

Preliminary New Results on β Cephei Stars in NGC 4755

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β Cephei stars are early B-type stars which show periodic variations of luminosity, radial velocity and line profiles. They have periods between 2 and 7 hr. Their variability is now believed to be caused by the classical κ -mechanism operating in the heavy-element ionization zones. Many of the β Cephei stars are multimode pulsators, and radial as well as nonradial pulsation may occur. Advances in the last few years in both the observational and theoretical studies of multiple pulsation modes of δ Scuti stars have reached the stage that realistic comparisons of the results and examination of predictions can be carried out (Breger et al. 1998; Stankov et al. 1999). We now want to apply those asteroseismological methods to the much hotter β Cephei stars.

The observations were made at the 1-m telescope at Siding Spring Observatory, Australia, with a SiTe 2K CCD during one run of 7 nights in 1999 February and March. Exposure times were 2.5 s for Johnson *V*, 4.5 s for *B* and 20 s for *U*. Approximately 320 observations in each of the three colors were made for all nine β Cephei stars. We binned 5 data points to one.

Star I (see Balona, Dziembowski, & Pamyatnykh 1997) is very interesting, because previous observations (Balona & Koen 1994) show it to have one of the largest amplitudes ($f = 5.585 \text{ d}^{-1}$, $A = 7.3 \text{ mmag}$) of the β Cephei stars in NGC 4755. The amplitude during 1996 was less than 3 mmag (Balona et al. 1997); in 1999 it is back again with 6.87 mmag. Star G, very similarly to star I, did not show any clear periodicity in 1996, whereas the 1999 data show a frequency at 6.07 d^{-1} , and the residuals indicate that this star probably has more than one pulsation frequency. Koen (1993) identified star G to be a β Cephei variable with $f = 6.62 \text{ d}^{-1}$ and 6.33 d^{-1} . Star F clearly shows the same frequency as in 1996 (Balona et al. 1997), namely $f = 4.485 \text{ d}^{-1}$. The previously discovered frequencies at 4.546 d^{-1} and 3.020 d^{-1} (Koen 1993) or 6.16 d^{-1} (Balona and Koen 1994) could not be detected. The stars 201, 202, 301 and 307 are probable pulsators and will be analyzed in more detail in the near future. The stars 113 and 210 were constant within the accuracy of our observations.

References

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