SOFTWARE TOOLS FOR THE VARIABLE STAR OBSERVER

J. Gunther
47 Grande rue
78510 Triel, France

Abstract

Software for collecting visual observations is described.

1   Introduction

The efficiency of amateur observers of variable stars and the usefulness of their work for the progress of stellar astronomy, can be greatly enhanced by the use of personal computers. These machines, whose cost is less than that of a medium-sized telescope, should be in use in every amateur observatory.

The purpose of this paper is to present some software tools that I developed for use at the French Association of Variable Star Observers (AFOEV); some of these tools are mainly for use by the observer himself, others for archiving and making collective use of our observations. I will send a copy of these programs and associated data files to anybody interested, for the cost of diskete and mail.

2.   Preparation of Observing Sessions

The observer of Mira stars, and also of other slow varying stars, can gain a better efficiency if he knows which stars are best for observing on a given night, so as to avoid wasting time by looking at stars that are out of reach of the telescope or that have been recently observed. The program PREMIR can achieve this aim by selecting the stars that:

- have reasonable chance to be visible, according to some crude ephemeris, and
- have not been observed for the last ten days.

Of course the "predicted" magnitudes are very crude and the risk of biasing the evaluations by a previous knowledge of anticipated magnitudes is low.

The first step in the program is similar to what can be done with the *AAVSO Bulletin* distributed each year by the AAVSO giving the predicted dates of maxima and minima and the periods of visbility of Mira stars, but the computer program is easier to use.

3. Data Acquisition

Our data acquisition program enables the observer to easily transfer data to disk in a chronological order. It is optimized to minimize the key strokes by using as much implicit information as possible. The file can then be sorted and a recapitulation of observations, in a format convenient for headquarters of our association, is created. A better solution is to send the data on diskette by mail or, if possible, by some network to the central office. In any case, the cumbersome sorting of data by hand in the observer's home is avoided.

4. Centralization and Editing of the Observations

All our data are collected by our President, Mr. Emile Schweitzer, at Strasbourg, where they are checked and then transferred to a mainframe computer whose utilization has been made possible by the Centre de Donnees Stellaires (CDS) of the observatory. The data are archived on disk files in this computer and can be accessed from any part in the world by the usual networks. At present time, more than 13 years of data, amounting to nearly a million observations, are accessible.

Four times per year the observations are published in our *Bulletin*; this enables each observer to compare his results with those of other observers. The data are checke3d using a graphic editor, and all observations, except those clearly in error or useless, are published and archived.

5. Data Analysis

The data to be analyzed are usually copied back to a personal computer, which is easier to use. Many graphical representations can be made using a laser printer (Figure 1).

Period analysis of Mira stars works quite well with the Fourier transform method. Once the period is good, a phase diagram easily gives the epochs of maxima. For stars with deep minima, it has been found that hegative observations may contribute usefully to a guess of the date of maxima if the period is known. If the period is not known, a trial and error process on the phase (also called composited diagram), can estimate it (Figure 2),. Such a procedure can make the best use of negative observations, which are unusable by any standard period-analysis.

