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1995-1998 Large-Scale Campaigns on λ Boo Star 29 Cygni

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Abstract. We present the main results of a photometric and spectroscopic study of the λ Boo star 29 Cyg carried out from 1995 – 1998.

29 Cyg was the first λ Boo star in which well-defined pulsations were detected (Gies & Percy 1977). It was selected by the Central Asian Network (CAN) group (Mkrtichian et al. 1998) and collaborators as a key object to investigate the pulsational characteristics of λ Boo stars. We intensively studied 29 Cyg during 1995 (Mkrtichian & Kusakin 1996; Paunzen & Handler 1996), 1996 (Mkrtichian et al. 1998), 1997 and 1998 multisite campaigns; the main results can be summarized as follows:

- We established a well-defined multiperiodicity in 29 Cyg and determined frequencies and amplitudes for nine low-degree ℓ modes with amplitudes greater than 0.9 mmag. The stationary amplitude solution for the 1996–1997 V filter light curves obtained for these nine frequencies using the differential correction code (Andronov 1994) is given in Table 1. We found

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long-term and short-term variability of amplitudes for all of these modes in 29 Cyg – the first time this has been done for a λ Boo star.

- For the first time for λ Boo stars we have detected pulsational multiperiodic radial velocity variations.
- Based on spectroscopic radial velocity and line-profile data we found that both low- and high-degree nonradial modes are excited.
- Based on multicolor W, B, V, R photometry we determined the amplitude–wavelength dependence for low-degree modes in 29 Cyg.
- The photometric behavior of 29 Cyg is similar to the pulsational characteristics of δ Scuti stars.

Table 1. Nine-frequency solution for the 29 Cyg 1996–1997 V-data.

Designation	Frequency (c/d)	$\pm\sigma_f$ (c/d)	Semi-ampl. (mmag)	$\pm\sigma_a$ (mmag)
f_1	37.425904	0.000005	10.72	0.06
f_2	34.720723	0.000012	4.80	0.06
f_3	29.775771	0.000020	2.82	0.06
f_4	25.188602	0.000024	2.41	0.06
f_5	27.503653	0.000035	1.63	0.06
f_6	28.159113	0.000050	1.14	0.06
f_7	25.459053	0.000056	1.04	0.06
f_8	34.911538	0.000058	0.95	0.06
f_9	32.626003	0.000059	0.93	0.06

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References

Andronov, I. L. 1994, Odessa Astronomical Publications, 7, 1, 49

Gies, D. R. & Percy, J. R. 1977, AJ, 82, 166

Kusakin, A. V. & Mkrtichian, D. E. 1996, IBVS, No. 4314

Mkrtichian, D. E., Kusakin, A. V., Janiashvili, E. B., Lominadze, J. G., Kuratov, K., Kornilov, V. G., Dorokhov, N. I., & Mukhamednazarov, S. 1998, Contrib. Astron. Obs. Skalnaté Pleso, 27, 238

Mkrtichian, D. E., Kusakin, A. V., Malanushenko, V. P., Paparó, M., Akan, M. C., Percy, J. R., Thompson, S., Krisciunas, K., Burnashev, V. I., Ibanoglu, C., Pekunlu, R., Devlen, A., Ozturk, A., & Koval, V. A. 1998, Contrib. Astron. Obs. Skalnaté Pleso, 27, 476

Paunzen, E. & Handler, H. 1996, IBVS, No. 4318