COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2846

Konkoly Observatory
Budapest
13 January 1986
HU ISSN 0374 - 0676

THE VARIABILITY OF HD 17433

We find that HD 17433 is variable; the timescale of variation is on the order of a few weeks. Its light variation and color suggest that it is a spotted variable, possibly an RS CVn-type star, with spots 800 K cooler than the photosphere covering at least 6% of the surface.

During a program to study changes in light curves of RS CVn variables, we observed the K star HD 17433. As far as we can determine, it was suggested to us as a possible spotted variable by Gregory W. Henry, who heard it has strong Ca II H & K emission from Francis C. Fekel. Twenty observations were obtained in the BVRI system (Cape R and I) on 10 nights in September 1984 with the No. 4 16-inch telescope at Kitt Peak Natonal Observatory. The comparison star was HD 17395, and HD 17329 was observed as a check. These data have been deposited in the IAU Commission 27 Archive for Unpublished Observations of Variables Stars (Breger 1982) as file 147.

HD 17433 was found to have the following colors, $(B-V) = 0.97$, $(V-R)_C = 0.55$, and $(V-I)_C = 1.08$, which are consistent with a middle K star. These values, in fact, lie quite close to the expected colors of a K3-4 dwarf on the standard relation of Bessell (1979). If the star is actually a giant, it would be too blue in $(B-V)$ by ~ 0.15 mag for the $(B-V)$--$(V-I)_C$ relation for giants. The photometry is plotted in Figure 1. The star is clearly variable in both light and color, the variation being at least consistent with a rotating spotted star. Variations in V and $(V-I)$ are greater than the 0.01 mag errors assumed. The period is something on the order of three weeks, although we do not seem to have observed a complete cycle and cannot give a definitive value. Clearly, it cannot be shorter. Likewise, the timescale for a large spot to move across the disk of a star, 0.4-0.55 rotational cycle, is not consistent with a period much longer.

Assuming a period of 20 days, we have calculated a rough spot model with the techniques used in Poe and Eaton (1985). The calculated light variation is shown by the solid curves in Figure 1. Values of parameters are as follows: $i = 60°$ (assumed), $T_{eff} = 4280$ K, and $T_{spot} = 3500$ K. Two spots were necessary to

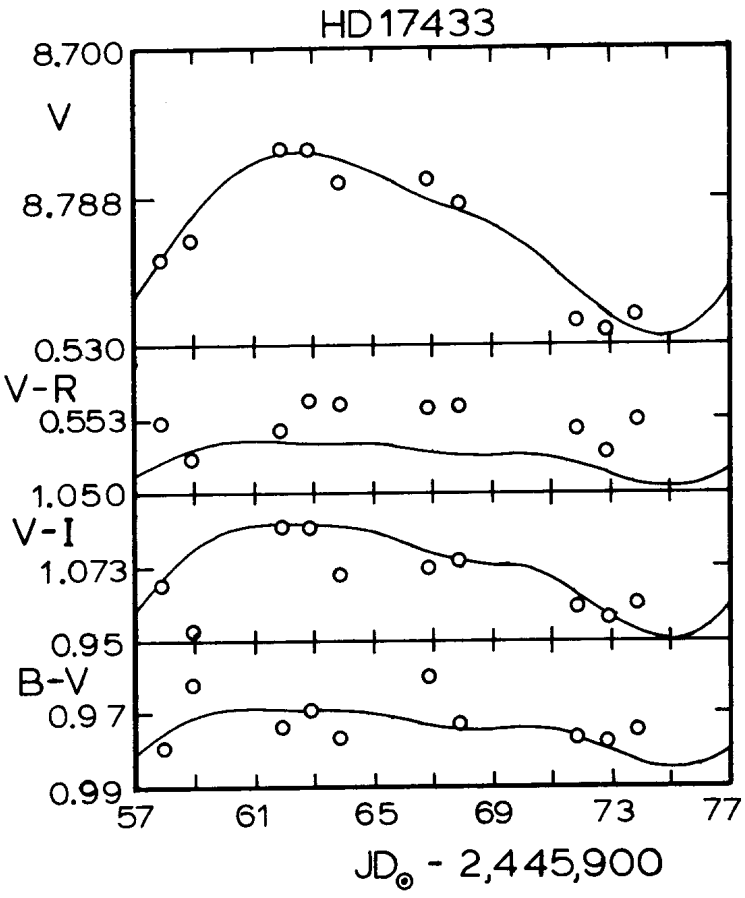

Figure 1. BVRI photometry of HD 17433. Nightly means are plotted against time. The star is obviously variable by ~ 0.1 mag in V and by ~ 0.03 mag in $(V-I)_C$. The solid curves show the calculated light and color variation for a two-spot model having spots 800 K than the surrounding photosphere on a single star rotating once in 20 days. The fit with this model is good, although there seems to be a systematic error in calculated $(V-R)_C$ color. If the spot were completely black, the variation in $(V-I)_C$ would be only 0.01 mag, considerably less than observed.

reproduce the asymmetry of the light variation. Both were taken to be at latitude 40°, their centers thus coming within 10° of the center of the disk as they transit, and they had angular radii of 10° and 17°, facing Earth at epochs JD 2,445,969.0 and JD 2,445,975.0, respectively, in Figure 1. So the spots are on the order of 800 K cooler than the photosphere and cover at least ~ 6% of the surface of the star. Since we cannot be sure we detected the light curve's minimum, the larger of the two spots could be even bigger than we have found. Also, since the inclination of the rotation axis and the latitude of a spot are not determined here, and since the latitudes of the two spots are likely different, the coverage is probably greater than 6%.

JOEL A. EATON

Astronomy Department
Indiana University
Bloomington, IN 47405 U.S.A.

CLINT H. POE

Washburn Observatory
475 North Charter Street
Madison, WI 53706 U.S.A.

References:

Bessell, M. S. 1979, Pub. A.S.P., 91, 589.

Breger, M. 1982, Inf. Bull. Var. Stars, No. 2246.

Poe, C. H., and Eaton, J. A. 1985, Ap. J., 289, 644.