

THE PERIOD OF GQ AURIGAE

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Abstract

An examination of AAVSO visual and Harvard photographic data verifies a period of 305 days for GQ Aurigae, for which no period was given in the GCVS.

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Introduction

The variability of GQ Aurigae was first noticed by C. Hoffmeister, who reported a variation between 12 and 13^m.5. No period was given (Hoffmeister 1949). A finding chart published several years later agrees quite accurately with the AAVSO finding chart (Hoffmeister 1957). Figure 1 is a finding chart for GQ Aurigae.

In 1961, the period was discussed in an article by G. Rathman. On the basis of observations made of the Sonneberg Patrol Plates, he deduced the epoch and period: J.D. 2434770 + 304.6 days (Rathman 1961). Although this article is listed as a reference in the 1969 General Catalogue of Variable Stars, the period and epoch are not included in the elements of GQ Aur, nor are they included in any supplement (Kukarkin et al. 1969).

My own research has verified and updated the figures found by Rathman. My data came from two sources, the Harvard College Observatory Patrol Plates (RA-BM series: 1929-1952; DNB series: 1975-1979), and AAVSO light curves (1970-1980).

Methods

To analyze the data, I used several computer programs (See Hammel 1981). The first was a period search program developed by C. Morbey. It fits trial periods to the data and calculates a figure of merit (FOM) for each trial period. The lowest FOM indicates the most likely period (Morbey 1973). For GQ Aurigae, the most probable period is 305 days. This result agrees very well with Rathman's 304.6 days.

In conjunction with the Morbey program, I ran a program which calculates the error for a wide range of periods. The result is a "one-sigma" range (a one-sigma range indicates that there is a 68% chance that the period will lie in this region). The one-sigma range for GQ Aur is 305.2 ± 1.5 days.

Using this period, I employed a program called FAZE, which calculates and plots magnitude vs. phase for each datum. From the output (see Figure 2) one can see how well the period fits the data. These data include both visual (AAVSO) and photographic (HCO plates) observations from 1929 - 1980.

The computer programs discussed above were kindly made available to the AAVSO by Drs. William Liller and Emilia Belserene.

The epoch can be found from this type of diagram by setting the maximum (center) to Phase=0. For GQ Aur, this yields the epoch J.D. 2426299. Using the probable period of 305 days, a maximum would be predicted for J.D. 2434769, which is very close to Rathman's epoch,

J.D. 2434770. A maximum would also be predicted for J.D. 2442699 - the AAVSO reports a well-documented maximum about J.D. 2442697.

Conclusions

The very close agreement between Rathman's figures and my own independently derived figures, and the good correlation between these results and the various data, lead me to believe that the period of GQ Aurigae is in fact 305 days and the epoch is J.D. 2426299.

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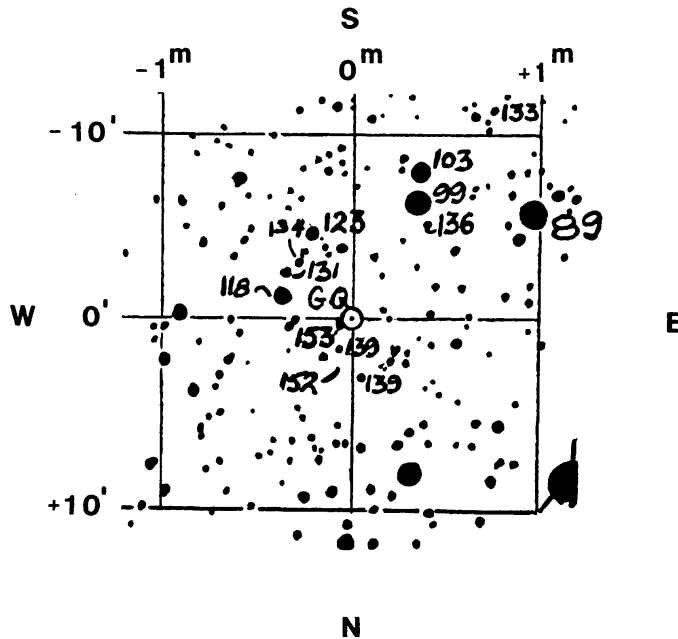


Figure 1. Finder chart for GQ Aurigae, $\alpha = 06^{\text{h}}19^{\text{m}}18^{\text{s}}$, $\delta = +47^{\circ} 17'$ (1900), taken from "d" scale (20"/mm) AAVSO preliminary chart for GQ Aur, 061947.

