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THE DISSOCIATION EQUILIBRIUM OF SOME DIATOMIC MOLECULES IN DELTA CEPHEI

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The dissociation equilibrium of CO, CN, C_2, CH, NH and OH is considered for the maximum and minimum phases of the light curve of δ Cep. Concentration-optical depth curves show that with both the phases the abundances decrease in the order CO, OH, CH, NH, CN and C_2. The amplitude of the abundance variation decreases in the order CO, CN, C_2. OH, NH and CH.

Диссоциативное равновесие некоторых двухатомных молекул в δ Cep. Рассматривается диссоциативное равновесие CO, CN, C_2, CH, NH и OH для максимума и минимума кривой блеска δ-Cep. Кривые концентрация — оптическая глубина показывают, что в обеих фазах содержание уменьшается в порядке CO, OH, CH. NH, CN и C_2. Амплитуда изменения содержания уменьшается в порядке CO, CN, C_2, OH NH и CH.

1. *Introduction*

Experience with diatomic molecules in the sun shows that the dissociation equilibrium of the diatomic molecules is sensitive enough for picking up even such differences in the runs of temperature T with optical depth τ as exist between an average facula and the photosphere (Pande et al., 1969a, 1969b). It is known that the cepheids show a large variation of effective temperature between maximum to minimum phases and that diatomic molecules CH and CN show spectral lines at both maximum and minimum phases of the light variation in δ Cep (cf., e.g., Walraven, 1948). All this suggests that dissociation equilibrium calculations should be carried out to assess how the abundances of some well-known molecules like CO, CN, C_2, OH, NH and CH, having dissociation potentials of 11·096, 7·5, 6·25, 4·395, 3·76 and 3·47 eV, respectively, and known to be present in the sun, would change with the phase of δ Cep.

*) Present address — see p. 199.

2. *Construction of model atmospheres*

A prior knowledge of the effective temperatures, a reasonable $(T - \tau)$ relationship, effective surface gravities at the two phases and the chemical composition enables one to construct models of δ Cep. The approach we adopted is similar to that of Dawe (1968) who constructed models for various phases of η Aql under the assumption of a quasi-hydrostatic equilibrium with constant gravity throughout the atmosphere. The abundances in η Aql were taken to be the cosmic abundances.

We have borrowed the spectral classes at the maximum and minimum phases of δ Cep from Melnikov (1962). These and the effective temperature scale for different spectral classes as applicable to luminosity class Ib (Mustel, 1960), yielded the effective temperatures T_e at the maximum and minimum phases to be 6200°K and 4700°K respectively. Next, the relationship between temperature and mean optical depth given by Krishnaswamy (1966) yielded the run of temperature T with mean optical depth τ at the two phases.