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SEVEN-COLOR PHOTOELECTRIC PHOTOMETRY OF STARS IN THE ALPHA PERSEI OPEN CLUSTER

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Abstract. Photoelectric observations in the Vilnius seven-color system of 78 stars with $V < 11.5$ mag in the Alpha Persei open cluster are presented. The photometric quantification of stars in terms of spectral class and absolute magnitude has been made and their individual reddening values determined. The mean reddening value of the cluster members is $\bar{E}_{Y-V} = 0.06 \pm 0.03$ mag (equivalent to $\bar{E}_{B-V} = 0.07 \pm 0.04$ mag). By fitting the zero-age main sequences of the Alpha Persei and the Hyades clusters and taking into account the difference in their metallicities, the true distance modulus $V_0 - M_V = 6.24 \pm 0.06$ mag (177 ± 5 pc) has been determined. The average value of individual distance moduli of 69 cluster members is found to be 6.28 ± 0.04 mag, which corresponds to 180 ± 3 pc distance. The absolute magnitude of the F5Ib supergiant α Per is found to be $M_V = -4.7$ mag.

Key words: methods: observational – techniques: photometric: Vilnius photometric system – open clusters: Alpha Persei

1. Introduction

The open cluster ($l = 147°.0$, $b = -7°.1$, $\phi \sim 5°$), named after its brightest member, the supergiant α Per, contains about a dozen B-type stars visible to the naked eye, which gives evidence of its relative proximity. Therefore, this richly populated cluster, together with other nearby clusters, plays a crucial role in finding the location of the zero-age main sequence (ZAMS) in the color vs. magnitude diagram. For this reason, the Alpha Persei cluster was investigated in the past in various aspects.

Photoelectric photometry in the *UBV* system of stars in the cluster area, selected as members in the proper motion survey of Heckmann et al. (1956), was made by Mitchell (1960). Observations of the cluster stars in the Geneva system were analyzed and the cluster distance was determined by Nicolet (1981). Photometry in the *uvbyβ* system was published by Crawford and Barnes (1974); they also estimated the interstellar reddening of the cluster. Radial velocity measurements in the Alpha Persei cluster were carried out by Petrie and Heard (1970) and more recently by Stauffer et al. (1985) and Prosser (1992). Also, in these latest investigations numerous faint members of the cluster were found.

Our main goal in undertaking the photoelectric photometry of the Alpha Persei cluster in the seven-color Vilnius system, was to locate more exactly the position of the ZAMS on the magnitude vs. color index diagrams of the Vilnius system for the stars of A and F spectral classes as well as to determine the cluster distance using the individual stars. This is impossible to determine reddenings, extinctions and distances of individual stars by a broad-band photometry without spectral observations.

2. Results of photometry

The observations were made in 1986–1988 with the 1 meter reflector of the Institute of Theoretical Physics and Astronomy (Vilnius, Lithuania) at the Maidanak Observatory (Uzbekistan). The standard glass filter set of the Vilnius photometric system was used in combination with a photomultiplier FEU-79 (S–20 cathode).

The atmospheric extinction was determined by the Nikonov method from repeated observations of two auxiliary stars separated by approximately 4 hours in the hour angle. To ensure reduction of the observed color indices and *V* magnitude from the instrumental to the standard system, 33 standard stars of the Vilnius system in the Cygnus region were observed. All reductions of the observational data were made according to the usual techniques (Straižys 1977, 1992). The mean square errors of one observation, calculated from observations of the standard stars, are ±0.02 mag for the color indices $U-V$ and $P-V$, ±0.01 mag for other indices and ±0.015 mag for the *V* magnitude. The results of our observations of 78 stars are presented in Table 1. The column *n* contains the number of

