Total eclipses of CK Dra

Lubos Brat [1,2] (brat@pod.snezkou.cz)

1) Variable Star Section of Czech Astronomical Society, http://var.astro.cz
2) ALTAN.Observatory, Velka Upa 193, 542 21 Pec pod Snezkou, Czech republic,
http://pod.snezkou.cz/altan

ABSTRACT: The Algol type eclipsing binary CK Draconi with period 4.994511 days has total eclipses more then 3.5 hours long. The period is inaccurate and should be corrected. In first half of 2006, good observation season will set in and every 5th night, the minimum of CK Dra can be observed.

CK Draconi (J2000: 15h37m43s.8 +57°06'49") is Algol-type semidetached eclipsing binary discovered by Wittmann in 1961 and named in 57th GCVS name list (Kukarkin and col., 1970). The star vary between 11.3 and 12.9 mag (p) (GCVS) and the orbital elements were determined as

$$M = 2436233.767 + 4.994511*E \quad (GCVS)$$

Since it's discovery, the star is very neglected by observers and researchers – I've found only the 57th GCVS namelist (as mentioned above) and Catalogue of Algol type binary stars (Budding and col., 2004) for this object in ADS (Smithsonian/NASA ADS). The BCVS (Bibliographic Catalogue of Variable Stars) database shows only 6 papers between 1961 and 1991.

Because the period is very close to 5 days (period is just 8 minutes shorter), the star is very difficult to observe. Acording to BRKA 2005 catalogue (Zejda 2005), the eclipse duration is about 12 hours.

There is no data about CK Dra in literature showing that the star is undergoes total eclipses.

I've tried to observe the CK Dra primary minimum in night 13./14. January 2006 using CCD camera SBIG ST-8 + R attached to RL 200/1950mm. The minimum prediction was 2006-01-14 01:18UT (53749.55441) according to newer basic minimum M0 = 52041.43200 (CCD database of AICU & Ondrejov observatory).

During 6 hours long CCD+R run, the light curve (see pic no. 1) shows only fading to minimum and long total eclipse. Unfortunelly, I was not able to observe the increase to maximum, becouse of dawn. What is the concludion, we can make from this observation?

A) **Total eclipses of CK Dra is 3,4 hour or longer**
B) The light elements given in GCVS (and in database of AICU & Ondrejov obs.) is wrong. Wrong parameter is probably period, but it can be corrected only with new precize time of minimum. The preliminary elements for minimum prediction for season 2006 is

$$M = 2453749.68 + 4.994511*E$$

The good observation season is now comming and becouse the period is only 8minutes shorter than 5 days, every 5th night the minimum of CK Dra can be observed. The observation season when every single eclipse can be observed will remain until March 2007, but the best time to observe is until summer 2006. Here is the minima prediction according to new elements mentioned above:

JD	Datum	Čas	Extr.	Azimut	Výška
2453754.674	18/19-01-06	04,0	1	SV	67
2453759.668	23/24-01-06	04,0	2	SV	69
2453764.663	28/29-01-06	04,0	3	SV	70
2453769.657	02/03-02-06	04,0	4	SV	72
2453774.651	07/08-02-06	03,5	5	SV	73
2453779.646	12/13-02-06	03,5	6	SV	75
2453784.640	17/18-02-06	03,5	7	SV	76
2453789.635	22/23-02-06	03,0	8	SV	77
2453794.629	27/28-02-06	03,0	9	SV	79
2453799.623	04/05-03-06	03,0	10	SV	80
2453804.618	09/10-03-06	03,0	11	SSV	81
2453809.612	14/15-03-06	02,5	12	SSV	82
2453814.607	19/20-03-06	02,5	13	S	82
2453819.601	24/25-03-06	02,5	14	S	82
2453824.596	29/30-03-06	02,5	15	SSZ	82
2453829.590	03/04-04-06	02,0	16	SSZ	81
2453834.585	08/09-04-06	02,0	17	SSZ	80
2453839.579	13/14-04-06	02,0	18	SZ	79
2453844.574	18/19-04-06	02,0	19	SZ	78
2453849.568	23/24-04-06	01,5	20	SZ	76
2453854.563	28/29-04-06	01,5	21	SZ	75

