

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

Number 2150

Konkoly Observatory
Budapest
1982 May 24
HU ISSN 0374-0676

H-ALPHA PHOTOMETRY OF LAMBDA ANDROMEDAE

As part of our program of photometric observations of RS CVn stars, we have observed the long-period (54.2 day) RS CVn star 2 And. The observations were made in the fall of 1981 using the University of New Mexico's 61-cm Capilla Peak Observatory. A computer-controlled, single-channel, photon-counting photometer with an EMR 641A phototube (cooled to -20° C) was used for all the observations. Photometric observations were made using a KPNO H-alpha filter set in a temperature-regulated filter slide. The KPNO filter set consists of a narrow band and intermediate band filter, both centered on the H-alpha line. The intermediate filter has a central wavelength at 6558\AA and a full-width at half maximum of 176\AA . The narrow band filter is centered at 6565\AA with a full width at half maximum of 32\AA . The star 7 And was used as the comparison for all observations.

Lambda And, 7 And, and the sky were each observed through both the narrow and intermediate band filters during the course of each observational cycle. Integrations were typically made so that an S/N of 100 was achieved, as checked in real time on the computer. The sky counts were subtracted and instrumental magnitudes were calculated. Figures 1 and 2 summarize the results of the observations. Figure 1 gives the intermediate band differential magnitude between Lambda And and 7 And. Figure 2 shows the R-alpha index of Lambda And. The R-alpha index is the difference between the narrow band and the wide band magnitudes of a single star. Phases for figures 1 and 2 were calculated using $HJD=2443126.5+54.2 E$ (Landis et al., 1978). The R-alpha index of 7 And was also monitored as a stability check for the filters and the photometer. The R-alpha index of 7 And was found not to vary in any systematic way over the course of the observations and had a mean value of -1.928 ± 0.007 .

Lambda And is a member of the long-period group of RS CVn binaries. It is a single-line binary with an orbital period of 20.5 days (Walker, 1944). The primary is classified as G7-G8 IV-III. Lambda And displays a photometric dis-

