COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2872

Konkoly Observatory
Budapest
3 March 1986
HU ISSN 0374 - 0676

U CEPHEI: AN UNUSUAL DEVELOPMENT

The eclipsing binary U Cephei, BD+81 25, was observed on the night of August 13, 1985 at the Stephen F. Austin State University Observatory. The observations were made with the 46cm reflector, which uses a Starlight-1 photometer with an uncooled EMI 9798A phototube. The observations of U Cephei were made as part of our study of the W Serpentis star systems, described elsewhere (Wilson, Rafert and Markworth, 1985).

During that night, 208 observations in the natural V and R system of the telescope/photometer combination were made, centered approximately on mid-eclipse. Normals of these observations, which are presented in Figures 1 and 2, were used to determine two new timings of primary minimum. The comparison star used was BD +81 30. The observations were automatically recorded with our digital data acquisition system, which uses a Commodore C-64 for photometer control, and a Rockwell AIM-65 for telescope control. The two computers communicate over a parallel data link in order to synchronize their operation.

As the eclipses of U Cephei are rather asymmetric, the quoted timings of minimum below were calculated by fitting the bottom of the eclipse curve (i.e., before the inflexion

points) by a parabola (Method I). As can be seen in either of the figures, the total portion of primary minimum appears to have a slight slope, so we also calculated timings of minimum with the data at the bottom of the eclipse excluded (Method II). The excluded data was centered upon the timing of minimum found by Method I +/- 0.015 in phase. For these

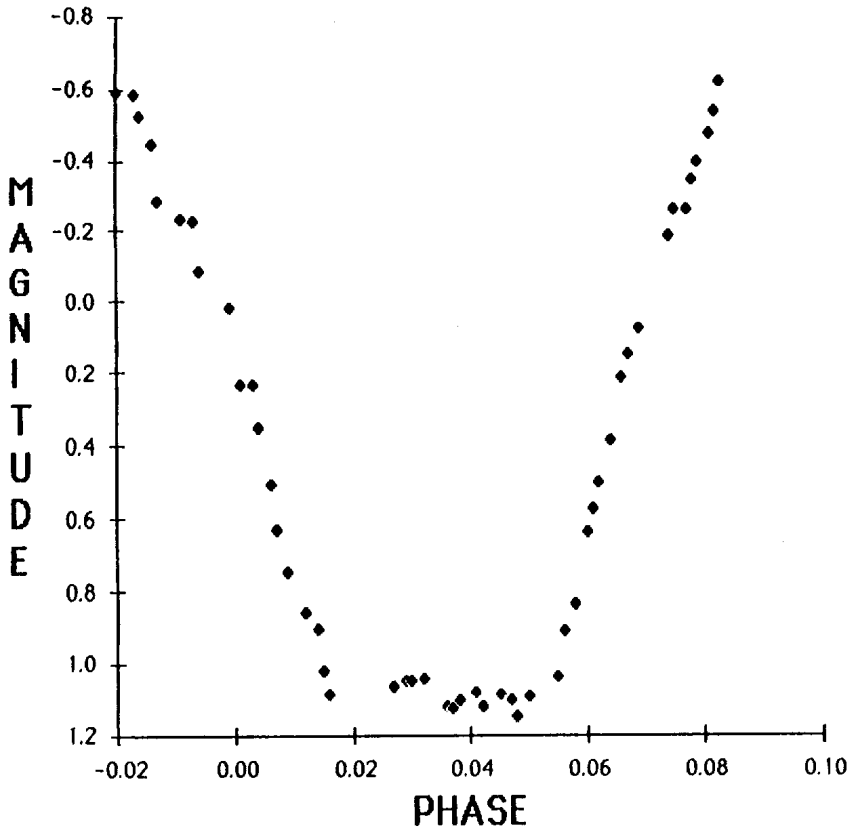

FIGURE 1. The differential V magnitudes for U Cephei in the sense (variable-comparison). Each point is a normal of two observations.