Table 1. Results of photometry

No.*	V	$U-V$	$P-V$	$X-V$	$Y-V$	$Z-V$	$V-S$	n	Remarks
29	10.63	2.44	1.92	1.31	0.56	0.22	0.52	2	nm
33	11.13	2.57	2.11	1.46	0.64	0.23	0.61	1	nm
94	10.36	2.52	2.01	1.40	0.59	0.22	0.59	1	
135	9.70	2.15	1.74	1.14	0.50	0.19	0.46	2	
151	8.96	2.24	1.64	0.92	0.37	0.13	0.34	1	
175	5.91	3.58	2.98	2.01	0.75	0.30	0.71	1	nm
212	7.15	1.74	1.19	0.49	0.21	0.08	0.19	1	SB
220	9.11	2.34	1.70	0.94	0.38	0.14	0.35	1	
228	9.93	2.50	1.84	1.11	0.49	0.19	0.43	1	nm
270	10.12	2.29	1.77	1.19	0.52	0.20	0.48	1	
299	11.13	2.50	1.97	1.35	0.60	0.21	0.56	2	
309	9.99	2.23	1.73	1.16	0.49	0.18	0.47	2	
334	10.37	2.34	1.85	1.26	0.52	0.20	0.52	2	
340	11.50	2.56	2.09	1.44	0.61	0.24	0.60	2	SB1?
350	11.11	2.61	2.10	1.47	0.62	0.24	0.62	1	
361	9.67	2.22	1.71	1.10	0.46	0.16	0.42	2	
365	9.98	2.26	1.75	1.17	0.51	0.20	0.48	2	
386	7.93	2.08	1.48	0.64	0.26	0.09	0.18	2	
387	10.29	2.44	1.92	1.28	0.58	0.20	0.53	2	SB2?
401	5.02	1.08	0.77	0.37	0.18	0.07	0.14	2	
421	9.20	2.34	1.77	1.09	0.46	0.17	0.44	2	
423	7.61	1.94	1.33	0.56	0.23	0.08	0.17	2	SB1
490	9.57	2.25	1.72	1.10	0.46	0.17	0.43	2	
501	9.13	2.29	1.69	0.96	0.39	0.15	0.35	2	
520	11.64	2.75	2.21	1.59	0.65	0.27	0.66	2	var RV
557	5.30	1.07	0.76	0.36	0.17	0.07	0.13	1	
574	8.97	4.27	3.57	2.42	0.93	0.38	0.88	1	nm
581	6.95	1.64	1.14	0.47	0.21	0.07	0.14	1	
588	9.96	2.37	1.86	1.23	0.55	0.21	0.50	2	
601	11.46	2.68	2.20	1.55	0.61	0.24	0.63	2	nm
606	8.95	2.27	1.70	0.94	0.38	0.14	0.34	4	
609	9.19	2.45	1.83	1.06	0.46	0.18	0.42	2	
612	7.84	1.98	1.41	0.59	0.22	0.08	0.15	3	
621	9.86	2.23	1.73	1.12	0.48	0.16	0.46	1	
622	11.66	2.79	2.30	1.58	0.65	0.20	0.65	1	
625	7.59	1.98	1.40	0.62	0.27	0.09	0.20	2	
635	8.90	2.25	1.68	0.95	0.39	0.16	0.35	2	
639	8.11	2.08	1.52	0.66	0.25	0.09	0.18	2	
647	10.36	2.60	1.89	1.06	0.44	0.17	0.37	1	nm
651	8.38	2.18	1.57	0.73	0.28	0.10	0.23	2	
658	9.21	2.55	1.90	1.05	0.43	0.16	0.36	2	nm
660	10.07	2.46	1.91	1.26	0.56	0.20	0.52	2	var RV?
675	6.05	1.13	0.82	0.36	0.16	0.06	0.12	2	

Table 1 (continued)

