band of SH ($A^2\Sigma - X^2\pi$) and for the the Q branch lines of the (0-0) band of CS ($A\,^1\pi - X\,^1\Sigma$) were carried out through weak line approach (Waddell 1958) using the formulation and the sources of continuous opacity as given by Matsushima (1968) and Travis and Matsushima (1968). These sources of opacity including some unidentified ones also, satisfactorily explain the centre to limb behaviour of the solar continuum (Matsushima 1968). The wavenumbers for SH are tabulated by Ramsay (1952) and those for CS were obtained through well known formulae (cf. Herzberg 1950). However, the calculated wavenumbers for CS are not accurate enough for seeking line coincidences in this crowded region of the solar spectrum.

Taking $f_{oo} = 1.63 \times 10^{-3}$ for SH (Henneker and Popkie 1971) and $f_{oo} = 5.91 \times 10^{-3}$ for CS (Smith, 1969), the maximum equivalent widths are 4.4 mÅ and 1.8 mÅ respectively, for the centre of the solar disk. The centre to limb behaviours of the lines 3293.016 Å (SH) and 2583.346 Å (CS) show an increase in equivalent widths by a factor of about 2.

Assuming 1 mÅ equivalent width as the threshold for line detectibility and keeping in view the uncertainties involved in the ultraviolet opacity and in the theoretical estimate of oscillator strength for SH, we infer that out of the species considered, only SH, at the best, can show up detectable weak lines in the photospheric spectrum.

An attempt for identification of this molecule in the crowded region of UV through line coincidences method only, may lead to erroneous results. The disadvantages of this method are discussed by Sotirovski (1971). Further, the determination of rotational temperature would require the use of unblended lines. So a construction of the synthetic spectrum, by including as many significant species as are present in the considered region of the solar spectrum, will be desirable before any such attempt is made.

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