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PROPOSALS TO FLARE STAR OBSERVERS

With the rapid increase in both the number of observers and the quantity of flare observations which has taken place in the last few years, several problems of standardisation and homogenisation of observational data have revealed themselves. It has become clear that the existing, various ways of observing and of publishing results cannot provide data suitable for future statistical investigations.

Drawing from the accumulated experience of many observers, the 'Working group on flare stars' of Commission 27 would like to suggest that further work on UV Ceti-type stars be based on the following considerations.

1) Photoelectric monitoring should be carried out in one of the standard UBV spectral bands (c.f.Johnson,H.L. 1955, Ann.d'ap., 18, p.292) within a closely-matched photometric system. Multi-colour observations of flares are most desirable, but continuous monitoring should be done bearing in mind that the effectiveness of flare detection increases towards shorter wavelengths.

2) In order to study the slow (secondary) and possibly secular light variations it is necessary to determine differential magnitudes and colours of the flare stars with respect to one, or better two comparison stars in the proximity. It is felt that this additional information on secondary variation is well worth the slight loss of monitoring time. The following comparison stars are suggested to improve the combining of results from different observers.

YZ CMi	Stars a and c (BD +3°1783) in I.B.V.S. No.265, 1968.
AD Leo	Companion star at 1!7 N. See I.B.V.S. No.307, 1968.
UV Cet	Stars d and e in Ap.J. Vol.109, p.534,1949.
V 1216 Sag	Stars d and e in I.B.V.S. No.273, 1968.

Whilst the colours of some of these comparison stars do not closely match the flare stars the possible variability of the redder stars makes them somewhat less suitable. Details of mirror-photomultiplier-filter combinations, and transformation equations from instrumental to standard system, when applied, should be stated.

3) Data on monitoring should include, whenever possible:

a) The date and Universal time of the star and end of effective coverage given in tabular form, noting all interruptions of more than one minute.

b) The standard deviation of random noise fluctuations, typical of the night or series of nights, given in magnitude form,

$$\sigma \text{ (mag)} = -2.5 \log (|\sigma|/I_o)$$

where I_o is the intensity deflection (less sky) of the quiet star.

The sampling time interval for σ should be that used throughout for the detection of small flares. The detection criterion is normally given by the 3-sigma rule.

c) A limiting magnitude for flare detection in the UBV spectral bands, defined with sufficient accuracy by,

$$m_{lim} = m_o - 2.5 \log (|3\sigma|/I_o)$$

$$= m_o + \sigma \text{ (mag)} - 1.19$$

where m_o is the mean apparent magnitude of the quiet star in the UBV system for the night or series of nights, for each filter.

4) The following standardised data on flares is also requested:

a) The date and Universal time of flare maximum.

b) The durations before and after maximum in the spectral band used for monitoring for all flares exceeding 3σ-deviation at maximum. Difficulties are frequently experienced here and individual treatment is almost inevitable. It is suggested that pre-flares be omitted and that the duration on the primary rising branch be given. The

greatest difficulty is met with on the descending branch, particularly when the star does not return to normal brightness. It should be stressed that the quoted duration after maximum need only be an indication, and cannot be a satisfactory time scale for large and small flares alike, and for flares of differing forms.

c) The standard deviations (as 3b) near all flares in each spectral band in which the flare is observed, using the same sampling procedure as in the general detection.

d) The maximum intensity in the magnitude scale, approximately in the UBV system, in each spectral band if possible, as defined by,

$$m_f = m_o - 2.5 \log (I_{o+f} - I_o)/I_o$$

where I_{o+f} is the total intensity deflection (less sky) of star plus flare at maximum. It should be noted that statistical investigations in which the values Δ m have been used may be strongly affected by the observational selection; therefore it is desirable to express the measured fluxes of flares in stellar magnitude (or in absolute units).

e) The integrated intensity (in minutes) of each flare over the total duration, including pre-flare if present, as given by,

$$P = \int (I_{o+f} - I_o) / I_o \, dt$$

f) The light curves in relative intensity units (as indicated in the integral) for all observed flares. Sufficient time resolution should be employed to retain all reasonable detail as dictated by the study of standard deviations and the time constant of the equipment.

g) The air mass (or secant of zenith distance) at the time of all flares, together with remarks on sky conditions, including seeing and moonlight, to aid in the weighting of suspected flares.

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