PHOTOELECTRIC PHOTOMETRY OF P/HALLEY

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ABSTRACT. The photoelectric measurements of P/Halley made at the Skalnaté Pleso Observatory are presented. They were carried out with IHW/IAU filters CN, C_2, C_3, CO^+, Cont. 365.0 and Cont. 484.5. A set of five diaphragms, diameters from 29.5" to 220.5", was used. The magnitudes are reduced to outside the atmosphere in the instrumental system. Some of the observations enabled the magnitudes to be determined in continua and emissions on the basis only Skalnaté Pleso data. These observations were published together with the analysis of the measurements elsewhere (Svoreň; 1987, 1990). However, not only these but all the observed data can be useful if a combination with measurements made by other observers were used. That is why all author's data (November 8, 1985 - May 4, 1986) are presented.

1. OBSERVATIONAL TECHNIQUE

The photoelectric observations were made with a photoelectric photometer, installed in the Cassegrain focus of the 600/7500 mm reflector at the Skalnaté Pleso Observatory. An EMI 6256 B type electron multiplier was used as the radiation detector. The optical and mechanical parts contain a set of focal diaphragms of following diameters: 29.5", 49.0", 81.1", 137.3" and 220.5". Five basic IHW filters and the CO^+ filter are installed in the optical part of the photometer.

2. COMPARISON STARS AND EXTINCTION CHANGES

Comparison stars were chosen from the list recommended by A'Hearn and Vaný-sek (1984). The magnitudes (listed in Table 1) according to the IHW list of Standard Stars (A'Hearn et al, 1987) were only used for processing the observations.

Table 1 - Magnitudes of standard stars

Number HD	Interval used 85/86	UC 365.0	CN 387.1	C_3 406.0	CO^+ 426.0	BC 484.5	C_2 514.0
25 680	Nov 8-18	7.28	7.48	6.99	6.87	6.16	6.11
3 379	Dec 12-13	5.88	5.88	5.88	5.88	5.88	5.88
218 687	Dec 22-Jan 5	7.85	7.98	7.56	7.48	6.82	6.76
97 991	May 1-4	7.06	7.28	7.35	7.37	7.36	7.40

The extinction coefficients for all nights were determined as follows:

Table 2 - Extinction coefficients

Date 1985/86	k(UC)	k(CN)	$k(C_3)$	$k(CO^+)$	k(BC)	$k(C_2)$
Nov 8/9	-	0.373	0.263	-	0.400	-
Nov 11/12	0.627	0.479	0.477	0.328	0.254	0.160
Nov 15/16	-	0.916	0.625	-	-	-
Nov 16/17	0.747	0.626	0.456	0.330	-	-
Nov 17/18	1.287	0.516	-	0.523	-	-
Dec 12	0.714	0.870	0.870	-	0.696	-
Dec 13	0.206	0.470	0.396	-	0.295	-
Dec 22	0.080	0.333	0.200	-	0.947	-
Dec 30	-	0.474	0.579	-	0.316	-
Jan 5	0.804	0.652	0.573	0.625	0.398	-
May 1	-	-	0.388	-	0.180	0.294
May 2	0.662	0.781	0.456	-	0.276	0.227
May 3	0.728	0.775	0.378	-	0.338	0.212
May 4	0.655	0.621	0.388	-	0.238	0.201
mean of standard error	$\pm$0.068	$\pm$0.068	$\pm$0.180	$\pm$0.062	$\pm$0.190	$\pm$0.063

The values in Table 2 show large night-to-night changes of the extinction. These rapid variations of atmospheric conditions excluded applying the mean values of the coefficients.

3. MAGNITUDES OF P/HALLEY

All the magnitudes of P/Halley in the next table are magnitudes in the instrumental system reduced to outside the atmosphere. The observed quantities

were reduced for the differential extinction using the extinction coefficients derived.

Table 3 - Magnitudes of P/Halley

Date and time UT 1985	Filter used	Diaphragm in arcsec	Magnitude	Standard error
Nov. 8.924	CN	29.5	11.02	0.01
Nov. 8.929	CN	49.0	10.05	0.05
Nov. 8.934	CN	81.1	9.15	0.01
Nov. 8.936	CN	137.3	8.34	0.03
Nov. 8.940	CN	220.5	7.60	0.01
Nov. 8.949	C_3	29.5	11.49	0.04
Nov. 8.951	C_3	49.0	10.76	0.05
Nov. 8.954	C_3	81.1	10.05	0.02
Nov. 8.957	C_3	137.3	9.46	0.01
Nov. 8.958	C_3	220.5	8.98	0.01
Nov. 9.046	CN	29.5	10.83	0.03
Nov. 9.049	CN	49.0	10.00	0.01
Nov. 9.051	CN	81.1	9.13	0.01
Nov. 9.053	CN	137.3	8.31	0.01
Nov. 9.055	CN	220.5	7.61	0.01
Nov. 9.065	C_3	29.5	11.49	0.04
Nov. 9.136	C_3	49.0	10.69	0.01
Nov. 9.139	C_3	81.1	10.09	0.02
Nov. 9.141	C_3	137.3	9.50	0.02
Nov. 9.144	C_3	220.5	8.97	0.05
Nov. 9.150	BC	29.5	11.24	0.03
Nov. 9.151	BC	49.0	10.61	0.02
Nov. 9.153	BC	81.1	10.15	0.02
Nov. 9.156	BC	137.3	9.69	0.02
Nov. 9.158	BC	220.5	9.26	0.03
Nov. 11.832	CN	29.5	10.96	0.05
Nov. 11.835	CN	49.0	10.01	0.02
Nov. 11.837	CN	81.1	9.18	0.02
Nov. 11.839	CN	137.3	8.31	0.02
Nov. 11.840	CN	220.5	7.63	0.02
Nov. 11.845	C_3	29.5	11.58	0.21
Nov. 11.847	C_3	49.0	10.66	0.05
Nov. 11.850	C_3	81.1	10.03	0.05
Nov. 11.852	C_3	137.3	9.38	0.05
Nov. 11.853	C_3	220.5	8.96	0.05
Nov. 11.863	BC	29.5	12.59	0.21
Nov. 11.865	BC	49.0	11.42	0.12
Nov. 11.867	BC	81.1	10.61	0.01
Nov. 11.869	BC	137.3	10.00	0.02