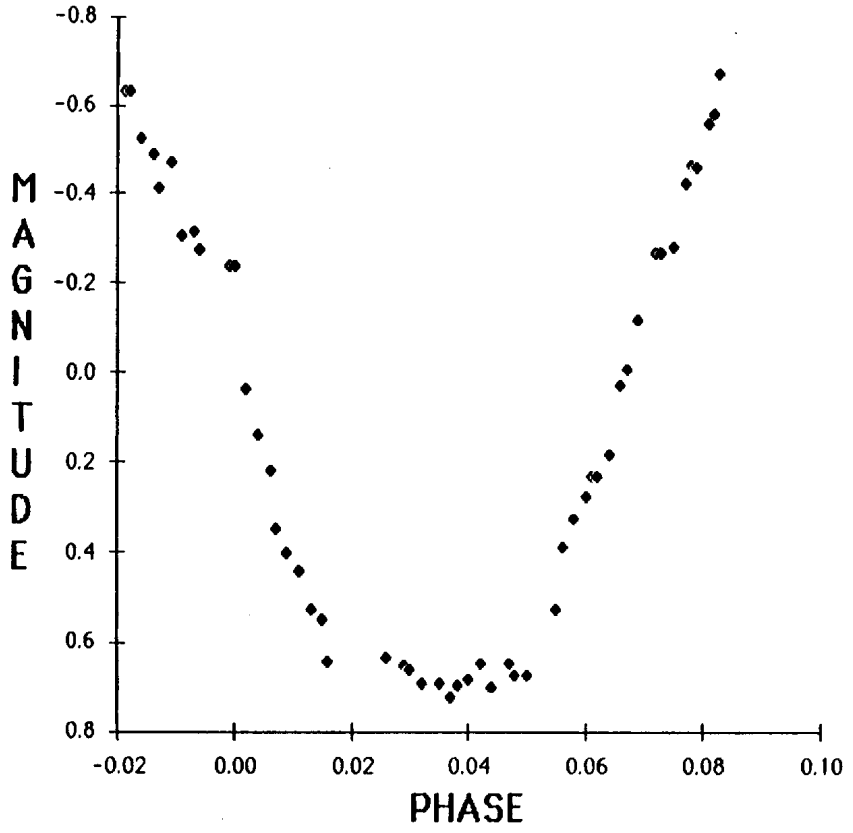

FIGURE 2. The differential R magnitudes for U Cephei in the sense (variable-comparison). Each point is a normal of two observations.

least squares fits, the quoted error was determined by standard error propagation techniques. For either method, we obtain rather sizeable residuals (O-C) from the ephemeris 2438291.5330 +2.4930475 quoted by Olson, et.al. (1981). O-C´s were calculated from Method I. Numerical results are presented in Table I.

Because of the apparent slope to the data in the extreme bottom of the eclipse, we also applied a linear least squares

Table I

Filter	JD (2440000+) Method I	JD(2440000+) Method II	O-C
V	6291.7430	6291.7428	0.0206
	.0099	.0184	
R	6291.7414	6291.7541	0.0190
	.0097	.0084	

fit to just this data. Surprisingly, the slope (delta mag/delta phase) of this portion of the light curve is 1.34 in the Visual, and 0.91 in the Red. These slopes are larger than the error in the slopes (as determined from the errors of the coefficients) by a factor of about 3. Alternatively, the total portion of primary eclipse can be considered to have both a "high" and a "low" part, although this is not so clear in the Red. Nonetheless, in the Visual, there is a fairly well defined drop of 0.06 magnitudes.

This evidence suggests that U Cephei could be involved in a high level of mass transfer, during which a gas stream from secondary to primary, or an uneclipsed portion of a gas disk around the primary component may have been visible following second contact.

This material is based upon work supported by the National Science Foundation under Grant Number AST840-1479.

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