to the observed quantities, i.e., to the magnitudes. In Jacchia's system we have

$$M_p = -2.5 \log I_p \tag{7}$$

and

$$M_v = -2.5 \log I_v. \tag{7a}$$

From equations (6) and (7a) it follows immediately that the logarithmic difference between τ_v expressed in cgs and in Jacchia's units is 9.72. Therefore we have

$$(\log \tau_{ov})_{\text{Öpik}} = -9.07 \text{ (cgs)}$$

$$(\log \tau_{ov})_{\text{Öpik}} = -18.79\,^{4} \text{ (Jacchia's units).}$$

For bright meteors, to which a color index correction -1.8 is applicable, we have

$$(\log \tau_{op})_{\text{Öpik}} = -18.07.$$

In addition to Jacchia's units for I_p and τ_p, we will use cgs units for all other quantities.

Procedure used for determining *n*

The drag equation is usually written in the form

$$a = \gamma A \rho_m^{-2/3} m^{-1/3} \rho_a v^2, \tag{8}$$

where a is the deceleration of the meteor; ρ_m, its density; γ, the drag coefficient; and A, the shape factor. The integration of equation (2) yields

$$m = 2\int_t^{t_E} \frac{I_p}{\tau_p v^2} dt, \tag{9}$$

t_E being the time at which the meteor ends. We assume that the terminal mass can be neglected; this should be correct in most cases (Jacchia, 1948; Verniani, 1959). Equation (9) may be written

$$m\tau_p = \frac{2}{\bar{v}^2}\int_t^{t_E} I_p dt = \frac{2E}{\bar{v}^2}, \tag{10}$$

where $E = \int_t^{t_E} I_p dt$ is the integrated brightness, and $\bar{v}$ is a value of v at some instant between t and t_E. The symbol τ_p refers here to the same velocity. Eventually, by eliminating m between equations (8) and (10), we obtain

$$\frac{\tau_p}{\rho_m^2} = \frac{2E}{\bar{v}^2}\left(\frac{a}{\gamma A \rho_a \bar{v}^2}\right)^3. \tag{11}$$

In writing equation (11), we admit the equality of the "dynamic" mass derived from the drag equation and of the "photometric" mass obtained by integrating the light curve. Such an assumption is valid only for meteors that ablate without fragmenting. Therefore, for most of the Super-Schmidt meteors, which crumble during their flight in the atmosphere, such an assumption is not right. It is well known that the photometric mass takes into account the light emitted from all fragments and therefore may also be considered reliable for fragmenting meteors. In contrast, the dynamic mass corresponds only to the mass of the larger fragments to which the measured deceleration refers. We must conclude that in the general case, when fragmentation is present, equation (11) overestimates τ_p/ρ_m^2. We will see under "Data and results" (p. 148ff.), however, that it is always possible to make use of equation (11) by taking into account the effects of fragmentation by means of Jacchia's fragmentation index χ.

The photographic data allow the determination of the velocity v, deceleration a, integrated brightness E and height z. The U.S. Standard Atmosphere (1962) gives ρ_a as a function of z. The Super-Schmidt meteors have several decelerations each; we will see that the most reliable for our purpose are those near to the beginning of the light. Therefore, for each meteor only one value $\bar{v}$ has been computed. We assumed $\bar{v}$ to be equal to the value of v corresponding to $m = \frac{1}{2}m_\infty$, i.e., to the value zero of Jacchia's mass-loss parameter s. Inspection of the light curves and of the observational velocity curves shows that $v_{s=0}$ represents a very adequate approximation of $\bar{v}$. The difference between $\bar{v}$ and v_∞ is generally very small. It is of the order of 1 or 2 percent for slow meteors and goes down to 0.1 or 0.2 percent for the fast ones.

The shape factor A is unknown. According to Öpik (1958), rotation, vibration, and oscillation of meteors during their flight smooth

[4] The value used in Harvard's work is −18.91. The difference of 0.12 results from the different form of equation (6), which was previously established by Öpik (1937) as: $M_v = 24.6 - 2.5 \log I_v$.