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HVAR OBSERVATORY 65-CM TELESCOPE AND SOME PRELIMINARY RESULTS

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Abstract. Description of a 65-cm telescope and its single-channel UBV photometer is given. Determination of certain instrumental parameters which are neccessary in the reduction of observations (calibration of sensitivity switch, measuring of photometer apertures, determination of extinction and color-system coeficients) is also presented.

Note is also given on observations carried out so far, as wel as on future research programme and improvements of the instrument.

I. *Introduction*

Hvar Observatory, whose building has been described in detail by Petković (1975), has fairly good weather conditions, and specially large number of photometrical nights. The main instrument installed at Hvar Observatory is 65-cm reflector designed for photoelectric photometry. Herein we shall describe the instrument, give some preliminary results of determination of extinction and color-system coefficients, together with programme of future research.

II. *Telescope and Photometer*

The telescope is of the Cassegrain type. The primary and the secondary mirrors have diameters 65 and 19 cm, respectively. Observations could be taken in Cassegrain focus only. With the focal length of 7300 mm, f/11.2, scale is 2.1 mm = 1 arcmin. The primary is ellipsoidal, while the secondary one is spehrical. Because of that the optical system has larger coma than the classical Cassegrain system.

The telescope, constructet at Carl Zeiss Jena is mounted on a German type bearing, size VII. The dayly motion is provided by Uhrgan, a d.c. motor, controlled by Electrochron clock adjusted for sideral time. The telescope with accessories

is sheltered in the pavillon with movable roof. In near future building of a dome is planned because wind reduces instrument's efficiency. Great problem is also sea-salt and each two years mirrors must be refurbished.

Single-channel photoelectric photometer of classical construction was designed by Dr. P. Mayer of Astronomical Institute of Charles University, Praha, Czechoslovakia. The photomultiplier EMI 6256 S is placed in an airtight box. Following filters are in use; U, 2 mm Schott UG 2; B, 2 mm Schott GG 13 + 1 mm Schott BG 12; V, 2 mm Schott GG 11. Two places on filter rod are free and other filters up to 25.5 × 25.5 mm and 7 mm thick can be used for special purposes. The image in the second eyepieces is reversed relative to the image in the other (primary and finder eyepieces) eyepieces. As the diameters of the photometer apertures were not known, the authors have taken necessary measurements. Diameters in arcsec are respectively; 19.9; 26.8; 31.5; 30.4; and 98.6.

The suitable voltage for the present photomultiplier is 1600 V (regulated high voltage supply NBZ 411 are in use). With the given voltage the brightest measurable stars are 3th magnitude.

III. *Extinction and Color Coefficients*

Results which will be presented here are very preliminary. In order to determin the extinction and color-system coefficients several standard open clusters were observed many times (NGC numbers; 225, 6910, 7092, 7160 and 7686). In reductions, which were done by means of computer programme HEC 9 (author Dr. P. Harmanec of Astronomical Institute of Czechoslovak Academy of Sciences, Ondrejov, Czechoslovakia) many standard star observations were also included. Extinction coefficients are: $k_V = 0.3$, $k_{B-V} = 0.24$ and $k_{U-B} = 0.40$. Color coefficients c_V, c_{B-V}, and c_{U-B} are —0.135, 1.155 and 1.005, respectively, for observations before May 1974, and —0.150, 1.174 and 1.000, respectively, after May 1974 when mirrors were refurbished.

Table I — Sensitivity steps

Position	Magnitude difference	
	Switch No. 1	Switch No. 3
1	0.000	0.000
2	0.619	0.633
3	1.233	1.313
4	1.874	1.963
5	2.513	2.621
6	3.121	3.264
7	3.730	3.901
8	4.361	4.581
9	4.956	5.264
10	5.574	5.892
11	6.215	6.525
12	6.864	7.175
13	7.493	7.798
14	8.096	8.448
15	8.701	9.153
16	9.336	—

In August 1975 new sensitivity switch was installed. In Table I results of calibration measurements of sensitivity steps are given. Data for sensitivity switch used before are also shown.

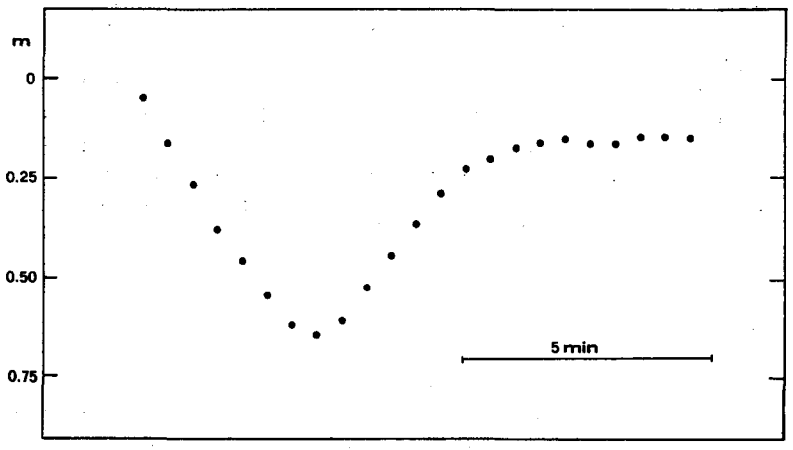

Figure 1 — Brightness vs. time of occultation of Europa by Io on August 23, 1973.