The use of infrequent and negative observations on poorly observed Mira stars is thus optimized; this makes itpossible to predict, even if only approximately, the date offuture maxima. Having these predictions, the observer can make the best use of his time to obtain the precise dates of these future maxima. One must remember that there are more than 2,000 Mira stars whose maxima are in the reach of amateur instruments, but fewer than 500 are effectively followed. If one wants to show evolutionary processes (which may induce period changes), it is necessary to have at least the dates of maxima for as many stars as possible, even if theminima are out of reach. Of ourse, when themorphology of thelight curve; when theminima can be reached, they are userful for studying period changews because the random flucuations of periods are smaller than if the period is obtained using the maxima. But the number of usable stars being much smaller, the chances of dinging evolutionary processes are reduced. There is no controadiction btween quality and quantity; both are needed, but not on the same stars!
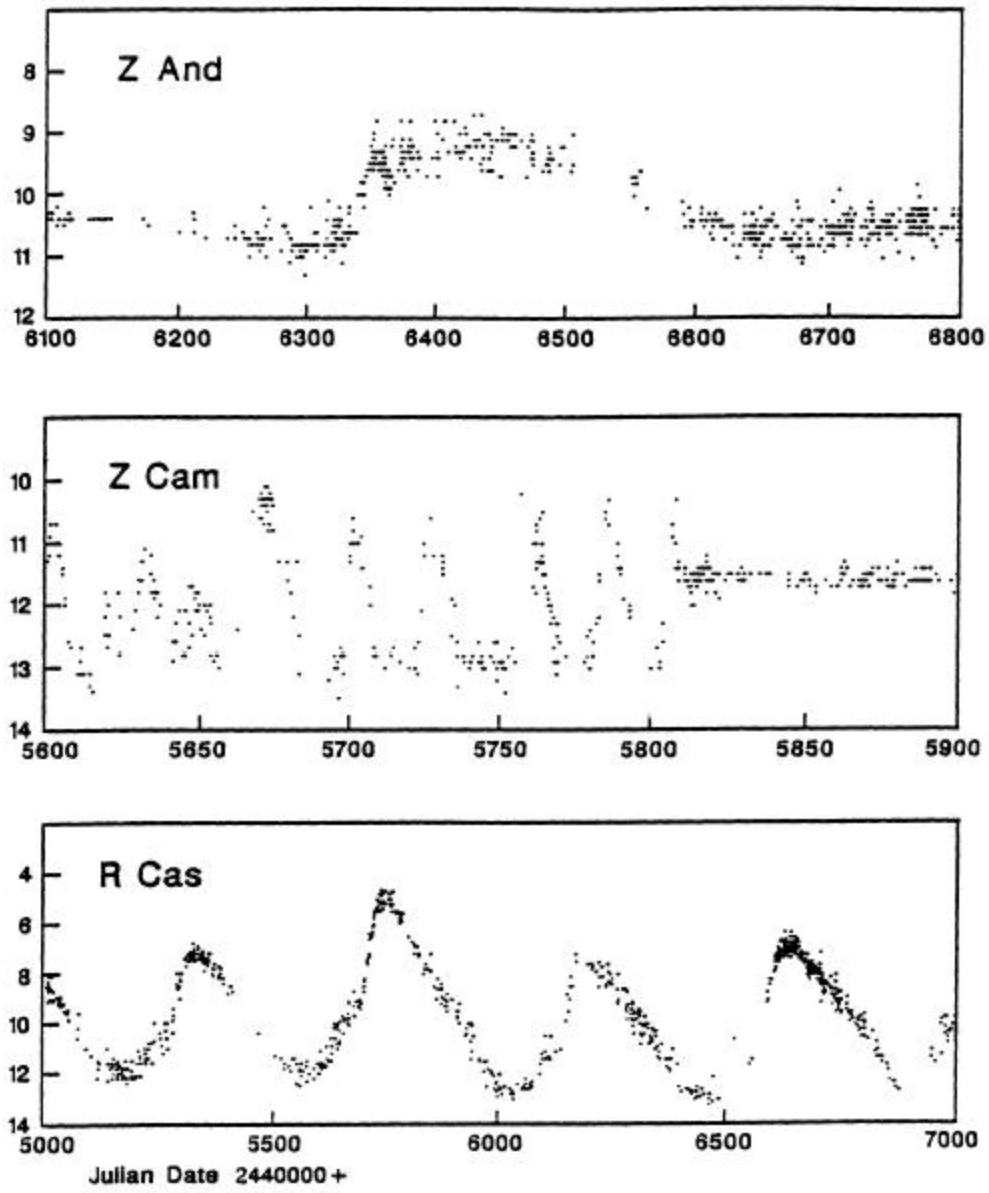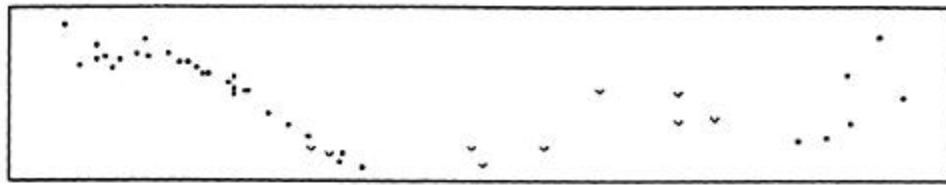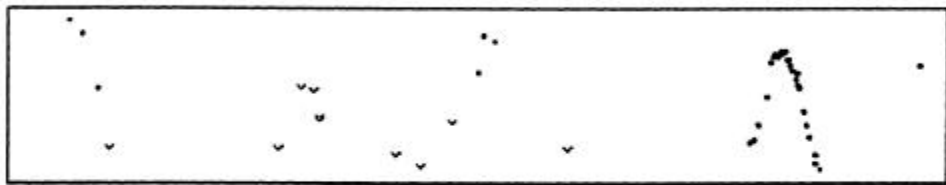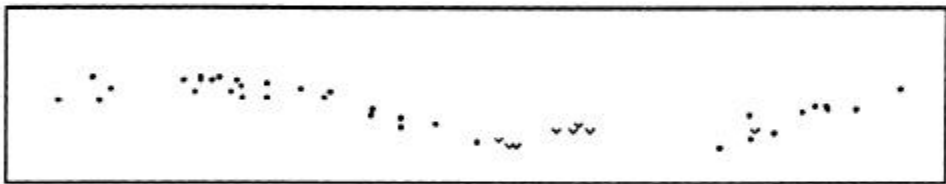
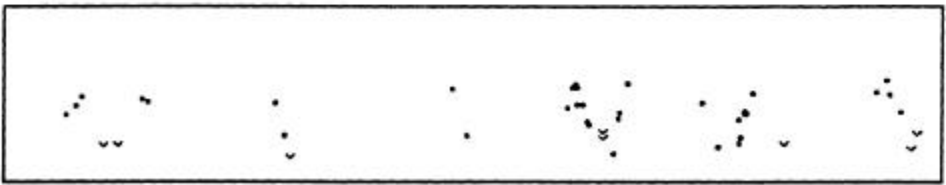Figure 1. Some representative AFOEV data.

VX TAU DATA COMPOSITED

VX TAU RAW DATA

FL CYG DATA COMPOSITED

FL CYG RAW DATA

Figure 2. Phase diagram (composite) of data.