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Differential photoelectric photometry of the δ Scuti star AV Ceti

AV Ceti (HR 401, m_v=6.02, Sp:F0V) was first reported as a short period variable star by Jørgensen et al. (1971). These authors, with three short nights of photoelectric observations detected a clear variation with a V amplitude of $0.^m02$ and estimated an approximate period of $0.^d07$.

The observations were carried out at Observatorio Astronómico Nacional (OAN) in San Pedro Mártir, Baja California, México, with the V Johnson filter on the nights of 23, 24, 28 and 29 of September, 1984. A pulse-counting single channel photometer and a dry-ice cooled 1P21 photomultiplier attached to 0.84 m telescope were used. The comparison stars were HR 404 and HR 444. Each observation consisted at least of 5 integrations of 10 seconds of the star followed by one 10-seconds integration of the sky. The average time between successive observations of the variable star was 6 minutes.

Table I lists the differential photoelectric photometry obtained for AV Cet minus HR 404. These differences plotted as a function of time are shown in Figure 1, the solid line was calculated from the obtained frequencies. The photometric behaviour of the comparison stars was highly constant, the sigma for the difference C_2 - C_1 was $\leq 0.^m005$, for the nights of 23, 28 and 29 of September. Figure 1 shows that the amplitude of the variation is similar to that reported by Jørgensen et al. (1971). The light variation as a δ Scuti star is confirmed for AV Ceti.

The Fourier analysis carried out to our data (López de Coca et al., 1984), showed a fundamental frequency at 14.5930 c/d, thus, a period of $0.^d0685$, which is also similar to that reported by Jørgensen et al. (1971). Once the data were prewhitened for this frequency, in the power spectrum, there appeared a frequency at 19.1862 c/d, but however more data are needed to confirm this result.

Using the photometric calibration (López de Coca et al., 1990) and the indices given by Hauck and Mermilliod (1985), we estimated the following physical parameters for this star: M_{bol} = 2.04, log T_e = 3.894 and log g = 4.02. With these values, we can calculate the pulsational constant Q with the classical Petersen and Jørgensen (1972) formula, thus, Q = 0.032 for the predominant period implying pulsation in the fundamental mode. The second frequency would give Q = 0.024 which would correspond to the first overtone. The ratio of the two periods is 0.76, in good agreement with the expected theoretical value (Petersen, 1976; Stellingwerf,

TABLE I.- Differential photometry of AV Ceti in the V filter.

