COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 3713

Konkoly Observatory
Budapest
21 April 1992

HU ISSN 0374 - 0676

1990 AND 1991 UBVRI PHOTOMETRY OF FK COMAE

During 1988 and 1989, Heckert and Maloney (1992) performed UBV photometry of FK Comae Berenices (HD 117555), the prototype star of the FK Comae class of variable stars. We continue this work with 1990 and 1991 UBVRI photometry.

We did the photometry on 10 nights between 13 and 30 May 1990, and on 13 nights in 1991 between 7 and 9 March and between 12 and 26 May. We used the 0.6m telescope at Mount Laguna Observatory operated by San Diego State University. The photometer used a different tube from that used for the 1988 and 1989 observations. The new tube was a Hamamatsu GaAs tube operated at -1450V. We usually used a 19" aperture but used larger apertures as seeing required. Data were transformed to the standard Johnson-Cousins UBVRI system. HD 117567 was the comparison star, and HD 117876 was the check. We find no evidence for variability in the comparison star. For reasons discussed by Heckert and Maloney (1992), we used C=2442192.345 + 2.400E (Chugainov 1976) to calculate the phases.

Flares are often observed on FK Com. Morris and Milone (1983) observed several flares on FK Com. Heckert and Maloney (1992) also observed a flare during 1989. Our practice of averaging nightly observations from a short time period into a single nightly point makes it difficult to distinguish flares; however, we observed another flare during 1991. The U-B point at phase 0.64 in our 1991 data is about 0.15 magnitudes brighter than the other points on that part of the light curve(Figure 3). This point is only about 0.05 magnitudes too bright at B-V and V (Figures 1 & 2). At V-R and V-I there appears to be no significant increase in brightness (Figure 4). These data were taken on the night of 21 May 1991 UT at about 09:15 UT under excellent sky conditions. The color behavior of this flare is similar to that observed in the previous flares. The flare is brightest at U, much less so at V, and insignificant at R and I. Morris and Milone (1983) note that all five flares reported up to the time of their work occurred between phases 0.4