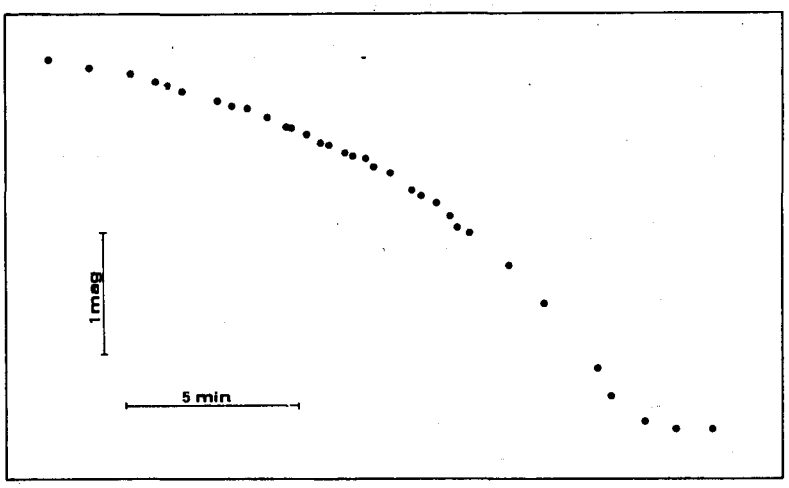

Figure 2 — Brightness vs. time of Ganymede disappearance in Jupiter's shadow on August 16, 1975.

IV. *Results Achieved*

The instrument is in charge since summer of 1972, and was used mostly by Czechoslovak collegues from Astronomical Institute of Czechoslovak Academy of Sciences (Ondrejov Observatory) and Astronomical Institute of Charles University from Praha. Authors were also included in the programme

they carried out at Hvar Observatory. Observations were exclusively devoted to: (1) eclipsing systems, (2) shell stars and (3) Wolf—Rayet stars. Results of photoelectric observations of BR Cyg, a very interesting binary, are already published (Harmanec et al., 1973).

Besides this the authors have observed several very interesting solar system eclipse phenomena; occultations of Europa by Io on August 23, 1973 and October 1, 1973, reappearance of Io from Jupiter's shadow on October 10, 1974, and Ganymede disappearance on August 16, 1975. Planed was also photoelectric photometry of Total Lunar Eclipse on November 29, 1974 but bad weather conditions made impossible any observations. Recordings of Jupiter satellites mutual phenomena have been proceeded to Dr. R. L. Millis of Lowell Observatory for further analysis. Results of two-color search for the Io post-eclipse brightening was shown elsewhere (Pavlovski, 1975). Some preliminary reduction of our eclipse curves are shown on Figs. 1 and 2.

V. *Future Work*

Work with the instrument is coordinated by Astrophysical Section of Hvar Observatory. Programme of observations, which is presented below includes in several points Czechoslovak programme also, so that majority of observations is carried out in cooperation with the collegues from Astronomical Institute of Czechoslovak Academy of Sciences (Ondrejov Observatory).

The programme provides for the observation of:

(1) Be stars: ζ Tau, 4 Her, 88 Her, o And, HD 41335, AX Mon, HD 218393, HD 187399, HD 173219, κ Dra, HD 174237, φ Per, HR 894, 28 Tau, and 17 Lep.

(2) Wolf—Rayet stars: HD 190918, HD 191765, HD 192163, HD 192641, HD 193077, HD 228766, HD 193576, HD 193793 and HD 193928.

(3) Peculiar A stars: HR 5355, HD 105058, HR 5045, HR 5313, HR 5153, HR 5749, HD 148330, HD 4776 and HD 100679.

(4) Eclipse binary star: RX Cas

(5) X-ray source: Cyg X—1

(6) Semiregular variables: T Ari, KS Peg, α Ori, RS Cnc, Y CVn, α Her, RS Cyg, μ Cep and TZ And (according to plans on working on autocorrelation and spectral analysis)

(7) Solar system eclipse phenomena:
   a) Lunar eclipses
   b) Io reappearance from Jupiter's shadow
   c) Jupiter satellites disappearances

(8) Short lived phenomena:
   a) Novae
   b) Comets.

For the future, installation of two-channel photometer is planned as well as intermediate and narow band photometry. Future programme includes also

detailed extinction study by means of special series of extinction stars. There are plans for extending programme also to polarimetry in coolaboration with the collegues from Belgrade Astronomical Observatory.

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