

## BRIEF COMMUNICATIONS

## VISUAL CATALOGS OF ABSOLUTE MAGNITUDES OF COMETS

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The author presents his views on suitable contents of a catalog of absolute magnitudes of comets.

In catalogs of visual photometric cometary parameters it is necessary to include, in addition to the values of the parameters, all data from which it might be possible to judge the reliability of their determination. The reduction of the brightness estimates for the heads of comets is performed either according to the old formula

$$H = H_0 + 2.5 n \log r,$$

or according to the new one derived by B. Iu. Levin [1-2]

$$H = H_0 + 0.547 \frac{L}{T_0} (\sqrt{r} - 1),$$

where  $H$  is already reduced to unit distance from the earth; there are two parameters:  $H_0$  and  $\underline{n}$  (or  $y = 2.5 n$ ) and  $H_0$  and  $\underline{p}$ , where

$$\underline{p} = 0.547 \frac{L}{T_0}.$$

The reduction of brightness estimates for the heads of comets having bright  $C_2$  bands in their spectra (in making visual estimates the unaided eye sees the head of a comet almost exclusively in the light of the  $C_2$  band on the background of a usually faint continuous spectrum) should be performed according to the new formula (for example, comets 1908 III, 1911 V, etc.). The formula was derived by B. Iu. Levin especially for comets with bright gas emissions. If the spectrum of the comet is continuous and the gas emissions are either not present or are barely perceptible (for example, comets 1892 III, 1901 I, etc.), the reduction should be made by use of the old formula, after a preliminary correction for the phase angle (for example, according to Euler).

The brightness estimates for comets with perihelion distances greater than 2 AU must be reduced according to the old formula. If at the epoch of observation the comet has passed through  $r = 1$  AU, the computed magnitudes  $H_0$  determined from the old and the new formulas are practically equal.

In addition to the values of the parameters determined from a solution of the equations by the method of least squares, their probable errors should be entered in the catalog. It is quite clear that the reliability of determination of the fundamental parameter  $H_0$  depends on whether the comet passed through  $r = 1$  AU (or close to 1 AU) at the epoch of observation. Only in this case will  $H_0$  be determined with sufficient accuracy (by interpolation). In the catalogs, therefore, it is necessary to give for each comet the limiting values of  $\underline{r}$  for the epoch of observation.

The second parameter  $\underline{n}$  (or  $\underline{y}$ ) and  $\underline{p}$  are reliably determined if a large number of observations are available and if they cover a considerable length of arc of the comet's orbit (i.e., if they cover a sufficiently large interval in  $\underline{r}$ ). Therefore, besides the limiting values of  $\underline{r}$ , it is also necessary to give for each comet the number of photometric estimates. In the remarks for each comet, the source of a series of photometric estimates

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(obtained by the same observer) or the sources of individual estimates by different observers should be indicated.

If possible, it should be shown how the estimate was made (unaided eye, prismatic binoculars, refractor, etc., and their F, D, and magnification). If the estimate was not expressed in stellar magnitudes, it should be quoted in its entirety (for example, "the comet was visible to the naked eye," "the comet was visible against the background of the twilight sky after sunset," and so on).

Recently S. K. Vsekhsviatskii [3] published his "Catalog of Absolute Magnitudes of Comets." His first catalog [4] was printed in 1933. However, neither the method of reducing the observations nor the plan of compilation of the catalog has changed in the past quarter of a century. But during this time Bobrovnikoff has published [5] a photometric catalog which unquestionably represents a definite step forward; later B. Iu. Levin [2] made a serious analysis of this catalog, even deriving a new formula, based on physical principles, for reducing the observations.

In his catalog, S. K. Vsekhsviatskii lists  $\underline{y}$ ,  $H_y$  and  $H_{10}$  for each comet. The author for some reason designates as absolute this last magnitude  $H_{10}$ , computed on the assumption that  $y = 10$ . But the absolute magnitude of a comet is the brightness of its head, determined from the observed brightnesses, reduced to  $r = \Delta = 1$  AU, when  $\underline{y}$  or  $\underline{n}$ , which characterize the law of brightness variation, are also determined from the same observations.

In view of the enormous dispersion in the values of  $\underline{y}$  for different comets (from  $-5$  to  $+28$ ), which depends not only on unavoidable errors of observations, but for the most part on characteristic properties of the cometary nuclei, to take for the determination of  $H_0$  some mean value  $y = 10$  is to create fictitious values ( $H_{10}$ ) which distort the physical meaning of the parameters.

The parameter  $\underline{y}$ , reliably determined from observations over a known interval of arc in the comet's orbit, has a definite physical meaning which it is the task of future investigations to disclose. That is why there should be included in the catalogs, besides the values of the parameters determined from observations by the method of least squares, their possible errors as well. The reliability of determination of the parameters depends on the interval in  $\underline{r}$  covered by the observations and on the accuracy and number of observations.

In S. K. Vsekhsviatskii's summary catalog there are no limiting values of  $\underline{r}$ , no numbers of observations, no probable errors of  $H_0$  and  $\underline{y}$ ; hence the reliability of the parameters computed by him remains indeterminate, although in the latter sections of his general catalog, for example in the work of T. V. Vodop'ianova on the determination of photometric parameters for each comet, the limiting values of  $\underline{r}$  and the number of photometric estimates are indicated [6].

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