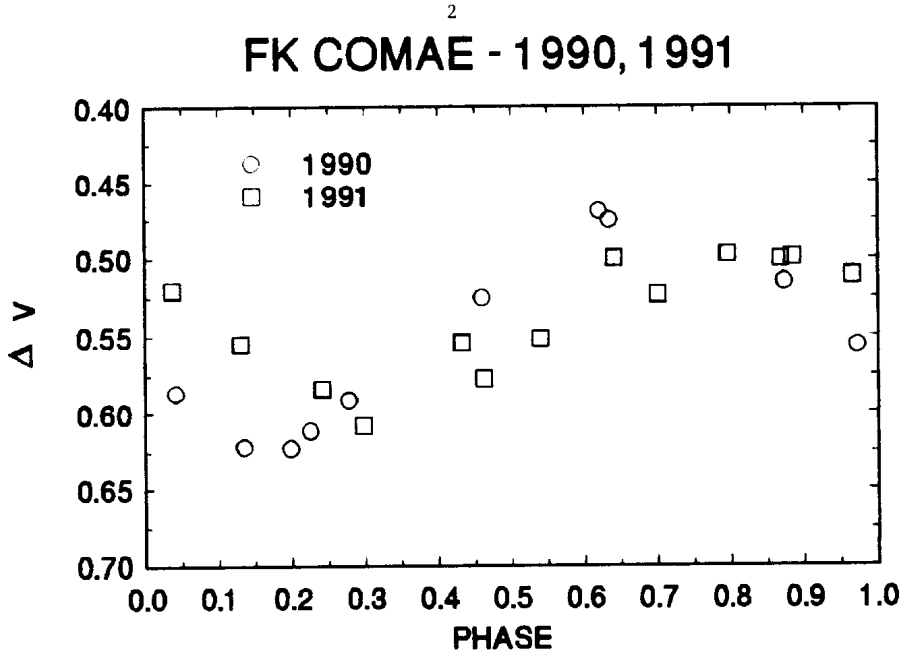

FIGURE 1

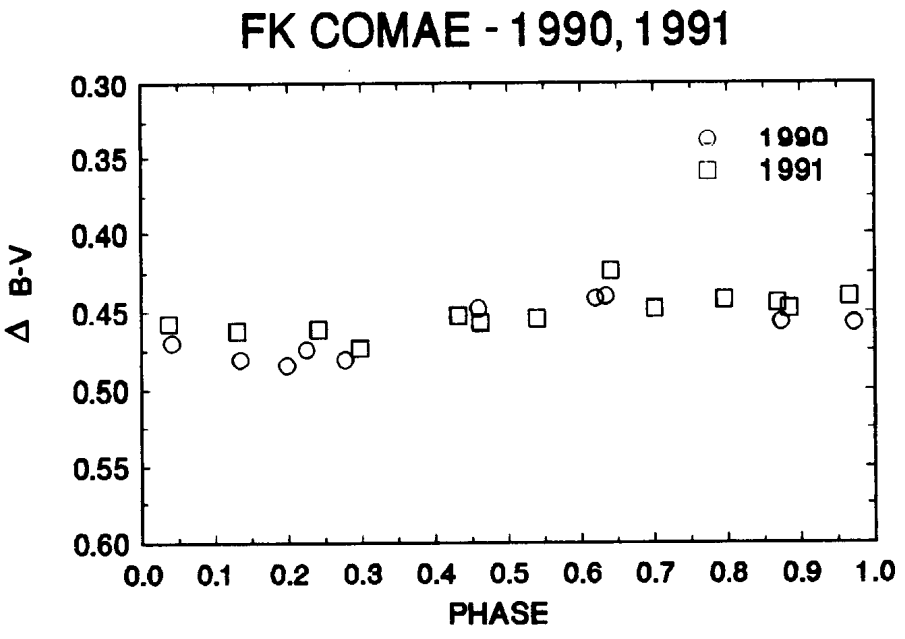

FIGURE 2

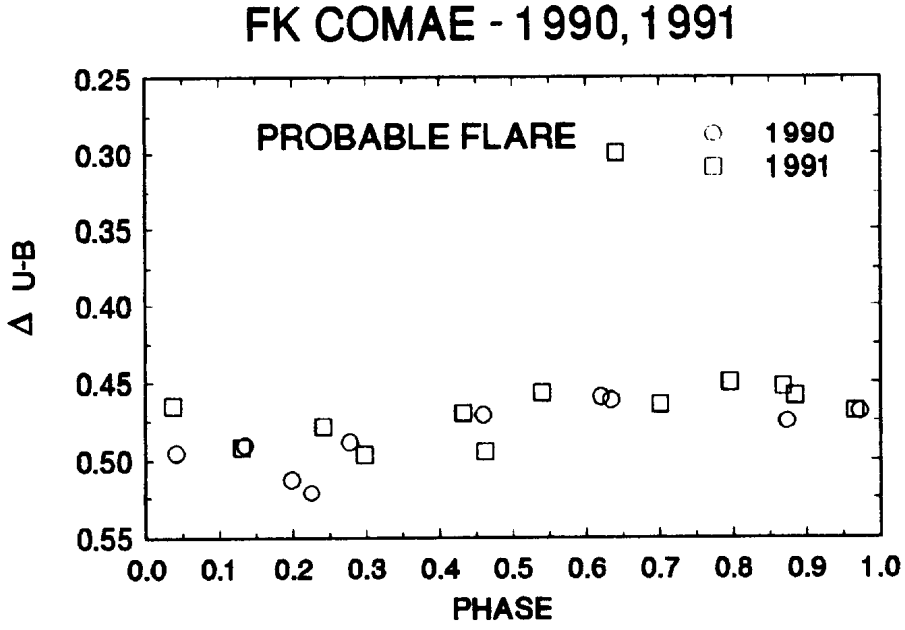

FIGURE 3

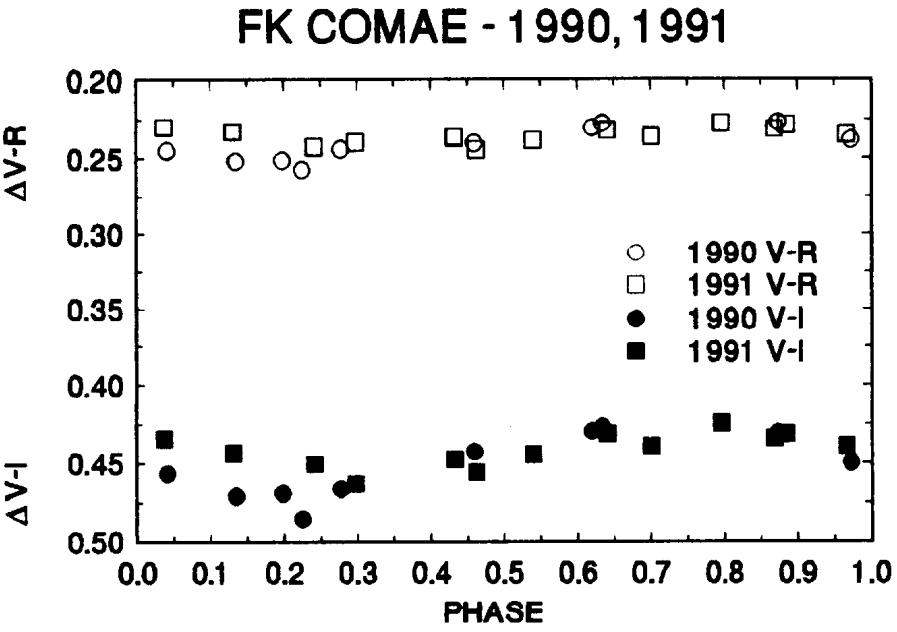

FIGURE 4

and 0.9. The 1989 and 1991 flares at phases 0.5 and 0.64 continue this trend. We have no information about the total energy or duration of the flare. We do however remove this point when considering the nonflare behavior of FK Com below.

We plot our V differential magnitudes in Figure 1. The phase of minimum light is about 0.17 in 1990 and about 0.3 to 0.35 in 1991. These results compare to the phases of minimum light of about 0.6 in 1988 and about 0.15 in 1989 (Heckert and Maloney 1992). The amplitude of variation is about 0.15 magnitudes for 1988, 1989, and 1990 (with small year to year fluctuations) and about 0.11 magnitudes in 1991. The level of light at maximum is about the same for both 1988, 1989, and 1991. It is about 0.02 magnitudes brighter in 1990.. From this information we conclude, in the context of the starspot model, that the major spot or spot group either migrated significantly in longitude or disappeared and reformed at a new longitude between 1988 and 1989. The spot then migrated an insignificant amount between 1989 and 1990 and the migration rate increased from 1990 to 1991. The migration is in the sense of increasing phase. In addition, the area covered by the major spot fluctuated a small amount from 1988 to 1990 and then decreased in 1991. From the levels of maximum light we conclude that there were smaller spots spread around the star that disappeared or decreased in 1990. The color curves generally show minima and maxima at the same phases as the V light curves. The star is reddest at minimum light as would be expected if cool spots cause the brightness variations.

Ron Angione scheduled generous amounts telescope of time at Mt. Laguna for this work. We also acknowledge support from The Research Corporation.

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