No.*	V	$U-V$	$P-V$	$X-V$	$Y-V$	$Z-V$	$V-S$	n	Remarks
676	11.39	2.59	2.06	1.42	0.64	0.25	0.52	2	nm
679	8.95	2.48	1.76	0.86	0.38	0.16	0.35	2	nm
684	10.59	2.34	1.86	1.28	0.55	0.20	0.51	2	
692	7.46	1.83	1.27	0.51	0.21	0.07	0.14	2	
694	8.45	2.20	1.60	0.76	0.29	0.10	0.22	2	nm
696	11.56	2.73	2.26	1.60	0.67	0.26	0.59	1	
699	11.14	2.62	2.14	1.48	0.65	0.28	0.61	1	
709	10.94	2.54	2.04	1.41	0.62	0.23	0.59	2	
715	9.68	2.23	1.74	1.13	0.50	0.17	0.46	2	SB2?
727	10.24	2.33	1.87	1.26	0.56	0.19	0.52	2	var RV
729	7.67	1.97	1.39	0.60	0.25	0.09	0.19	2	nm?
733	9.85	2.29	1.80	1.18	0.52	0.18	0.47	2	
735	6.80	1.58	1.07	0.44	0.20	0.07	0.15	2	
750	10.51	2.37	1.90	1.30	0.56	0.20	0.53	2	
756	7.91	2.08	1.50	0.65	0.25	0.09	0.17	2	SB?
767	10.67	2.44	1.96	1.37	0.58	0.22	0.54	2	
771	11.10	2.57	2.03	1.39	0.63	0.21	0.60	1	nm
775	7.22	1.65	1.16	0.50	0.22	0.07	0.18	2	SB1
780	8.08	2.13	1.55	0.69	0.29	0.10	0.23	2	SB
794	10.11:	2.48:	1.95:	1.30	0.62	0.22	0.49	2	var RV
802	8.40	2.14	1.55	0.70	0.28	0.10	0.19	1	SB?
810	5.54	1.20	0.85	0.39	0.19	0.07	0.14	1	
831	7.33	1.67	1.17	0.48	0.20	0.07	0.14	2	
833	10.01	2.27	1.78	1.17	0.51	0.17	0.49	2	
841	10.25	2.34	1.83	1.25	0.55	0.21	0.49	1	
875	7.62	2.01	1.41	0.61	0.25	0.08	0.20	2	nm?
885	8.77	2.27	1.68	0.88	0.34	0.12	0.27	1	
906	8.73	2.33	1.71	0.86	0.35	0.12	0.28	2	
917	10.55	3.41	2.96	2.00	0.70	0.40	0.75	2	
955	6.73	1.51	1.06	0.44	0.13	0.05	0.18	2	SB1?
965	6.59	1.42	0.99	0.42	0.20	0.06	0.15	1	SB1?
968	10.45	2.38	1.88	1.29	0.55	0.20	0.53	2	
970	8.17	2.17	1.56	0.85	0.49	0.09	0.18	2	
1082	7.21	1.72	1.20	0.51	0.22	0.07	0.16	2	
1153	6.86	1.40	1.01	0.43	0.19	0.06	0.14	1	

* Number is from Heckman et al. (1956).

independent observations on different nights. The coordinates of the stars can be found in Prosser (1992).

For selection of the cluster members we used the proper motion survey of Heckmann et al. (1956) comprising the stars brighter than $V = 11.5$ mag in the cluster area. Numbering of stars in the table is according to this survey. After our observations have been completed, extensive radial velocity surveys in the Alpha Persei cluster (e.g., Prosser 1992) appeared, in which some of the observed stars were recognized as nonmembers. In the table, these stars are marked as "nm". Also, a few of the stars exhibited variations in the radial velocity. Known or suspected spectroscopic binaries are noted, too.

3. Quantification and discussion

The measured stars have been quantified in terms of spectral class and absolute magnitude using a computer program written by Vansevičius and Bridžius (1994). The quantification is based on a three-dimensional (spectral class, absolute magnitude and color excess) fitting of the observed color indices of the program star with those from the bank of standard stars. The results of quantification are given in Table 2. It gives dereddened color indices $(Y-V)_0$, spectral classes, absolute magnitudes M_V, color excesses E_{Y-V}, distances r and parameters of the precision of quantification Δ, which are the mean square deviations of the observed color indices from the best fitted model. The luminosity classes are ascribed according to M_V, which are based on the distance modulus of the Hyades $V - M_V = 3.2$. For checking of the results of the quantification, the method employing the reddening-free Q,Q diagrams calibrated by Straižys et al. (1982b) has been used. Satisfactory agreement between the results is found.

Table 2 is supplemented by the three brightest cluster members (including α Per) for which the color indices have been given in the first photometric catalogue of stars measured in the Vilnius system (Zdanavičius et al. 1969).

