# Light Elements for V353 Hydrae, a Hipparcos Eclipsing Binary

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**Abstract** The Hipparcos eclipsing binary V353 Hydrae has been observed visually in order to determine its period. Results of this campaign are presented. The system is an eclipsing binary in a circular orbit. The combination of visual, Hipparcos, and ASAS-3 data finally revealed that the period is 7.56 days.

## 1. Introduction

The Hipparcos satellite discovered lots of eclipsing binaries during its three years in space (Perryman *et al.* 1997). However, periods could not be found for several of them.

In May 1999, the authors became interested in observing some of these stars after reading an article that appeared in *Sky & Telescope* magazine (Sinnott 1999). The article was devoted to some of these stars that show amplitudes large enough for visual observers to detect their eclipses. One of them was V353 Hydrae, which had been observed fainter than normal two times by the Hipparcos satellite.

## 2. The detection of the eclipses

On May 3, 1999, immediately after the article was published, Stephan caught a 0.6-magnitude dimming of V353 Hya using a 36.2-cm reflector in his first-ever observation of the field from Robert Clyde Observatory in Sebring, Florida. On May 23, 2002, Otero caught another eclipse through a pair of $7 \times 50$ binoculars from Buenos Aires, Argentina, and after observing two more fadings a possible period of 3.779 days was proposed (Otero 2002). However, as more eclipses were detected, it became obvious that the period wasn't right. Stephan's observations didn't fit in the folded light curve.

## 3. Results

With the public availability of the ASAS-3 data (Pojmanski 2002), the combination of all datasets allowed us to determine the period of the star. To combine them, Hipparcos observations were transformed to Johnson $V$ using a table by the author (Otero 2003). The visual observations were normalized to the $V$ magnitude of the star.

The period and times of minima were determined by light curve fitting since the observing regime both of ASAS-3 and Hipparcos generally offer only one point per eclipse. The accuracy depends on the quantity and quality of the observations. The long time baseline between the 1990 Hipparcos observations and the 2003 observations by ASAS-3 and the authors allows accurate elements to be established. However, there are neither ASAS-3 nor Hipparcos observations at the minimum of the secondary eclipse so more observations are needed to determine an improved ephemeris for it.

Poor-quality observations (flagged data in Hipparcos and saturated observations in ASAS-3) were deleted from the datasets before any analysis was made. We obtain the following elements:

$$\begin{array}{lll} \text{Min I} = \text{HJD} & 2448608.450 & + 7.56506 \text{ E.} \\ & \pm 0.010 & \pm 0.00004 \end{array} \quad (1)$$

$$\begin{array}{lll} \text{Min II} = \text{HJD} & 2448612.233 & + 7.56506 \text{ E.} \\ & \pm 0.030 & \pm 0.00004 \end{array} \quad (2)$$

The photometric parameters of the star are shown in Table 1. The 0.6-magnitude range makes it one of the Hipparcos eclipsing binaries with the largest amplitude. Times of minima derived from the observations are shown in Table 2.

Table 1. V353 Hya photometric parameters.

| | *V* |
|---|---|
| Maximum | 7.42 |
| Primary minimum | 8.02 |
| Secondary minimum | 7.95: |

Table 2. Times of minima from the observations.

| *Observer* | *HJD* | *O-C* | *Cycles* | *Min* |
|---|---|---|---|---|
| Hipparcos | 2448608.450 | 0.000 | 0 | I |
| Stephan | 2451301.616 | 0.005 | 356 | I |
| Otero | 2452470.430 | 0.016 | 510 | II |

## 3. The star

V353 Hya (NSV 6574; HD 123767; HIP 69211) was first classified as a variable star by Strohmeier *et al.* (1965) and given the designation BV 739. Its spectral type is F5V (Houk and Smith-Moore 1988) and since the eclipses are roughly equally deep it is possible that the system is made up of two similar F stars. Variability type is thus probably EA/DM. $B-V$ of the combined light is 0.50.

Tycho color data do not show significant changes during eclipse, although the observations are very sparse and suffer from a lot of scatter. The orbit seems to be rather circular, with secondary eclipse occurring at phase 0.5. The folded light curve can be seen in Figure 1.

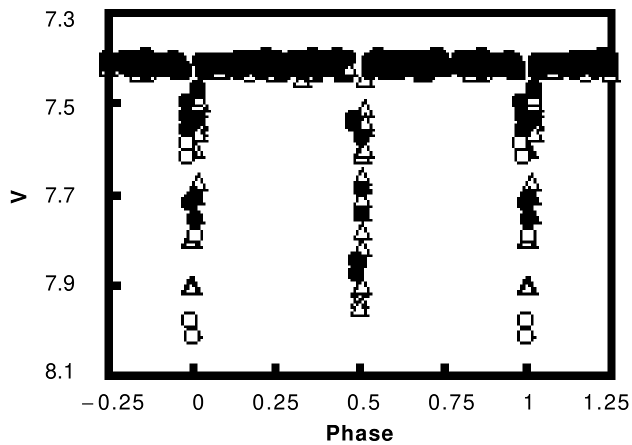


Figure 1. Light curve of V353 Hya showing ASAS-3 (filled circles), Hipparcos (open circles), and visual observations by Stephan and Otero (triangles).

## 4. Conclusions

Visual observations continue to be useful in variable star research. This time, they helped discover the true period of the bright EA-type eclipsing binary V353 Hya. While automated surveys detect the possible candidates, the visual observer can provide useful observations in order to unveil the true nature of these objects. This kind of collaboration show how there's always room for everyone, even in the CCD age.

## References

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