Atmospheric extinction measure at Guwahati

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Abstract. The extinction coefficients in UBV filters were determined using the 15cm reflector at Guwahati University Observatory, Jalukbari during January - March, 1994, January - March, 1995 with photometric observations. The extinction coefficient K_U, K_B, K_V have been found to vary between 0.58 - 0.66, 0.53 - 0.61, 0.45 - 0.48 respectively and their average values are obtained. A seasonal variation is expected. This is an important parameter for the site of the observatory. Measurement of the extinction coefficients for a longer period will be required for a reliable estimate of the parameter.

Key words: extinction coefficient, star observation, photometry

1. Introduction

The Gauhati University Observatory is located at Gauhati University campus, Jalukbari, Guwahati. Its latitude is 26°.1 north and longitude 92°.45 east. The average annual rainfall at Guwahati is 1832.5mm (1986 - 1993) (IMD). The sky is completely clear during the period September - March.

The principal factors which decide the suitability of an astronomical site are the 'seeing' and the sky transparency. Transparency plays a major role in determining the photometric quality of the site. Good and steady transparent skies are most essential while measuring the absolute brightness of astronomical objects. When starlight traverses through the earth's atmosphere it suffers a loss which can be expressed as (Birney, 1991)

$$M_O = M - KX \tag{1}$$

where M_O is the magnitude of a star as it appears outside the earth's atmosphere, M is the actual observed magnitude through a path length X in the atmosphere and K the extinction coefficient. Normally X is measured in units of air masses at the zenith of the observer and hence K is loss of magnitude for a star at zenith obtained as the slope of $M_O - X$ line.

2. Instruments and observations

A 15cm cassegrain reflecting telescope (Carl-Zeiss make) was installed in Gauhati university observatory. A solid state photometer (SSP-3) attached to the telescope was used for the observation. We use the following schott filters: (Handle & Kaitchuk, 1982).

U – UG 2 (2mm)
B – GG 13 (2mm) + BG 12 (2mm)
V – GG 14 (2mm)

Each of the filters used has been computer - optimized for the best fit with standard established by Johnson *et al.* (1966). Airmasses were calculated from the zenith angles and magnitudes (counts) were calculated from the digital display of the solid state photometer.

3. Results and discussion

During the period 1994 to 1995 March, we have attempted to quantitatively determine the sky transparency on several nights. Observations covering 1-2 airmasses could be obtained only on 11 nights. The plots of U, B, V, B-V, B-U magnitudes (counts) against the corresponding airmasses are given in Table 1. The table lists the data of observations, star identification and extinction coefficients K in U, B, V, B-U, B-V denated by K_U, K_B, K_V, K_{BU}, K_{BV}. Now from the definition of extinction coefficient, (J. Singh *et al.* 1988),

$$K_B = K_{BV} + K_V$$
$$K_U = K_{UB} + K_B$$

The extinction coefficients K_U, K_B, K_V have been found to vary between 0.58 - 0.68, 0.53 - 0.61, 0.45 - 0.48 respectively and average values are K_U = .63 ± .076 (S.D), K_B = .57 + .038 (S.D) and K_V = .47 + .015 (S.D).

Table 1.

Date	K_V	K_{BV}	K_{BU}	KU	KB	Star
19 Jan., '94	.45	.13	.20	.66	.58	α Tau
4 Feb., '94	.46	.08	.18	.64	.54	α Tau
7 Feb., 94	.48	.13	.20	.68	.61	α Tau
8 Mar., '94	.48	.049	.10	.58	.53	β Gem
9 Mar., '94	.47	.07	.12	.59	.51	β Gem
25 Dec., '94	.47	.11	.17	.64	.58	α Tau
27 Dec., '94	.48	.12	.19	.67	.60	α Tau
29 Jan., '95	.45	.14	.22	.67	.59	α Tau
2 Feb., '95	.46	.16	.19	.62	.55	α Tau
12 Mar., '95	.48	.09	.14	.62	.57	β Gem
14 Mar., '95	.47	.07	.16	.63	.53	β Gem

Average K_V = 47 ± .05; K_U = .63 ± 0.76; K_B = .57 ± 0.36

Since the data samples are very limited no meaningful deduction can be made about the seasonal variation of extinction coefficients at Guwahati. Efforts are in progress to determine the extinction coefficients on a longer number of nights so that we could obtain a better picture about the sky transparency at Guwahati and thereby make a detailed comparison with other observatory sites of the world.

References

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