The average reddening for the cluster members is $\bar{E}_{Y-V} = 0.06 \pm 0.03$ mag (r.m.s. error), which is equivalent to $\bar{E}_{B-V} = 0.07 \pm 0.04$ mag. This is comparable with the values determined by Crawford and Barnes (1974) which are equivalent to $\bar{E}_{B-V} = 0.075$ mag for F-stars and 0.095 mag for A-stars, if the ratio of color excesses E_{Y-V}/E_{B-V} is taken according to Kurilienė (1977). Prosser (1992) for M dwarfs of the cluster finds a greater value, $\bar{E}_{B-V} = 0.11$ mag. Our results show that the reddening across the cluster area is quite inhomogeneous.

Table 2. Results of quantification

No.	V	$(Y-V)_0$	Sp	M_V	E_{Y-V}	r(pc)	Δ
29	10.63	0.51	F8 V	3.8	0.05	207	0.010
33	11.13	0.54	G0 V	4.5	0.10	173	0.018
94	10.36	0.50	F9 V	4.1	0.09	148	0.016
135	9.70	0.47	F5 V	3.4	0.03	172	0.021
151	8.96	0.34	A9 V	2.6	0.03	175	0.008
175*	5.91	0.75	G9 III	0.1	0.00	145	0.009
212	7.15	0.14	B9 V	0.6	0.07	175	0.006
220	9.11	0.33	A9 IV	2.0	0.05	236	0.007
228*	9.93	0.40	F1 III	1.9	0.09	338	0.010
270	10.12	0.47	F5 V	3.7	0.05	172	0.009
299	11.13	0.46	F6 V	4.1	0.14	189	0.008
309	9.99	0.47	F6 V	3.8	0.02	166	0.009
334	10.37	0.49	F8 V	4.1	0.03	170	0.011
340	11.50	0.55	G1 V	4.5	0.06	221	0.008
350	11.11	0.51	G0 V	4.4	0.11	176	0.014
361	9.67	0.44	F4 V	3.5	0.02	163	0.014
365	9.98	0.48	F6 V	3.7	0.03	169	0.010
386	7.93	0.23	A2 V	1.7	0.03	166	0.017
387	10.29	0.49	F6 V	3.7	0.09	173	0.020
401	5.02	0.10	B5 III	−1.5	0.08	170	0.005
421	9.20	0.39	F2 V	3.0	0.07	151	0.007
423	7.61	0.16	A0 V	0.7	0.07	210	0.015
490	9.57	0.43	F4 V	3.3	0.03	170	0.008
501	9.13	0.34	A9 V	2.7	0.05	173	0.009
520*	11.64	0.57	G0 III:	2.4:	0.08	606:	0.034
557	5.30	0.10	B5 III	−1.5	0.07	199	0.008
574*	8.97	0.78	K1 III	0.9	0.15	304	0.019
581	6.95	0.16	B9 V	0.8	0.05	152	0.012
588	9.96	0.48	F6 V	3.7	0.07	155	0.015
601	11.46	0.53	G3 V	4.9	0.08	174	0.022
606	8.95	0.33	A9 V	2.7	0.05	160	0.016
609	9.19	0.34	A9 V	2.7	0.12	155	0.009
612	7.84	0.21	A2 V	1.7	0.01	166	0.020
621	9.86	0.45	F5 V	3.6	0.03	169	0.016
622	11.66	0.52	G3 V	4.4	0.13	218	0.030
625	7.59	0.18	A0 V	1.7	0.09	126	0.012
635	8.90	0.34	A9 V	2.9	0.05	144	0.012
639	8.11	0.22	A2 V	1.9	0.03	165	0.029
647*	10.36	0.30	A7 IV	1.6	0.14	423	0.020
651	8.38	0.24	A4 V	2.0	0.04	173	0.012
658	9.21	0.26	A5 V	2.4	0.17	160	0.023
660	10.07	0.45	F4 V	3.5	0.11	163	0.010
675	6.05	0.10	B5 V	−0.3	0.06	165	0.011

