COMMISSIONS 27 AND 42 OF THE IAU INFORMATION BULLETIN ON VARIABLE STARS

Number 5180

Konkoly Observatory Budapest 27 September 2001 *HU ISSN 0374 - 0676*

THE CHANGING AMPLITUDE OF THE δ SCUTI STAR AN Lyn

LACLUYZÉ, A.; SMITH, H. A.; CLARK, A. R.; CRAVEN, J. C.; INGBER, M. A.; LAM, K.; LANDE, J. L.; NEIR, M. G.; PRICHARD, M. N.; SHEPPARD, M. R.; ZIETHE, J.

Dept. of Physics and Astronomy, Michigan State University, East Lansing, MI 48824, USA, email: smith@pa.msu.edu

The δ Scuti variable AN Lyn was discovered by Yamasaki et al. (1981) and has been the subject of several subsequent investigations (Rodriguez et al. 1997b and references therein). Earlier studies have shown that AN Lyn exhibits a single dominant frequency, which Rodriguez et al. (1997a,b) found to be 10.1756 c/d. Rodriguez et al. (1997b) identified additional frequencies of 18.1309 c/d and 9.5598 c/d, though both of these had amplitudes much smaller than that of the 10.1756 c/d frequency. Rodriguez et al. (1997a,b) reported that the amplitude of AN Lyn declined between the early 1980s and mid 1990s. However, Zhou (2001) recently reported that the amplitude increased between 1994 and 2000.

We obtained CCD photometry of AN Lyn on nine nights between JD 2451989 and JD 2452042. All observations were obtained with an Apogee AP7 CCD on the 60-cm telescope of the Michigan State University Observatory. Differential photometry in the Johnson V passband was secured relative to GSC 02990-00019. This star was also used as a comparison star by Yamasaki et al. (1981), who determined its magnitude to be $V = 11^{\text{m}}01$. The Tycho system V magnitude is listed as $10^{\text{m}}97$. A second, fainter, star was used to check the nightly variability of GSC 02990-00019, but was not used in obtaining the AN Lyn photometry.

We performed a period search on the 738 data points using a discrete Fourier transform. The best single frequency (f_1) was found to be 10.1739 ± 0.0002 c/d, close to, but smaller than, the previously determined strongest frequency. A fit to the light curve using a frequency of 10.1739 c/d and its first five higher harmonics produced residuals with a standard deviation of $0^{m}.012$, comparable to the uncertainty expected from our photometry. The data were prewhitened to remove the 10.1739 c/d frequency and its harmonics, and the period search was repeated. There was no clear evidence for a secondary frequency, but frequencies with amplitudes as small as those of the secondary frequencies reported by Rodriguez et al. (1997b) might not have been detected. The differential light curve of AN Lyn is shown in Figure 1. The V amplitude of the f_1 term is 0.092 ± 0.001 mag.

These observations confirm Zhou's result that the amplitude of AN Lyn has been increasing. V amplitudes of the f_1 frequency of AN Lyn are plotted in Figure 2. Amplitudes for 1996 and earlier years are taken from Table 3 of Rodriguez et al. (1997b). The amplitude for 2000 is taken from Zhou (2001), while the amplitude for 2001 is based upon



Figure 1. Light Curve of AN Lyn folded with a frequency of 10.1739 $\ensuremath{\mathrm{c/d}}$



Figure 2. Amplitude of the f_1 frequency. Vertical lines indicate error bars

the observations reported here. Further observations are needed to discover whether the increase in amplitude continues.

This work has been supported in part by the National Science Foundation under grant AST9986943.

References:

- Rodriguez, E., Gonzalez-Bedolla, S.F., Rolland, A., Costa, V., & Lopez de Coca, P., 1997a, A&A, **324**, 959
- Rodriguez, E., Gonzalez-Bedolla, S.F., Rolland, A., Costa, V., Lopez-Gonzalez, M.J., & Lopez de Coca, P., 1997b, A&A, 328, 235
- Yamasaki, A., Okazaki, A., & Kitamura, M., 1981, PASP, 93, 77
- Zhou, A.-Y., 2001, in Radial and Nonradial Pulsations as Probes of Stellar Physics, IAU Coll. 185, ASP Conf. Ser., eds. C. Aerts, T. Bedding, J. Christensen-Dalsgaard (in press)