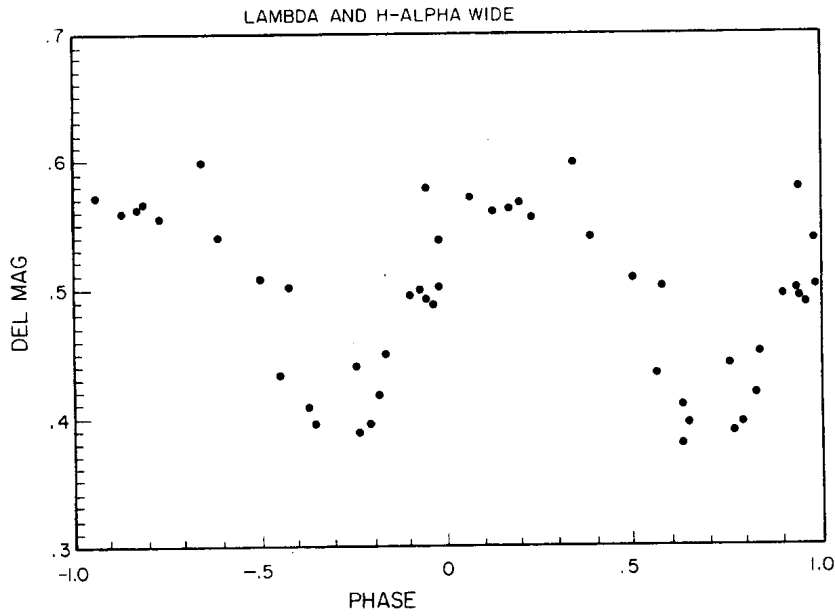


FIGURE 1

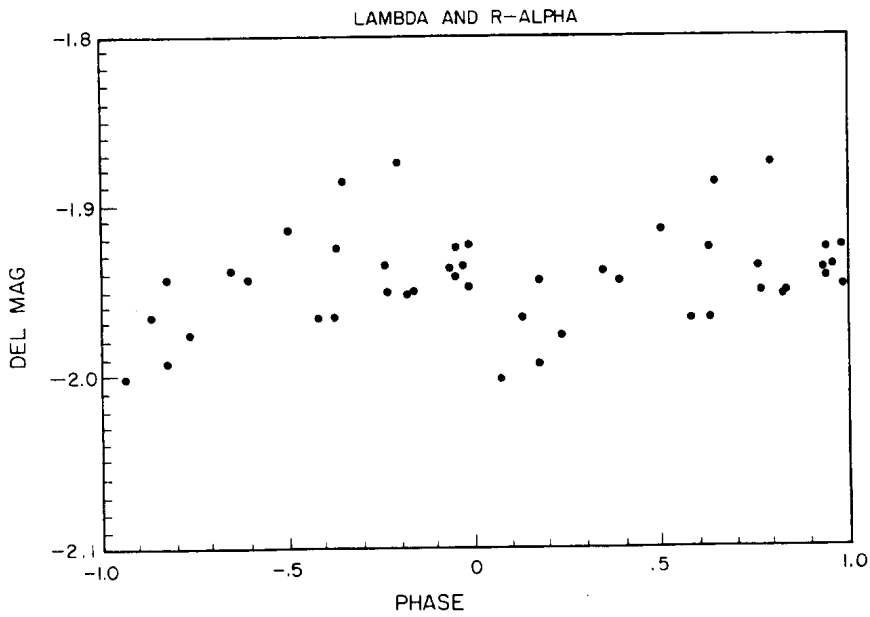


FIGURE 2

tortion wave with an amplitude of about 0.2 mag. The distortion wave is not periodic but successive maxima occur at intervals which range from between 48 and 57 days (Archer, 1960; Landis et al., 1978). Lambda And, like all RS CVn stars, shows strong CA II H and K emission. Eilek and Walker (1976) found that the H and K emission was highly variable. They also found that the H and K emission may have some correlation with the 56-day photometric period, with the maximum H and K intensity occurring at the minimum system intensity. Lambda And is also a radio source being first detected by Bath and Wallerstein (1976).

Our observations indicate the H-alpha emission of Lambda And is correlated with the continuum intensity of the system. The intermediate band differential magnitudes given in Figure 1 represents the continuum emission of the system. The R-alpha index shown in Figure 2 represents the H-alpha intensity of the system. These observations show that the maximum H-alpha emission occurs at the minimum light of the system. This type of correlation between H-alpha intensity and total system intensity can be explained very well by a model in which cool star spots cause the photometric distortion. In a situation analogous to sun spots, the star spots would have stronger H-alpha emission than the surrounding surface. As star spots cover more of the visible surface of the star the total visible light emitted would decrease but because the star spots have stronger H-alpha emission the H-alpha emission would increase.

H-alpha photometry provides a very sensitive probe of stellar surface temperatures. Also, it provided a probe for the detection of circumstellar matter. We hope to extend our program of H-alpha photometry to other RS CVn systems to find if the behavior of Lambda And is common among systems of this type.

R. ELSTON, M. ZEILIK, G. HENSON, P. SCHMOLKE, P. SMITH
 Capilla Peak Observatory
 Department of Physics and Astronomy
 The University of New Mexico
 Albuquerque, NM 87131
 U.S.A.

References:

- Archer, S., 1960, *J. Brit. Astr. Assoc.* 70, 95.
 Eilek, J. and Walker, G., 1976, *PASP* 88, 137.
 Bath, G. and Wallerstein, G., 1976, *PASP* 88, 259.
 Landis, H. et al., 1978, *Astron. J.* 83, 176.
 Walker, E. C., 1944, *J. R. Astron. Can.* 38, 249.