Table 2 (continued)

No.	V	$(Y-V)_0$	Sp	M_V	E_{Y-V}	r(pc)	Δ
676*	11.39	0.57	F8 V	3.5	0.07	325	0.024
679	8.95	0.20	A2 V	1.3	0.18	233	0.015
684	10.59	0.51	F8 V	4.4	0.04	159	0.013
692	7.46	0.19	A0 V	1.4	0.02	157	0.015
694	8.45	0.25	A4 V	2.1	0.04	171	0.020
696	11.56	0.60	G3 V	4.7	0.07	205	0.024
699	11.14	0.57	G1 V	4.5	0.08	179	0.019
709	10.94	0.51	F8 V	4.3	0.11	171	0.010
715	9.68	0.48	F5 V	3.6	0.02	157	0.021
727	10.24	0.52	F8 V	4.3	0.04	142	0.023
729	7.67	0.19	A1 V	1.7	0.06	139	0.009
733	9.85	0.50	F6 V	3.6	0.02	170	0.020
735	6.80	0.15	B8 V	0.2	0.05	190	0.006
750	10.51	0.51	F9 V	4.4	0.05	151	0.014
756	7.91	0.23	A2 V	1.8	0.02	161	0.024
767	10.67	0.53	F9 V	4.3	0.05	170	0.017
771	11.10	0.49	F7 V	4.1	0.14	187	0.019
775	7.22	0.13	B8 V	0.7	0.09	168	0.009
780	8.08	0.21	A2 V	1.7	0.08	160	0.021
794	10.11	0.56	F6 V	3.2	0.06	215	0.033
802	8.40	0.25	A3 V	2.0	0.03	179	0.021
810	5.54	0.12	B5 V	−0.8	0.07	159	0.007
831	7.33	0.15	B9 V	1.1	0.05	159	0.014
833	10.01	0.47	F6 V	3.7	0.04	170	0.018
841	10.25	0.50	F7 V	3.9	0.05	167	0.014
875	7.62	0.21	A2 V	1.8	0.04	135	0.011
885	8.77	0.29	A6 V	2.3	0.05	176	0.024
906	8.73	0.25	A4 V	2.3	0.10	158	0.016
917*	10.55	0.70	K3 V	6.7	0.00	58	0.007
955	6.73	0.68	B8 V +	1.0 +	0.05	150	0.043
			F2 III:	2.0			
965	6.59	0.14	B7 V	0.2	0.06	167	0.010
968	10.45	0.50	F8 V	4.2	0.05	159	0.011
970*	8.17						
1082	7.21	0.15	B9 V	0.8	0.07	165	0.014
1153	6.86	0.13	B7 V	0.6	0.06	156	0.012
401*	5.03	0.09	B4.5 III	−2.5	0.07	278	
605*	1.79	0.40	F5 Ib	−5.0	0.05	197	
835*	4.67	0.11	B3.5 V	−1.2	0.05	135	

Remarks:

Stars Nos. 175, 228, 574, 647, 676 and 917 photometrically are non-members; for the star No. 520, the M_V values on different Q, Q diagrams are controversial; the star No. 970 is outside of the calibrated area on the Q, Q diagrams; H401=31 Per, H605=α Per, H835=34 Per are from Zdanavičius et al. (1969).

In the remarks we indicate some stars which are probably non-members of the cluster on the basis of the quantification results, independently of the kinematic criteria. All these stars belong to the group of kinematically suspected non-members and marked by "nm" in Table 1.

The mean of the distances of the 69 cluster members is 171±3 pc, which corresponds to $V_0 - M_V = 6.16 \pm 0.04$ mag. The obtained $V_0 - M_V$ value corresponds to the Hyades distance modulus of 3.20 mag. In our paper which is being published in this issue of the journal (Dzērvītis and Paupers 1994), we obtain the optimum value of the Hyades distance modulus of 3.32 mag. In this case, the Alpha Persei cluster modulus turns to be 6.28 mag or 180 pc.

