A NOTE ON PERSONAL EQUATION FOR VISUAL OBSERVATION OF OCCULTATION

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Abstract

Data of visual observations of occultations, which were obtained by a single observer and were made simultaneously with photoelectric observations, are analysed. Time delays of visual observations from respective photoelectric observations are, in general, larger for fainter stars, showing a concentration to 0.4 sec for visual data of good quality. We should not employ any definite value of personal equation even for data made by a single observer.

For reduction analysis of visual observations of occultations the effect of personal equation should be taken into account. In general the value of personal equation is considered to be about 0.3 to 0.4 sec.

Though personal equation is usually evaluated for each observer empirically through long series of observations, this value is never constant even for a single observer but is affected by various conditions at the time of observation. In the Hydrographic Office of Japan, value of personal equation has been determined for each observer by any kind of simple flashing apparatus (e.g. Ono, 1967) immediately before and after each observation.

In the Hydrographic Office observations of occultations are carried out by photoelectric apparatus principally, with which visual observations are made simultaneously, if possible. For faint stars only visual observations are made. Among them the number of simultaneous data of which visual observations were made by a single observer at Kurasiki Hydrographic Observatory ($\varphi = +34°35'23.''38$, $\lambda = -8^h 55^m 05.^s023$, h=4.9m) amounts to about one hundred and fifty during 1956 to 1964. This accumulation of data seems to be sufficient to investigate characters of personal equation.

At Kurasiki Hydrographic Observatory photoelectric observations are made by 30-cm Cassegrain-reflector with 1P21 photomultiplier and visual observations are made by 20-cm Newton-reflector using button swich which is connected to ink-oscillograph for the photoelectric recording.

Fig. 1 shows 137 data obtained by S. Kaneko of the observatory. Abscissa denotes time delay of visual observation from photoelectric observation, and ordinate denotes magnitude of occulted star. Quality of visual data is classified into three classes, *A*, *B* and *C*. This quality is designated by the observer himself just after each observation only through his feeling without any scientific criterion.

A : good, *B* : fair, *C* : poor .

In practice, there exist worse 18 data classified as *D* or *E*. These *D*- and *E*-

data are not adopted to reduction analysis.

In Fig. 1 we can see that

(i) most of *A*-data lie in a rectangular triangle surrounded by ($0.^s35, 3^{mag}$), ($0.^s35, 8^{mag}$) and ($0.^s7, 8^{mag}$), showing a concentration along $0.^s4$.

(ii) *B*-data seem to occupy a slanting belt which lies below and right-hand of the *A*-data triangle, and

(iii) *C*-data scatter in the region of larger time delay, showing that this class also cannot be adopted to reduction analysis.

In Fig. 2, arithmetical means and modes of the time delay for each stellar magnitude are shown by solid line and dashed line, respectively. In general, the fainter the occulted star the larger the delay of visual observation. This tendency is clear for *B*-class data, while for *A*-class modes are situated in the region between 0.4 to 0.5 sec of time delay, independent of magnitude of star. Data of the brightest stars do not follow this.

Recently, in her analysis of occultations for 1958 and 1959, F. M. Sadler (1966) took into account the effect of the moon's limb, obtainning a result that probable errors of evaluated corrections to the moon's position reduced to almost one-half. In such precise discussion, it seems desirable to consider the complicated effect of personal equation which is suggested in the present note.

The effect of the phase of the moon to the personal equation is not taken into account here. This will be treated after accumulation of more observational data.

(Astronomical Section)

References

Ono, F. 1967, *Report of Hydrographic Researches*, No. 2, 73.

Sadler, F. M. 1966, *Royal Observatory Bulletins*, No. 107.

TABLE 1. STATISTICAL DATA

class	mag.	n	mean $\bar{t}$	disp. σ	mode m	skewness $\frac{m-\bar{t}}{\sigma}$
A	0.5 — 1.4	2	0.52	0.08		
	1.5 — 2.4	0				
	2.5 — 3.4	2	0.42	0.01		
	3.5 — 4.4	5	0.49	0.12	0.44	0.4
	4.5 — 5.4	12	0.50	0.12	0.47	0.6
	5.5 — 6.4	25	0.49	0.15	0.41	0.5
	6.5 — 7.4	32	0.52	0.17	0.42	0.6
	7.5 — 8.4	17	0.60	0.28	0.46	0.5
B	0.5 — 1.4	2	0.46	0.05		
	1.5 — 2.4	0				
	2.5 — 3.4	0				
	3.5 — 4.4	2	0.51	0.16		
	4.5 — 5.4	1	0.53			
	5.5 — 6.4	14	0.66	0.22	0.49	0.8
	6.5 — 7.4	6	0.77	0.15	0.63	0.9
	7.5 — 8.4	10	0.91	0.29	0.79	0.4
C	3.5 — 4.4	1	1.23			
	4.5 — 5.4	0				
	5.5 — 6.4	2	1.07	0.14		
	6.5 — 7.4	1	1.51			
	7.5 — 8.4	3	1.19	0.08		
D & *E*		18				

