PHOTOELECTRIC PHOTOMETRY OF THE SUSPECTED CEPHEID, RHO BOOTIS

GORDON F. FISHER
2319 West Gramercy Place
San Antonio, TX 78201

DOUGLAS S. HALL
GREGORY W. HENRY
Dyer Observatory, Vanderbilt University
Nashville, TN 37235

HOWARD J. LANDIS
RFD 2, Box 44ED
Locust Grove, GA 30248

HOWARD LOUTH
2199 Hathaway Road
Sedro Woolley, WA 98284

Abstract

New photoelectric observations at 3 different observatories on 25 nights in 1979, along with examination of older published UBV photometry, reveal no photometric variability larger than $0^m.01$ or $0^m.02$, thus not confirming the suspicion by visual observers that Rho Bootis is a Cepheid variable with a period of approximately 6 days and an amplitude of approximately $0^m.4$.

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Our attention was drawn to Rho Bootis by a report in the June 28, 1979, issue of New Scientist explaining that visual estimates by a number of observers had led them to suspect that this bright (V = $3^m.6$) star might be a yet undiscovered Cepheid variable with a period of approximately 6 days and an amplitude of approximately $0^m.4$. For that reason we obtained one-color differential photoelectric photometry on 25 nights in 1979 at three different observatories using Sigma Bootis as the comparison star. Particulars concerning equipment, observing techniques, etc. can be found in the references Bartolini et al. (1978), Chambliss et al. (1978), and Genet et al. (1980).

The lower part of figure 1 is a histogram showing the nights on which measures of Rho Bootis were made at the three observatories. It is important to note that several locations acquired observations on consecutive or nearly consecutive nights covering most of the suspected 6-day cycle.

The upper part of figure 1 is a plot of the nightly mean ΔV magnitudes of Landis and Louth, corrected for differential atmospheric extinction and transformed differentially to V of the UBV system. The overall average of the nightly mean magnitudes was $\Delta V = -0^m.908 \pm 0.001$ for Louth and $\Delta V = -0^m.903 \pm 0^m.006$ for Landis. These are entirely consistent with each other, although the nearly $1^m.0$ difference in color index between the variable and comparison star and the $\sim\pm 0^m.01$ uncertainty in the transformation coefficient, ε, of both observers could have accounted for a difference of $\sim 0^m.01$. The standard deviation of a single nightly mean from each overall average was $\pm 0^m.004$ for Louth and $\pm 0^m.013$ for Landis. The observations of Fisher were greater in number and better in phase coverage and hence useful in this study, but they are not plotted in figure 1 because the standard deviation of his single nightly means from his overall

average was greater, around ± $0^m.04$, due to a differential observing sequence which was not optimum.

Because observation was begun when Rho Bootis was already rather low in the sky, the observations are not numerous. Nevertheless, we can conclude that we see no evidence of the suspected variability of several tenths of a magnitude on a time scale of several days. The scatter in our observations could be concealing a variability of ± $0^m.01$ or ± $0^m.02$ but not more. Earlier UBV photometry summarized by Blanco et al. (1968) is consistent with our conclusion, as the 8 values of V in that catalogue show a standard deviation of only ± $0^m.01$.

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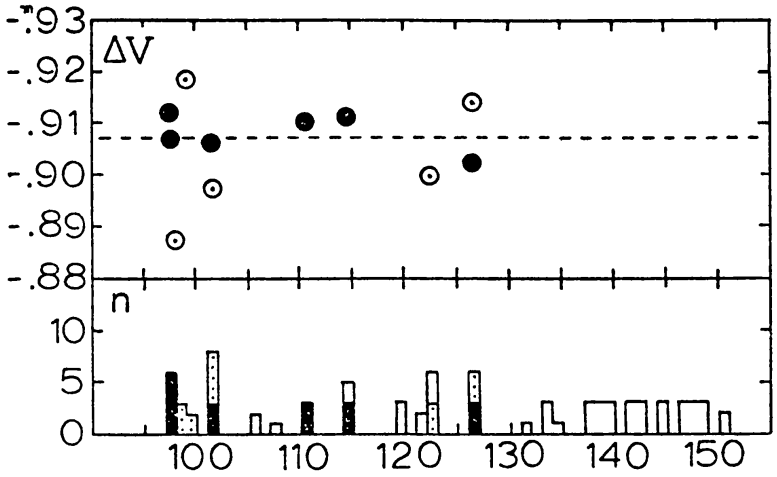

Figure 1. The lower portion is a histogram showing nights on which Rho Bootis was observed, with n being the number of individual observations. Solid is Louth, dotted is Landis, and clear is Fisher. The upper portion is a plot of the nightly mean differential V magnitudes of Louth (filled circles) and Landis (dotted circles). The scatter could be concealing a variability of 0.01 or 0.02 but not the suspected variability of around 0.4. The numbers in the abscissa, plus 2444000, give the Julian date.

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