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**Further Observations of 9 Aurigae**

Krisciunas and Guinan (1990) recently found that the F0 V star 9 Aurigae is variable, with an amplitude of $\Delta V \approx 0.06$ mag and a suggested period of 36-39 days. There was some evidence of short term variations (< 1 hr), which would be attributable to pulsations of the star, though it is to be noted that 9 Aur lies to the right of the instability strip (Breger 1979). In this paper we present results that refute the notion that 9 Aur might be a pulsating star.

The photometry discussed in this paper can be found in IAU file 238 of unpublished photometry of variable stars (Breger *et al*. 1990). This amounts to 182 V-band points by Skillman, obtained on 10 nights with his 32-cm automatic photoelectric telescope (APT) (see Skillman 1981), and 143 V-band and 142 B-band points by Guinan, obtained on 4 nights with a 25-cm APT at Mt. Hopkins, Arizona. The comparison star was BS 1561. Data previously made available in IAU file 218 show, using BS 1568 as a check star on 52 nights, that BS 1561 exhibits no suspected variability.

Figs. 1 and 2 demonstrate that 9 Aur can vary linearly by $|\Delta V/dt| \approx 0.01$ mag/hour over the course of a few hours. (The differential brightness of 9 Aur vs. BS 1561 showed no significant temporal trend on 9 of the 14 nights on which the two stars were monitored by Guinan and Skillman.) Frequency analysis was carried out using the Lomb-Scargle algorithm (see Press and Teukolsky 1988) to produce power spectra. Analysis of individual nights' data yields no significant short term (< 1 hr) variations. Combining several nights' data gives peaks approximately equal to 0.73, 2, 3, and 4 cycles per day, which would most likely be artifacts of aliasing (demonstrating only that the data were obtained at about the same time each night).

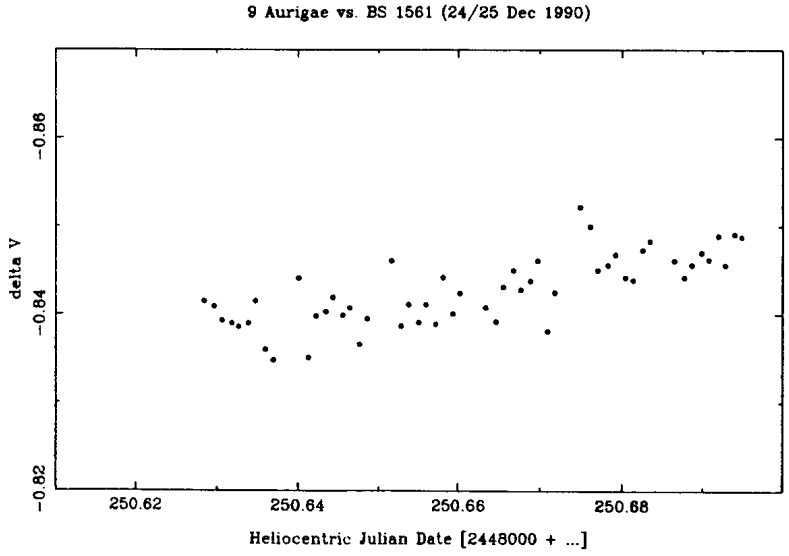


Fig. 1 - V-band differential photometry of 9 Aurigae by Guinan. The data were obtained over 96 minutes.