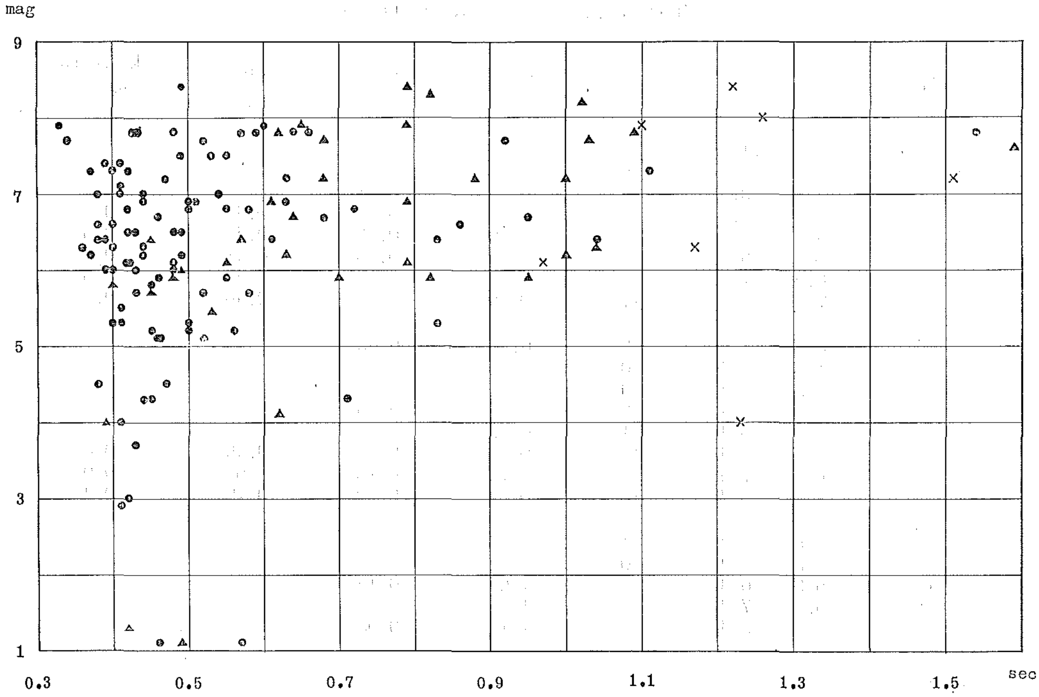

Fig. 1. *Abscissa* : Time delay of visual observation from photoelectric observation obtained simultaneously.
Ordinate : Magnitude of occulted star.
Quality of visual observation : dot, *A* ; triangle, *B* ; cross, *C*.

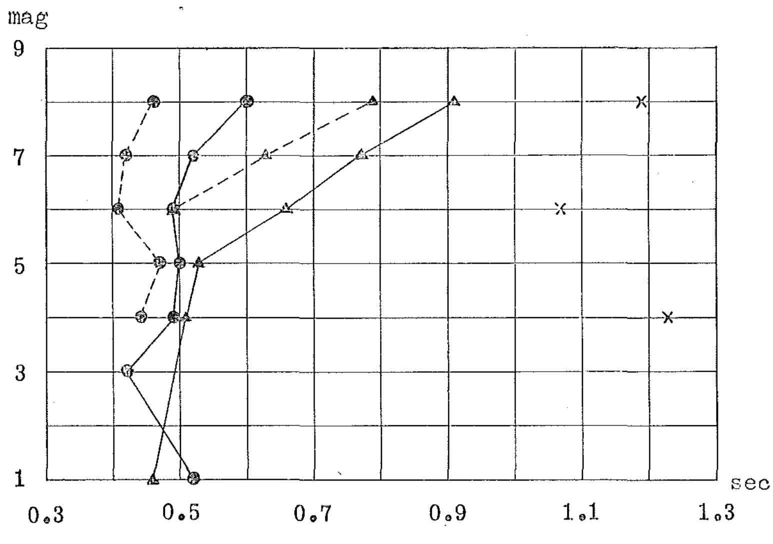

Fig. 2. *Abscissa* : Time delay. *Ordinate* : Magnitude.
Solid line : mean, dashed line : mode.