PROBLEM OF LATENT MASS UNDER RADIATION OF METEORS

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ABSTRACT. The date on absolute spectrophotometry of meteor spectrograms permit to estimate the number of radiating particles for different brightness of meteor.Methods of nonradiation meteor mass estimation are given. Comparison of observed numbers of radiating concentration with know data of artificial cosmic sample will allow to get the coefficients for calculation the nonradiating meteor mass.

Key words: Meteors: spectrofotometry, the latent mass.

The physical theory of meteor radiation is know to be founded upon equation:

$$J = \tau(-\mathrm{d}m/\mathrm{d}t)V^2/2, \tag{1}$$

τ - coefficient of radiation efficiency which can be determined quantitatively from special experiments. Only velocity V is the most beliable value obtained. τ and mass m, relation $m(t)$ are unknown magnitudes. It is possible to examine two methods possibility calculation of nonradiating meteor mass. First is the spectral intensity expression introduction a corrector factor $q_n = (A_{nl} + D_n)/A_{nl}$. In this expression A_{nl} is the calculated probability of spontaneous transmission from the level n to that l below per unit of time. The introduced magnitude D_n characterized frequency of inelastic collisions of the second art between particles of meteor plasma.

Formula for spontaneous radiation intensity from the level n to level l is of the form:

$$J_{nl} = N_n^T A_{nl} h\nu_{nl} q_n. \tag{2}$$

Here N_n^T - theoretical population of level n corresponding to the thermodiynamic equlibrium condition. The theoretical radiation intensity arising at the spontaneous transition from the level n to l is designated with i_{nl} and defined by the formula

$$i_{nl} = N_n^T A_{nl} h\nu_{nl}. \tag{3}$$

Let us assume the frequency of inelastic collisions of the second kind for levels n and k to be the same that is $Dn = Dk = D$. The nagnitude D can be derived which characterizes the degree of meteor plasma radiation departure from the equilibrium state

$$D = \frac{\frac{i_n}{i_k} - \frac{I_n}{I_k}}{A_n \frac{I_n}{I_k} - A_k \frac{i_n}{i_k}} A_n A_k, \tag{4}$$

that is possible to determine. However, to determine real theoretical values N of atom number density the real theoretical intensities for the model corresponding to a radiative object are needed which cannot be done practically.

Second method of calculating nonradiating meteor mass based on comparising the number for selected radiating atoms from observation and theoretical values of particle number densities received from decision of kinetics equation. Application of kinetics equations makes it possible to calculate changes in particle number densities in time (Smirnov, 1995). Comparing observed and theoretical number densities for the meteor we can get radiation efficiency.

Numerical calculations according to both methods contains in the book "Spectra of trancient atmospheric light phenomena: meteors" (Smirnov V.A., 1994).

So, to yield real elemental abundance in meteor spectra, artificial standards are needed the radiation of which occurs under the conditions similar to the meteor ones. The project "Fire I" is an illustration of such a standard object investigation (Millman, 1964). Comparison of spectra of such artificial objects with meteor plasma might help to determine meteor radiation efficiency and find real chemical composition of radiating matter.

References

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