We have also applied another method for obtaining the distance of the Alpha Persei cluster by fitting its main sequence with the Hyades sequence in the color vs. magnitude diagrams $V, U{-}V$; $V, P{-}V$; $V, X{-}V$ and $V, Y{-}V$. One of such diagrams ($V, X{-}V$) is shown in Fig. 1. The Hyades data were taken from the Dzērvītis and Paupers (1994) paper. The apparent difference in distance modulus between both clusters is found to be $\Delta(V_0 - M_V) = 3.10 \pm 0.03$ mag; it is almost the same for all four diagrams. The error characterizes the uncertainty of the fit. The interval of the ZAMS overlap in our data was about 2 mag long, and both lines were of identical shape. The two remaining diagrams with the color indices $Z{-}V$ and $V{-}S$, due to great steepness of the ZAMS, are unsuitable for the fit.

However, a direct fit does not yield the true relative distance between the Alpha Persei and the Hyades clusters due to their difference in metal abundance. The metal abundance in the Hyades dwarfs was determined many times in the past yielding an enhancement relatively to the solar abundance (see, for instance, Mayor 1980, Gratton et al. 1981, the latest containing many references to the previous investigations). The mean value of the most accurate recent determinations is [Fe/H] = 0.17 ± 0.02 dex (Dzērvītis and Paupers

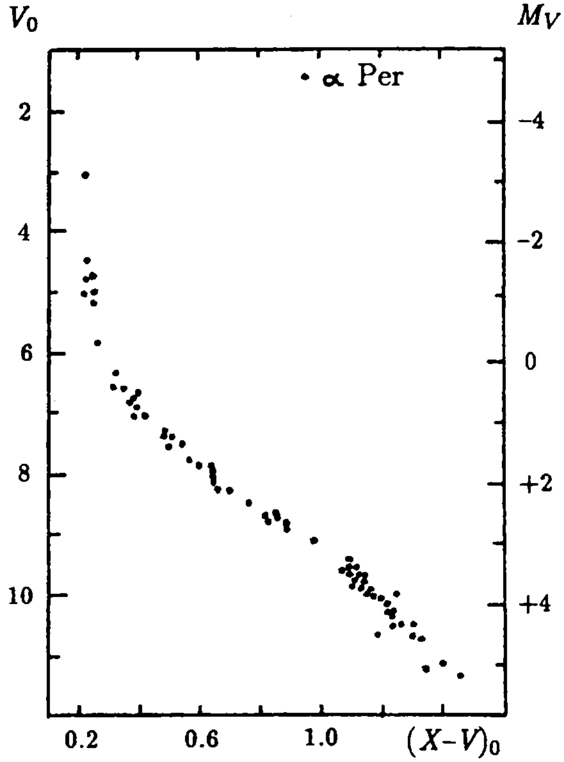

Fig. 1. The color-magnitude diagram of the Alpha Persei cluster.

1994). On the other hand, it is well known that relatively young clusters, such as Alpha Persei, with the age $< 10^8$ yr, do not reveal any deviation from the solar abundance. For the Alpha Persei cluster itself, this is confirmed by direct abundance determinations. So, Klochkova and Panchuk (1985) from analysis of high resolution spectra of four cluster main sequence stars have found [Fe/H] = 0.04. The result is confirmed by Balachandran et al. (1988), who have determined [Fe/H] = 0.05 ± 0.02 from spectra of 46 F, G and K cluster dwarfs. An identical value was reported by Boesgaard et al. (1988) as found in six F dwarfs of the cluster. Beginning with the early determination by Greenstein (1948), the same conclusion was drawn in many reports on metallicity of the cluster's F5Ib supergiant α Per (see, for instance, Parsons 1967 or Klochkova and Panchuk 1988).

As it is demonstrated by the models of internal structure of the ZAMS stars with various chemical composition by VandenBerg and

Bridges (1984), increasing metallicity causes brightening of the sequence. Strictly speaking, the luminosity change depends mainly not on iron but on CNO element abundance, however, in the case of the main sequence stars both quantities are proportional (Lambert and Ries 1981). For the above mentioned [Fe/H] values, the shift in M_V for A and F stars between the Hyades and the Alpha Persei clusters amounts to $\Delta M_V = 0.18 \pm 0.03$ mag. Taking into account this correction, the true relative distance modulus between the Hyades and the Alpha Persei cluster is $\Delta(V_0 - M_V) = 2.92 \pm 0.04$ mag.