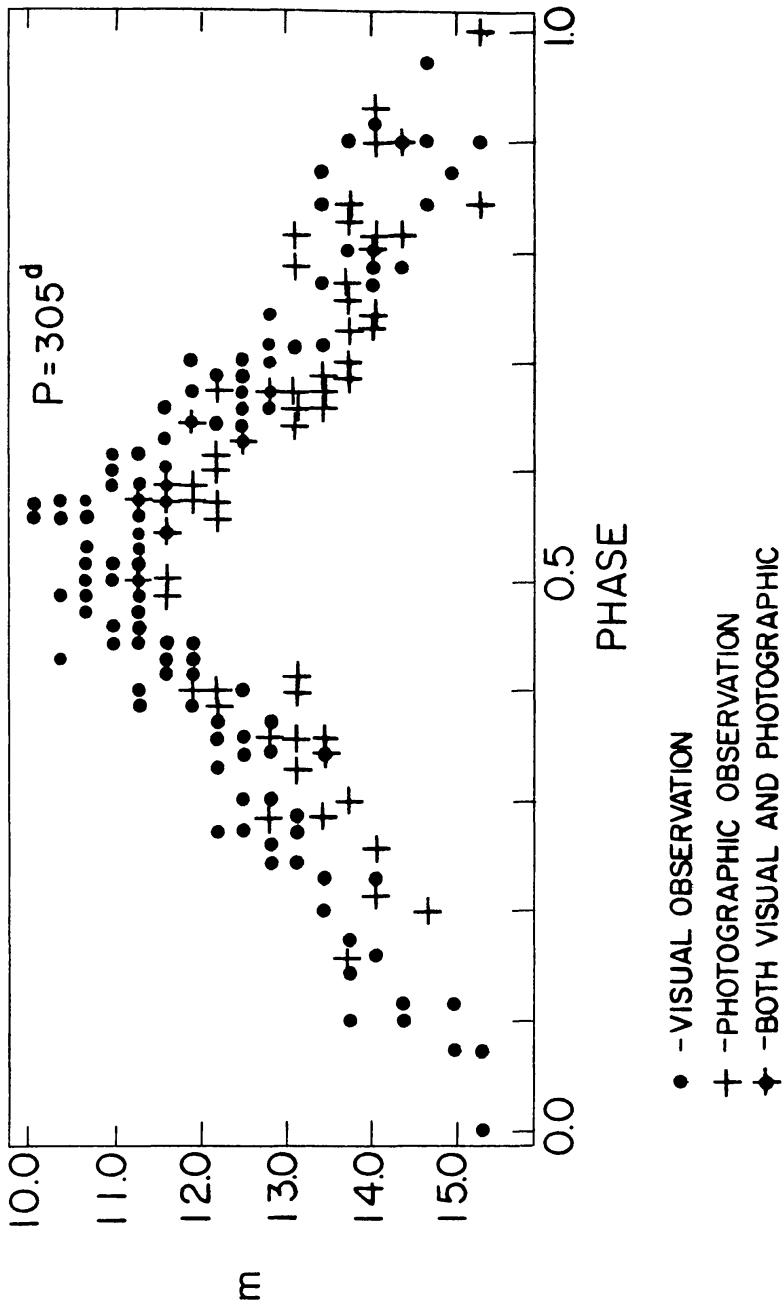


Figure 2. Light curve of GQ Aurigae, utilizing AAVSO visual data and Harvard College Observatory plates photographic data. The period is 305 days and the epoch is J.D. 2426299.