The Variable Stars South Eclipsing Binary Database

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Abstract   Variable Stars South (VSS) has three active projects using electronic detectors to study eclipsing binaries, especially EAs. In addition to supplying JD observational data to the AAVSO International Database, VSS maintains a database of observed times of minima (ToM) and linear light elements derived from the ToMs. This database, located on the VSS website www.variablestarssouth.org, is updated monthly. In addition, the same page links to the areas for the three projects which maintain extensive observational and analytic data.

1. Introduction

Variable Stars South (VSS) is an online organization of astronomers interested in studying southern variable stars. It is a research section of the Royal Astronomical Society of New Zealand. All information about VSS including its collected data can be found on its website, www.variablestarssouth.org. VSS primarily acts as a host to projects organized by individuals or teams, and three such are:

• Equatorial Eclipsing Binaries (EEB), joint with the British Astronomical Association Variable Star Section; leader Tom Richards.

• Search for Planets around Detached Eclipsing Binaries (SPADES); leaders Simon O'Toole (Australian Astronomical Observatory) and Tom Richards.

• Southern Binaries DSLR (SBD), leader Mark Blackford.

Although these projects have very different goals, they all collect and analyze electronic (DSLR and CCD) time series data on eclipses of binary star systems. Information about each project, including science cases, observational requirements, and guides for observers and analysts, as well as observational data and analyses, can be found under the Research Projects menu on the VSS website. Collaboration in these projects is open to any astronomer with appropriate equipment. The eclipse data from the three projects are collected into a single downloadable file, the VSS Eclipsing Binary Database. JD data from these observations are also supplied by individual observers to the AAVSO International Database—a requirement on all VSS observational projects. There is no fixed northerly limit to the targets in any of the projects—the main requirement is to be well observable from temperate southern latitudes. At present the most northerly target is LT Her in SPADES, at +09° 57' 52".

2. The VSS EB database

Typically, when an observer in one of the projects obtains a measureable time series on an eclipse, an analysis is carried out to determine time of minimum (ToM) and other results of interest, which are then stored in the project's area on the VSS website. For example, in the SPADES observation area, one may find under the sub-area for each target system:

  • Excel Observation Files of every observation set obtained—all to a fixed format, as submitted by the observer.

  • An Excel Results File maintained by the analyst responsible for that target system, containing: all ToMs measured from the Observation File data; sets of linear light elements (LEs) published by others (such as GCVS); calculations of O–C of the ToMs against a published LE set (such as GCVS); and where sufficient measured ToMs exist, a linear estimate of the LEs from the ToMs.

  • A PERANSO (www.peranso.com) file of all the observational data in the project for the target, and associated information and plots.

  • A text file of all the HJD data for the target obtained in the project.

The VSS EB database consolidates ToM and LE data obtained and recorded in the three projects in their own different ways, so that researchers have a "one-stop shop" for such commonly required data. At present, it contains data on 91 systems. The file itself is in CSV plain text format. It is updated monthly (that's an intention, not a promise!) to contain new data and also to refine or correct old data as improved analyses are carried out. Some old data, such as "eyeball" estimates of poorly recorded minima intended as rough guides to observers, may even be removed when better data become available.

The format of the file is given below. It may change in future when it becomes apparent that a change would be for the better; but it is always accompanied by a Readme file specifying the current format.

  System—Name of the binary system. Format is constellation abbreviation, then GCVS identification where available, with 3-digit V... identifications expanded with a leading "0" (for example, Ara V0536). Where the GCVS identification is not available the constellation abbreviation is retained then another catalogue identifier is used, whose provenance should be obvious. The table is sorted lexically on this column, so, for example, "Sco" entries precede "Sgr", and "Gru RU" precedes "Gru W".

Next come five columns recording ToM measurements:

Type—p = primary min, s = secondary min.

HJD_min—Measured HJD of minimum, to the same number of significant decimal places as the error (next column). The rows for a given system are sorted on HJD_min, earliest first.

Error—Measured uncertainty in HJD_min, to one or two significant figures.

Min V mag—Measured magnitude of minimum in Johnson V band.

Min B mag—Measured magnitude of minimum in Johnson B band.

Min R Mag—Measured magnitude of minimum in Cousins R band.

Notes—Any useful information on the preceding data.

Next come four columns recording measured linear light elements. In rows where these occur, they are derived from linear regressions on the minima measurements recorded in that row and the preceding rows for that system. Thus it is possible to count the number of data points in the regression; and for a given system later rows will have regressions based on more data points.

E0—The HJD zero epoch for the elements, to the same number of significant decimal places as the error (next column). This will be close to one of the measured minima in this or preceding rows.

E0 error—The measured uncertainty in E0, to one or two significant figures.

P—The measured orbital period of the system in days, to the same number of significant decimal places as the error (next column).

P error—The measured uncertainty in P, to one or two significant figures.

Other data follow:

Spectrum—Spectral type and/or class, derived from a spectrum taken for the project. This is entered into the last row for the system that exists at the time the spectral analysis was carried out.

Project—Abbreviation of the project name.

3. Conclusion

The VSS EB database is a downloadable file in CSV text-only format containing data on southern eclipsing binaries obtained in three VSS projects. The data, updated monthly, consist of measured times of minima, light elements, and spectra. At present it contains data on 91 systems.