HJD	ΔV	HJD	ΔV	HJD	ΔV	HJD	ΔV
2445966. +		2445967. +		2445971. +		2445972. +	
0.821	0.293	0.786	0.270	0.812	0.294	0.783	0.300
0.824	0.294	0.790	0.284	0.816	0.293	0.786	0.289
0.828	0.291	0.795	0.295	0.820	0.291	0.791	0.297
0.832	0.293	0.796	0.272	0.823	0.293	0.794	0.303
0.835	0.293	0.798	0.296	0.827	0.294	0.798	0.296
0.839	0.286	0.812	0.302	0.830	0.294	0.801	0.285
0.842	0.284	0.815	0.284	0.833	0.294	0.805	0.291
0.845	0.291	0.819	0.284	0.837	0.294	0.808	0.288
0.848	0.300	0.822	0.308	0.840	0.293	0.813	0.290
0.854	0.300	0.826	0.304	0.847	0.296	0.816	0.290
0.857	0.304	0.830	0.298	0.851	0.295	0.820	0.294
0.860	0.301	0.834	0.300	0.854	0.294	0.824	0.293
0.864	0.304	0.838	0.290	0.858	0.298	0.827	0.303
0.867	0.301	0.843	0.288	0.861	0.295	0.831	0.302
0.871	0.304	0.846	0.279	0.865	0.296	0.834	0.296
0.875	0.298	0.850	0.295	0.868	0.297	0.838	0.305
0.879	0.302	0.854	0.293	0.872	0.292	0.842	0.300
0.882	0.298	0.863	0.273	0.876	0.292	0.845	0.300
0.886	0.302	0.867	0.287	0.879	0.294	0.849	0.303
0.889	0.297	0.870	0.292	0.882	0.293	0.858	0.287
0.893	0.298	0.874	0.299	0.886	0.290	0.861	0.292
0.896	0.296	0.878	0.288	0.890	0.290	0.866	0.290
0.899	0.289	0.882	0.302	0.894	0.291	0.868	0.291
0.902	0.289	0.889	0.314	0.902	0.293	0.872	0.290
0.906	0.289	0.893	0.284	0.906	0.296	0.876	0.296
0.908	0.290	0.896	0.302	0.910	0.295	0.880	0.304
0.912	0.287	0.899	0.288	0.913	0.295	0.884	0.299
0.915	0.290	0.903	0.276	0.918	0.293	0.887	0.299
0.918	0.291	0.907	0.296	0.921	0.296	0.891	0.299
0.922	0.292	0.912	0.290	0.925	0.298	0.894	0.300
0.925	0.297	0.915	0.290	0.929	0.301	0.898	0.299
0.928	0.299	0.919	0.288	0.932	0.300	0.901	0.295
0.931	0.298	0.922	0.290	0.936	0.303	0.905	0.293
0.934	0.300	0.926	0.287	0.941	0.303	0.908	0.292
0.937	0.299	0.930	0.293	0.945	0.297	0.912	0.292
0.940	0.296	0.934	0.292	0.949	0.294	0.916	0.290
0.944	0.302	0.938	0.299	0.952	0.292	0.919	0.293
0.946	0.301	0.942	0.291	0.956	0.295	0.926	0.296
0.950	0.300	0.946	0.302	0.959	0.290	0.929	0.298
0.953	0.299	0.949	0.306	0.963	0.288	0.932	0.296
0.957	0.293	0.952	0.303	0.966	0.287	0.936	0.296
0.960	0.287	0.957	0.300	0.970	0.294	0.940	0.294
0.964	0.286	0.960	0.301	0.977	0.294	0.943	0.296
0.967	0.283	0.965	0.300	0.981	0.291	0.946	0.297
0.971	0.281	0.968	0.299	0.985	0.294	0.950	0.296
0.974	0.282	0.972	0.292	0.988	0.292	0.953	0.302
0.978	0.289	0.976	0.293	0.992	0.299	0.957	0.296
0.982	0.293	0.980	0.294	0.996	0.303	0.960	0.294
0.985	0.294	0.984	0.297	1.000	0.300	0.963	0.298
0.989	0.298	0.987	0.304	1.003	0.304	0.967	0.294
0.994	0.302	0.990	0.297	1.007	0.299	0.970	0.296
0.998	0.304	0.993	0.299	1.010	0.300	0.974	0.305
1.002	0.301	0.997	0.293			0.977	0.305
1.006	0.300					0.981	0.302
1.009	0.299					0.984	0.302
1.013	0.300					0.988	0.302
						0.992	0.292
						0.996	0.292
						0.999	0.290
						1.003	0.285

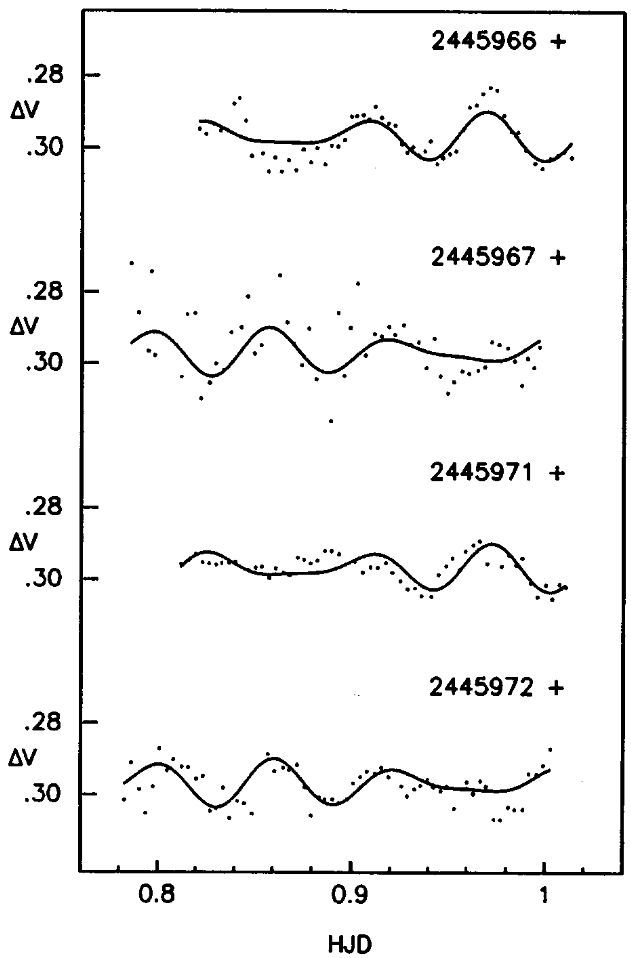

Figure 1

1979) for the fundamental and first overtone. Of course, more and continuous observations are needed for this star in order to detect this possibility.

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