Helium abundance differences among the clusters are expected to be small (Iben and Renzini 1984). Usually, open clusters do not reveal differences in the helium abundance. Moreover, the helium content of the globular clusters is also close to the solar abundance.

Taking the distance modulus of the Hyades as 3.32 ± 0.05 (Dzērvītis and Paupers 1994), we obtain for the Alpha Persei cluster the value $V_0 - M_V = 6.24 \pm 0.06$ mag, or 177 ± 5 pc. Consequently, the distance of the cluster determined by both methods coincides very well (180 and 177 pc).

The deduced distance of the cluster may be compared with earlier determinations. So, Johnson et al. (1961) from observations in the *UBV* system by the ZAMS fitting obtained the value $V_0 - M_V = 6.1 \pm 0.2$ mag. An identical value was deduced by Hagen (1970) from Mitchell's (1960) observational data in the same system. Both these determinations should be corrected for the increase of distance modulus of the Hyades by ~ 0.3 mag. Nicolet (1981) by the method of photometric boxes in the Geneva system found $V_0 - M_V = 6.26 \pm 0.12$ mag and noted that from trigonometric parallaxes even greater (though less accurate) value of 6.40 mag follows. The value of Nicolet is in good agreement with the result obtained in this paper.

The maximum extent of the cluster on the sky, according to the list of members by Prosser (1992), is $5^\circ.2$, which at the calculated distance and supposing a spherical shape gives a diameter of the cluster of 16 pc.

The obtained position of the cluster main sequence in various color-magnitude diagrams is given in Table 3. The normal places listed in the table can be useful in constructing a compound ZAMS by fitting together the sequences of clusters having different ages. The rows under the line relate to the zero-age main sequence of the cluster, which starts at $V = 7.8$ mag or spectral class A0, i.e. 3.5 mag lower than the brightest cluster members.

Table 3. The main sequence of the Alpha Persei cluster. The ZAMS starts below the separating line

M_V	$(U-V)_0$	$(P-V)_0$	$(X-V)_0$	$(Y-V)_0$	$(Z-V)_0$	$(V-S)_0$
0.0	1.22	0.78	0.29	0.11	0.04	0.09
0.5	1.49	1.01	0.36	0.14	0.04	0.11
1.0	1.71	1.18	0.46	0.18	0.06	0.12
1.5	1.92	1.37	0.56	0.21	0.08	0.15
2.0	2.05	1.50	0.67	0.25	0.09	0.19
2.5	2.12	1.56	0.81	0.30	0.11	0.28
3.0	2.16	1.63	0.95	0.39	0.14	0.37
3.5	2.20	1.70	1.07	0.46	0.16	0.44
4.0	2.25	1.77	1.19	0.51	0.19	0.49
4.5	2.34	1.89	1.29	0.53	0.21	0.52
5.0	2.49	2.02	1.41	0.56	0.23	0.57

The obtained position of the sequence of the Alpha Persei cluster may be compared with the ZAMS in the Vilnius system resulting from the calibration of spectral classes in terms of absolute magnitude and the relation between spectral classes and intrinsic color indices of the ZAMS stars as given by Straižys et al. (1982a,b). Before a comparison, the M_V values from Straižys et al. (1992a) should be taken smaller by 0.1 mag due to the revision of the Hyades distance. The comparison reveals some discrepancy on the diagrams M_V, $U-V$ and $M_V, P-V$: the A5–F2 stars on the Alpha Persei sequence are by $\sim$ 0.2 mag brighter than is obtained by the above authors. In other spectral ranges and for other colors, the coincidence is fine.

For α Per, the brightest member of the cluster, we obtain $M_V = -4.7$ mag, adopting the determined distance modulus and reddening value of the cluster. This value is in good agreement with the calibration of MK spectral types in terms of absolute magnitude as given by Straižys et al. (1982b): $M_V = -4.8$ mag for a F5Ib type star.

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