The equivalent widths and the central intensities of the hydrogen absorption lines up to at least the H_{10} line appeared different in 1971 from that in 1970. Generally, the wings of the absorption lines appeared more shallow in 1971 than in 1970.

The variations in the absorption lines in a shell are usually attributed to changes in the shell opacity, especially in the line-of-sight part of the shell that probably are the result of mass ejection, possibly from a rotational instability of the outer layers of the star, or from disturbance because of a close companion. The second case looks at the moment more probable after the above mentioned hypothesis of Harmanec et al. (1972) that 88 Her is probably a binary. But the spectrograms of September 1970 and of July 1971 were taken in opposite peaks of the 88·4-day radial – velocity curve of 88 Her given by Harmanec et al. (1972). Therefore a possibility exists that the spectral changes observed correspond to the changes of radial velocity.

The last Balmer line appearing on the GB 1213 plate is the H_{22}. Applying the Inglis-Teller formula

$$\log Ne = 23{\cdot}26 - 7{\cdot}5 \log n_m$$

we get for the 1971 phase $\log Ne = 13{\cdot}87$. This is an upper limit for the electronic density Ne in the envelope of 88 Her in 1971, if we consider that the last appearing Balmer line is due to the envelope.

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C_2 IN ETA AQUILAE SPECTRUM

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The equivalent width of R_1 (16) line of the 0–0 band of the Swan system of C_2 calculated for the minimum phase of light variation in η Aql comes out to be 27 mÅ. Thus, if Dawe's model atmosphere and the assumed abundance are realistic, the lines belonging to the 0–0 band of Swan system of C_2 will be observable in the η Aql spectrum.

Молекулы C_2 в спектре η Aql

Вычислена эквивалентная ширина линии R_1(16) полосы 0—0 системы Swan-а для C_2 вблизи минимальной фазы блеска η Aql, которая оказалась равной 27 mÅ. Следовательно, если модель атмосферы Dawe и предполагаемые количества реальны, линии указанной полосы могут наблюдаться в спектре η Aql.

Introduction

The abundance calculations by Pande et al. (1972) for some diatomic molecules in the atmosphere of η Aql based on Dawe's (1968) models show that C_2 is more abundant than the easily observable molecule CH, at all phases of the light variations in the star. So we decided to investigate the detectibility of the lines belonging to the 0–0 band of the C_2 Swan system by carrying out equivalent width calculations for a selected line of the said band based on Dawe's model for the minimum phase of light variation in η Aql. This model will henceforth be abbreviated as DM. It is obvious that such calculations help in testing the physical parameters and their depth variation in the adopted model and also to check the assumed abundances.

The details of the equivalent width calculations under study are reported and discussed here.

Equivalent Width Calculations

The concentration-optical depth curve for C_2 considered valid for solar abundances was obtained by

Pande et al. (1972) adopting DM. This curve has been used for calculating the equivalent width of 0 – 0 band line of R_1 branch of C_2 at 5136·256 Å.

The profile was assumed to form via pure absorption and Doppler broadened by thermal and turbulence effects. The depth variation of turbulence in DM is the same as given by Pande and Joshi (1972). The residual intensities at various distances from the centre of the line were obtained following the method given by Lambert (1968). The oscillator strength ($f_{el} \cdot f_{vib} = 2{\cdot}9 \times 10^{-2}$) for this transition and the rotational S_J factor are taken from Schadee (1964). For obtaining the continuous opacity the sources accounted for were H^- ion, neutral hydrogen, electron scattering and Rayleigh scattering by neutral hydrogen atoms. The variation of continuous opacity with depth was calculated in the same manner as given by Stankiewicz (1967). The $r(\Delta\lambda)$'s thus obtained give the equivalent width after numerical integration. The value comes out to be 27 mÅ.

Discussions

From the above we conclude that the lines belonging to the 0 – 0 band of the Swan system of C_2 will be observable in the spectrum of η Aql if DM and solar abundances are valid. However, its absence will indicate that either carbon is less abundant in the star or the temperature structure of DM is not describing the objective situation there. Another possibility could be that the star is more oxygen rich than the sun and most of the carbon is depleted in CO formation. If this be true the equivalent widths of the first overtone lines of CO will be larger than that calculated by Pande and Joshi (1973) for solar abundances in DM. There is some uncertainty about the location of the ground state of C_2 molecule. Herzberg (1953) assumes $x^3\Pi_u$ to be the ground state, which is also the lower electronic level for Swan system. On the other hand, Glushko (1962) assumes $x'\Sigma_g^+$ to be the ground state. If Glushko's version is accepted the equivalent width of the selected line will diminish slightly.

The nature of turbulence and its depth variation adopted by us is uncertain. Further, though we have assumed pure absorption as the mechanism responsible for line formation the actual mechanism may be different. Solar studies show that some of the molecular lines may originate via complete incoherent scattering e. g. CN lines in the solar spectrum (Khlystov, 1970) and others through pure absorption e. g. CO first overtone lines (Sitnik and Pande, 1967). For C_2 lines no such investigations exist. For these reasons we cannot attach too much weight to the profile. It is expected, however, that the equivalent widths of the C_2 lines will not be affected much.

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