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COMMENTS ON THE VARIABILITY OF HD 219018,
COMPARISON STAR TO SZ Psc

HD 219018 has long been used as a very convenient comparison star to the important RS CVn binary SZ Psc. It was claimed in Jakate et al. (1976) that the non-variability of HD 219018 had been established through observations by Bakos in 1957 and again by myself in 1974, although no details were given. The recent announcement by Jakate (1979) that this star is in fact variable on a scale of about 0.1 mag has therefore proved very disconcerting, and, of course, casts doubt on earlier conclusions regarding SZ Psc itself. I have, therefore, re-examined the photometry of HD 219018 that I obtained at the Las Campanas Observatory, Chile, in September 1974, in case Bakos' earlier conclusion had somehow subconsciously affected my own conclusion that the star is not variable.

The observations consisted of BVRI photometry made sporadically on seven consecutive nights, during which I was searching for an eclipse of SZ Psc. This was found on September 17/18, and on that night there are observations extending over six hours or more.

Table 1

NIGHT-TO-NIGHT PHOTOMETRY OF HD 219018		
Date	V (Absolute)	ΔV (219018-220825)
1974 Sep. 14/15	7.70	2.776
15/16	7.70	-
16/17	7.69	2.779
17/18	7.71	2.781
18/19	7.70	2.774
19/20	7.69	2.783
20/21	7.68	2.777

The sporadic night-to-night observations are listed in Table 1 with results shown in two ways. Absolute results were obtained by treating HD 219018 merely as another program star reduced with respect to the general set of standards, and dif-

ferential results were obtained by comparing HD 219018 to HD 220825 only, the latter being a nearby bright standard. Neither column offers any evidence for variability on a scale of 0.1 mag.

Such observations, however, do not entirely rule out the possibility that HD 219018 is variable with a period close to 1^d. Table 2, therefore, lists a selection of observations spanning about six hours made during the time SZ Psc was undergoing eclipse. (Space precludes showing all the observations, but their use would not change any conclusions.) Again it is clear that there is no variability exceeding 0.01 mag during the six hours.

Table 2

ABSOLUTE PHOTOMETRY OF SEP. 17/18, 1974

U.T.	V	U.T.	V	U.T.	V
23 ^h 51	7.70	03:08	7.70	04:44	7.71
00:06	7.72	03:35	7.71	05:14	7.70
00:22	7.70	04:09	7.71	05:46	7.70

If we now set aside these results and consider those of Jakate (1979), the following comments may be made. Jakate's conclusions are not the result of random photometric errors, because the differential magnitudes in his Table 1 show a very smooth sinusoidal variation. If nightly means are taken, I find they can be fitted to within 0.01 mag by the expression

$$\Delta V = 0.438 + 0.038 \sin \left[\frac{360 (JD - JD_0)}{9.0} \right]$$

where $JD_0 = 2443812.1$.

A period of 9^d.0 is suggested.

The colours of HD 219018 (given in Jakate et al., 1976) show with little uncertainty that it is a G1 V star. (At this spectral type the U-B vs B-V diagram distinguishes dwarfs from other luminosity classes quite accurately). It is therefore very unlikely that it is a pulsating variable of any period. Could it be a binary? (It is known to be a close visual binary - AD8 16591 - of period 29.5 years (Baize 1955), but this seems irrelevant here.) Jakate's own nightly observations seem to rule out any W UMa variability, as of course do those in Table 2. Could it be an ellipsoidal binary? If the primary is G1 V, then $(m_1 + m_2) > 1.0 m_\odot$, and with an orbital period now of 18^d, the semimajor axis of the relative orbit is $> 29 R_\odot$. It seems most improbable that a G dwarf

could be significantly distorted by the presence of a similar star 30 stellar radii away. Thus a binary interpretation looks unpromising.

Hence, not only do the 1974 observations disagree with Jakate's findings, but his own observations are difficult to account for by any reasonable model.

There are only two explanations that occur to me: (a) It is Jakate's check star, HD 219150, that is in fact variable, despite the apparent contradiction in his Table 2; or (b) HD 219018 or its optical companion has a rotational period of $9^d.0$ and developed severe starspots between 1974 and 1978 that modulated the brightness at the later epoch. It is intended to obtain further observations this coming season to investigate these alternatives. Meanwhile, it does not seem likely that any earlier conclusions regarding SZ Psc were vitiated by variability in HD 219018.

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