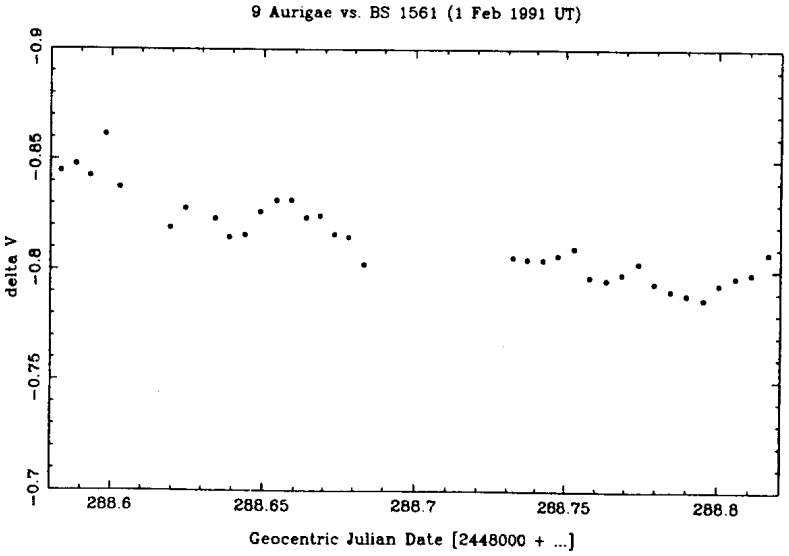


Fig. 2 - V-band differential photometry of 9 Aurigae by Skillman. The data were obtained over 5 hours and 35 minutes.

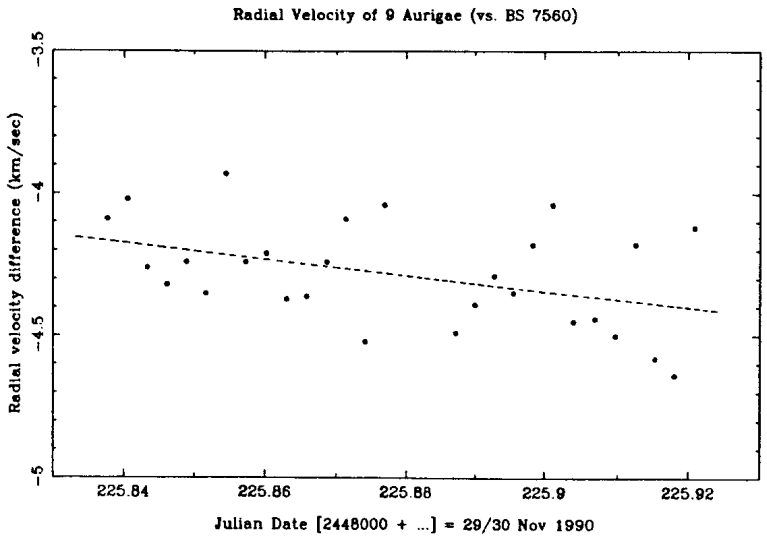


Fig. 3 - Radial velocity measurements of 9 Aurigae, using BS 7560 as the reference star. Data by Abt.

File 238 also contains 28 radial velocities of 9 Aur vs. BS 7560, obtained by Abt on the night of 29/30 Nov 1990 over a two hour time span. Abt's radial velocities were obtained at Kitt Peak with a coudé spectrograph giving a dispersion of 15 Å/mm. Fig. 3 shows Abt's radial velocity data. A linear least-squares fit gives a slope that is non-zero only at the 2.3-$\sigma$ level. The scatter about the mean is only $\pm$0.18 km/sec, which is no more than one would expect for the equipment and line width. Frequency analysis indicates no periodicity in the data. Thus on the basis of the photometry and radial velocity data, there is no evidence that 9 Aur is a pulsating star with a period comparable (tens of minutes) to those of stars with similar mass and size.

Abt (unpublished) has also obtained a new value of v sin $i$ = 20 km/sec for 9 Aur. (The non-definitive value given in the *Bright Star Catalogue* is 14 km/sec.) Given an assumed size of 1.35 $R_{Sun}$ for an F0 V star, this means that the maximum rotational period of 9 Aur (setting $i = 90^{O}$) is

about 3.4 days. We note that a reanalysis of Guinan's data given in IAU file 218, using the Lomb-Scargle algorithm, gives a power spectrum whose highest peak corresponds to P = 2.888 days for the V-band and B-band data. Could this be the true rotational period of 9 Aur? If the variability of the star is other than purely sinusoidal and is somehow related to such a rotational period, a definitive light curve could only be obtained by means of coordinated photometry carried out with a number of telescopes distributed around the Earth. Even then we need to explain how such variability results on a star with no reported spectroscopic anomalies (e.g. evidence of magnetic fields).

K. KRISCIUNAS
Joint Astronomy Centre
665 Komohana Street
Hilo, Hawaii 96720 USA

D. R. SKILLMAN
9517 Washington Avenue
Laurel, Maryland 20723 USA

E. F. GUINAN
Villanova University
Department of Astronomy
Villanova, PA 19085

H. A. ABT
National Optical Astronomy
Observatories
P. O. Box 26732
Tucson, Arizona 85726 USA

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