

AN OBSERVING CAMPAIGN FOR SYSTEMATIC PHOTOELECTRIC OBSERVATIONS
OF BRIGHT Be STARS

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Most of our present-day knowledge of the photometric behaviour of Be stars still comes from various surveys only. Little attention was paid to systematic studies of possible photometric variability of particular objects on different time scales. Nevertheless, just this kind of information is necessary if one wants to study the physical relationship and/or differences between Be stars and other types of B stars like Beta Cepheids, supergiants, helium-rich stars etc., and to test various models of the Be phenomenon. Long systematic photoelectric observations do exist only for several Be stars. They invariably indicate that the long-term variability - if present - is always the most pronounced one. In some cases, this long-term variability masks the periodic light variations occurring on shorter time scales (see, e.g., the case of CX Dra, Koubský et al 1980).

All this suggests that the series of systematic (differentially measured) photoelectric observations of individual Be stars secured over many years would be of a great value. Consequently, an appeal was made by Harmanec et al (1980a) and by Harmanec (1980) to organize an international cooperation on systematic photoelectric observations of a large but defined group of bright Be stars over a period of at least ten years.

After a positive reaction from a number of colleagues all over the world we prepared a detailed observing programme, selecting comparison and check stars etc. for about 140 bright emission-line B objects (including several supergiants) - roughly up to the magnitude limit of the Bright Star Catalogue and north of -20° declination. Detailed instructions concerning the practicalities of the campaign have been published in the second issue of the Be Star Newsletter which is available on request from Dr.M.Jaschek (Harmanec et al 1980b).

Important points to be discussed here are:

1. All the measurements should be performed differentially, with

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respect to comparison stars which, after some optimization of their choice, should become obligatory for all the participants.

2. A careful transformation to standard photometric systems must be performed. Colour coefficients should be determined for each observing season.

3. To ensure convincing detection of possible rapid variations of a small amplitude and to give an idea about confidence of a particular set of measurements, each participant should observe the check stars as frequently as variables and to publish the results of these measurements, too.

4. Which would be the most suitable form of publishing and storing the data obtained in the course of the campaign is a point which we should agree on here.

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HARMANEC: Let me to summarize the main ideas from our discussion as follows:

1. As the campaign is planned for 10 or 20 years, we should afford to devote say one or two years to a search for optimal comparison stars in particular cases.

2. Individual observations from all participants should be collected in the data files which already exist at the Ondřejov Observatory Computing Centre. They should be made available to anybody on request.

3. All participants should feel free to publish their results in usual astronomical journals. However before submitting their papers to particular journals they should send them to the Ondřejov Campaign Centre which should play the role of a first referee to check whether the papers contain all basic pieces of information on which we agreed here.

4. The Campaign Centre should extend the observing programme also to southern Be stars.

5. New detailed instructions concerning the organization of the campaign, amount of obligatory information to be published, etc. will be prepared for the next issue of the Be Star Newsletter. In particular, a list of suitable standard stars with obligatory standard values will be prepared for convenience of participants and in an effort to homogenize the data as much as possible.

DISCUSSION

C. Jaschek: Is a regular journal going to accept to publish observational data in small bits?

Sterken: 1. IBVS will not object against publishing numerous short reports. The publication is fast and there are no page charges.
2. Are you willing to act as a kind of referee when you get the progress reports? Do you plan to inform people if they are not observing in the correct way? This would be very desirable and would insure the homogeneity and the credibility of the results.

Harmanec: 1. Yes, IBVS is a very good possibility for rapid publishing.
2. Also yes, we agree to do that. We shall prepare some suggestion along this line for the next Be Newsletters.

Sterken: 1. I have a comment on the use of small or medium passbands: since amateur observers will be involved, and since many of them work with apertures of 30 to 35 cm, it might be a problem to obtain the same accuracy when using narrow bands.
2. I agree that it is very important to observe the same comparison stars all the time, even if they are relatively distant to the program star. But near-by comparison stars are absolute needed in order to carry out accurate photometry (especially if short time variations are studied). I would therefore suggest that every observer selects one comparison star in the very neighbourhood of the program star, and that he observes them together with the official comparison star. After two or three years the promoters of the campaign will be able to single out the good (constant) nearby comparison star, after which they could be kept as definite comparison stars. On a project which is meant to be executed over 10 or 20 years, it would really pay to look first for good comparison stars.

Harmanec: Well, I hope that it will be possible to distribute the objects in such a way that amateur observers will observe mainly the brightest program stars. (As to sec. question, see my reply to Dr. Sareyan)

Sareyan: I strongly suggest that we use no longer the UBV system, even if it is a "realistic" choice just now, it's a very bad one on the long-term scale. Any narrow band pass filter system is easier to reduce than UBV, which has numerous draw-backs: the U filter has a red leak, the flux in which depends on the actual multiplier's cathode; the V filter is cut off on its red side only by the photomultiplier cathode's cut-off. So these two limits are PMT dependent. Moreover it would be really useful (and necessary) that each observation is given with the PMT temperature, and its stability during the night, even if the observations are made differentially (a 1% drift is given by a 1°C drift in flux of the photocathode, and this cannot be completely removed when we observe with large bandpass filters some variable and comparison stars that have very different spectral types).

2. It appears that very short period variations (< 1 day) cannot be investigated as exactly as longer periods. For example, the comparison star in rapid differential photometry has to be very close to the variable; so they probably won't be photometric standards, and no reduction "to the system" can be done that particular night, in order to increase the measurement's precision and the time resolution.

Harmanec: Starting with the first appeal for photometric observations of Be stars we always stressed that the ubvy β system should be preferred over the Johnson system. In fact, we ordered the Strömrgren filters from the Kitt Peak and in future we shall use them in Ondrejov and at Hvar. The same did Dr. Muminović in Sarajevo. Yet, I am afraid that for most of the data we will have to live with the UBV data. I believe that if the choice is to have no photometric information or to have the UBV data only, than the latter possibility is to be preferred. It is certainly possible to use different comparison stars for various types of observations according to the special needs of the program, but in all such cases, at least few differential observations of this new comparison star with respect to the obligatory one should be performed during each observing night. Then you do not lose the information for possible long-term variability.

Sterken: Could you consider to extend your program to the southern hemisphere? The southern hemisphere offers many possibilities for long observing runs under good observing conditions, and especially in Australia and New Zealand there are many amateurs who are able to perform professionally, and who are surely willing to participate such a campaign.

Harmanec: Well, we shall do it, but I shall send you a preliminary version of the program to check the suitability of selected comparison stars.

Mermilliod: ubvy photometry is homogenous only as long as small groups are working in this system. If a large number of people are to work with it, the same will happen as happened to the UBV system: systematic differences and a large scatter will appear for stars observed by various observers.

Harmanec: Thank you for reminding me this point. I would like to ask the audience whether it would be useful to prepare an obligatory list of standard stars and ask all the participants to use just these stars for deriving the colour transformation coefficients of a given photometric system. - yes? It seems that you all agree.

Bolton: We should not worry about transformations between Johnson U and Strömrgren u because the bandpass of U crosses the Balmer jump. This will make the transformation for Be stars very difficult and makes the U band useless for physical interpretations.

Harmanec: But you probably agree that at least the V and B-V data can

be reconciled with the corresponding Strömgren values. Then we can save at least some brightness and colour information about the long-term variability.