Table 1.: Minima prediction for observation season 2006 computed using program Ephem (Motl 2005).
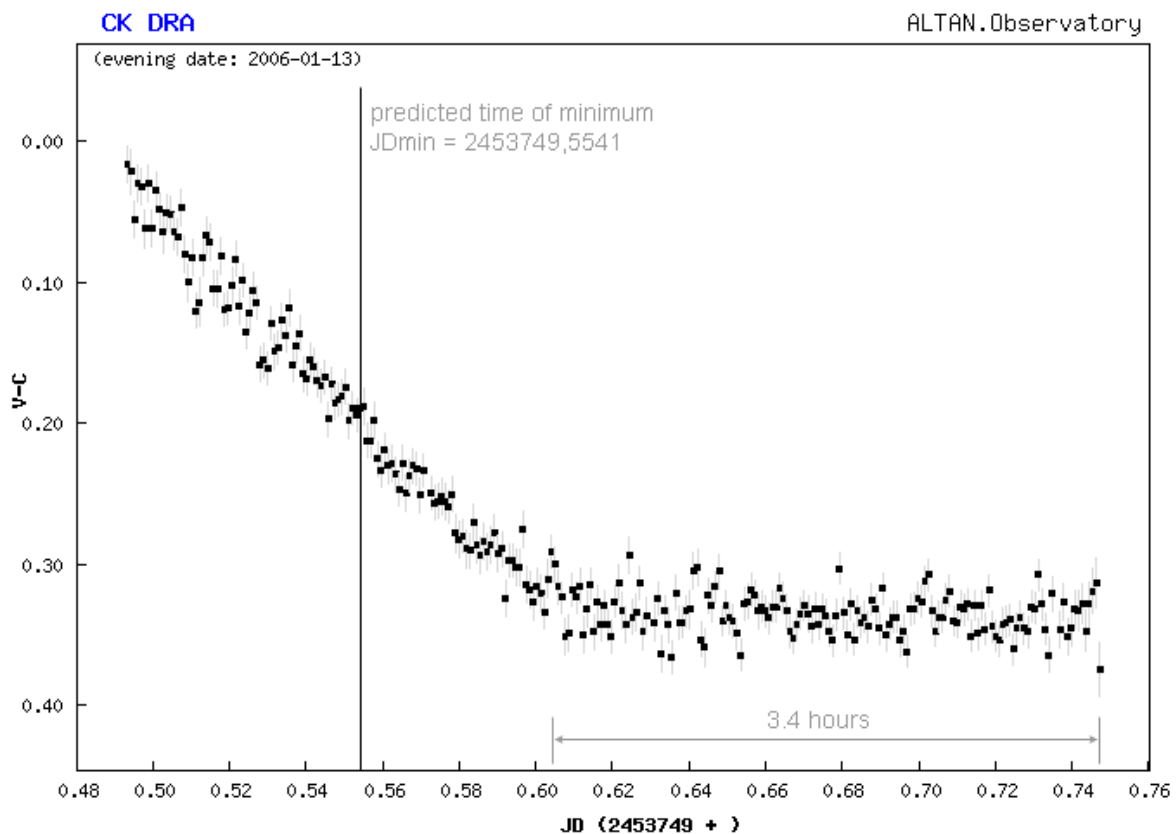
Pic. 1: 6 hours long CCD+R observation run made by author

Additionally, I've searched for observational data in world databases and I've found the CCD data of CK Dra in MEDUZA databaze and in NSVS database (data by ROTSE I project). The phased light curve computed from MEDUZA and NSVS data shows pic 2.
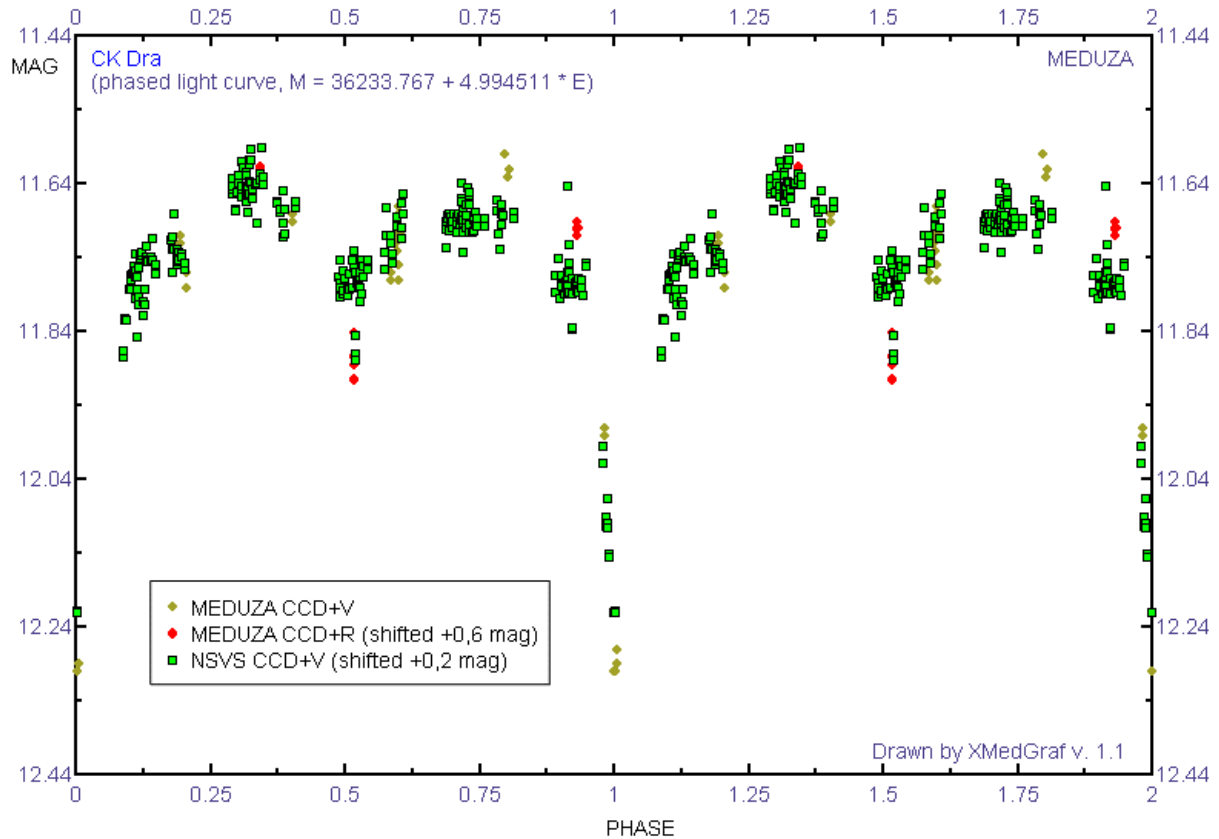
Pic 2.: Combined MEDUZA + NSVS phased light curve of CK Dra according to elements from GCVS.

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