Light Variability of 28 Aql

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1. Introduction

28 Aquilae (HR 7331, V1208 Aql) was first announced as a δ Scuti type variable
by Breger in 1969 with a period of about 0.15 day. It was clear that the light
variability could not be adequately represented as a sinusoidal variation with just
one frequency. Since then several observers have provided additional light curves
and new analyses of the light variation. In this paper we discuss observations
which we have made and an analysis of the data available since 1966.

Our objective was to find the frequencies of components which would rep-
resent the light variation of 28 Aql over the 28 years for which the star has been
observed.

2. Observations

Using the 30 cm reflector of the Hume Cronyn Memorial Observatory we ob-
served 28 Aql in 1979, 1980, 1981, and 1993 in blue light. The light curves for
JD 2444140 and 2449190 are shown below. Comparison stars were HD 180868
and HD 181383. Magnitude differences are referred to HD 181383. Nights on
which the scatter in the observations, due to poor transparency, appeared to be
excessive were discarded. Observations on 21 nights were retained for analysis.

Observations have been obtained in a number of years by Breger (1966),
Breger, Hutchins, & Kuhi (1967), Moreno (1967), Pena & Warman (1978), and
by Reed & Welch (1983).

3. Analysis

The periodogram programs described by Matthews and Wehlau, and by Wehlau
and Leung were used to identify the frequencies present in the data. Spectra
and window functions were produced for individual years, as well as for the
entire data set. In searching for the frequencies present, differences between
blue and yellow light curves were frequently ignored. Of course, the amplitudes
and phases will depend on the colour, so that prewhitening should be done with
values determined from one colour only.

To identify the frequencies present we calculated the periodogram of the
data for each year. As an example, the periodogram and window function for
1978 (Pena & Warman's data) is shown in Figure 1. The periodograms for
the different years were combined to form an average periodogram. The largest
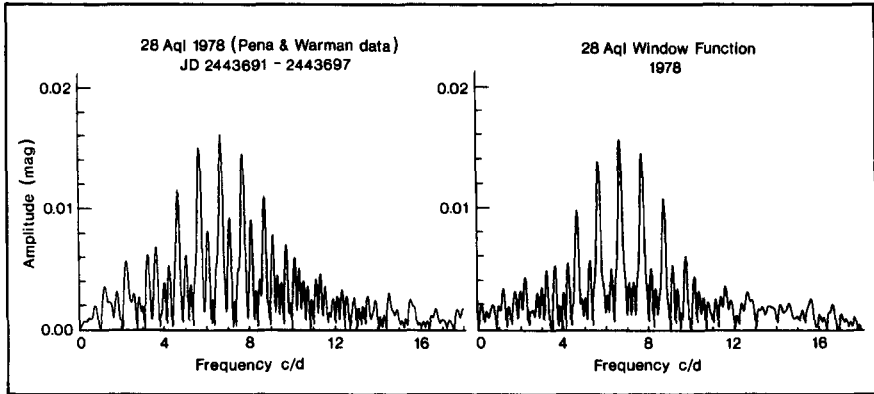amplitude *was obtained for a frequency of about 6.68 c/d, so a periodogram*

Figure 1.   Periodogram and window function for 1978 data.

of the entire data set was calculated near this frequency. After prewhitening for this frequency, another average periodogram was calculated which indicated the presence of another component with a period near 7.1 c/d. The search for a third frequency did not produce any peak in the periodogram significantly above the noise.

Synthetic light curves were computed for each light curve using the two components found.

4.   Results

The frequency with the largest amplitude was present in every year for which observations were available. The frequency, approximate amplitude, and phase (for $JD_0 = 2444075.0$) were

Frequency	Standard Dev.	Amplitude	Phase
6.68072	± 0.00006	0.0181	6.227 rad.
7.12466		0.0063	5.906

Comparison of the observations with the synthetic light curves computed with these elements show deviations which are greater than can attributed to observational error.

References

Breger, M. 1969, AJ, 74, 166

Breger, M., Hutchins, J.H., & Kuhi, L.V. 1976, ApJ, 210,163

Moreno, M.A. 1980, Rev. Mexicana Astron. Astrof., 5, 19

Pena, J.H., & Warman, J. 1979, AJ, 84, 1046

Reed, L.G., & Welch, G.A. 1988, AJ, 95, 1510