

# The Variable “Hybrid” PG 1159 Star HS 2324+3944

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HS 2324+3944 is one of only four “hybrid” PG 1159 stars. The latter objects are a subgroup of DO white dwarfs. The spectra of “hybrids” show an He II/C IV absorption trough similar to the “classical” PG 1159 stars, but also strong Balmer lines (Napiwotzki & Schönberner 1991).

About 50% of the PG 1159 stars are multiperiodic nonradial g-mode pulsators (the GW Vir stars). Driving of the pulsations is supposed to be caused by the  $\kappa$ - $\gamma$ -mechanism in the region of partial ionisation of carbon and oxygen. However, according to model calculations, the efficiency of the above  $\kappa$ - $\gamma$ -mechanism is very sensitive to the chemical composition in the driving region. In particular, the presence of hydrogen in the driving zone is believed to inhibit pulsations (Stanghellini et al. 1991).

Silvotti (1995, 1996) obtained two nights of time-series photometric observations of HS 2324+3944. He discovered the star to be variable with a period of about 35 minutes and suggested this is due to high-order g-mode pulsations.

Earlier observations of ours (of a quality too low to publish) confirmed the unusual variability. Therefore, we carried out a more extensive photometric study to gather more clues about the behaviour of HS 2324+3944.

We obtained 17.4 hours of time-series photometry of the star in 8 nights. Our data can be explained with three sinusoids with frequencies between 481 and 502  $\mu$ Hz. The residuals left behind this solution are consistent with noise.

Because of this multiperiodicity, a pulsational origin of the light variations of the “hybrid” PG 1159 star HS 2324+3944 becomes very attractive, although the excitation of such pulsations and the length of their periods still need theoretical explanation. A binary origin becomes unlikely, since multiperiodic variations can only be explained by mass transfer. No evidence for the latter is spectroscopically seen.

## REFERENCES

Napiwotzki, R., Schönberner, D., 1991, A&A 249, L16

Silvotti, R., 1995, IBVS 4265

Silvotti, R., 1996, A&A 309, L23

Stanghellini, L., Cox, A. N., Starrfield, S. G., 1991, ApJ 383, 766