Date and time UT 1985	Filter used	Diaphragm in arcsec	Magnitude	Standard error
Nov. 11.871	BC	220.5	9.44	0.04
Nov. 11.915	C_2	29.5	11.00	0.20
Nov. 11.916	C_2	49.0	10.12	0.12
Nov. 11.917	C_2	81.1	9.03	0.02
Nov. 11.919	C_2	137.3	8.14	0.01
Nov. 11.921	C_2	220.5	7.37	0.02
Nov. 11.926	UC	29.5	12.68	0.07
Nov. 11.927	UC	49.0	11.89	0.12
Nov. 11.928	UC	81.1	11.25	0.02
Nov. 11.931	UC	137.3	10.57	0.01
Nov. 11.932	UC	220.5	9.89	0.11
Nov. 11.935	CO^+	29.5	12.01	0.05
Nov. 11.937	CO^+	49.0	11.04	0.01
Nov. 12.044	CN	29.5	10.95	0.09
Nov. 12.047	CN	49.0	10.15	0.10
Nov. 12.050	CN	81.1	9.23	0.01
Nov. 12.051	CN	137.3	8.33	0.03
Nov. 12.053	CN	220.5	7.69	0.01
Nov. 12.058	C_3	29.5	11.59	0.05
Nov. 12.060	C_3	49.0	10.62	0.02
Nov. 12.061	C_3	81.1	10.00	0.02
Nov. 12.063	C_3	137.3	9.39	0.01
Nov. 12.064	C_3	220.5	8.94	0.01
Nov. 12.072	BC	29.5	11.97	0.05
Nov. 12.074	BC	49.0	11.39	0.08
Nov. 12.075	BC	81.1	10.51	0.08
Nov. 12.076	BC	137.3	9.95	0.03
Nov. 12.078	BC	220.5	9.47	0.01
Nov. 12.099	C_2	29.5	10.98	0.25
Nov. 12.101	C_2	49.0	9.76	0.05
Nov. 12.103	C_2	81.1	8.98	0.03
Nov. 12.104	C_2	137.3	8.16	0.01
Nov. 12.106	C_2	220.5	7.46	0.01
Nov. 12.110	UC	29.5	12.67	0.05
Nov. 12.113	UC	49.0	12.32	0.14
Nov. 12.115	UC	81.1	11.43	0.05
Nov. 12.116	UC	137.3	10.74	0.05
Nov. 12.118	UC	220.5	10.27	0.05
Nov. 12.123	CO^+	29.5	11.83	0.07
Nov. 12.125	CO^+	49.0	11.18	0.04
Nov. 12.126	CO^+	81.1	10.61	0.01
Nov. 12.128	CO^+	137.3	10.16	0.01
Nov. 12.130	CO^+	220.5	9.88	0.01
Nov. 16.094	CN	29.5	10.57	0.14

Date and time UT 1985	Filter used	Diaphragm in arcsec	Magnitude	Standard error
Nov. 16.097	CN	49.0	9.58	0.04
Nov. 16.099	CN	81.1	8.67	0.01
Nov. 16.101	CN	137.3	7.74	0.01
Nov. 16.103	CN	220.5	7.12	0.04
Nov. 16.113	C_3	29.5	10.72	0.05
Nov. 16.115	C_3	49.0	9.99	0.02
Nov. 16.117	C_3	81.1	9.38	0.01
Nov. 16.119	C_3	137.3	8.86	0.02
Nov. 16.122	C_3	220.5	8.30	0.02
Nov. 16.946	CN	29.5	10.50	0.01
Nov. 16.948	CN	49.0	9.57	0.01
Nov. 16.950	CN	81.1	8.68	0.01
Nov. 16.952	CN	137.3	7.78	0.01
Nov. 16.953	CN	220.5	7.03	0.01
Nov. 16.963	C_3	29.5	10.92	0.07
Nov. 16.965	C_3	49.0	10.60	0.02
Nov. 16.967	C_3	81.1	9.50	0.02
Nov. 16.969	C_3	137.3	8.92	0.02
Nov. 16.971	C_3	220.5	8.44	0.02
Nov. 17.001	UC	29.5	12.53	0.14
Nov. 17.003	UC	49.0	11.77	0.05
Nov. 17.004	UC	81.1	11.07	0.01
Nov. 17.008	UC	137.3	10.43	0.05
Nov. 17.010	UC	220.5	9.76	0.04
Nov. 17.014	CO^+	29.5	11.91	0.08
Nov. 17.016	CO^+	49.0	10.69	0.05
Nov. 17.018	CO^+	81.1	10.07	0.07
Nov. 17.019	CO^+	137.3	9.55	0.02
Nov. 17.022	CO^+	220.5	9.22	0.01
Nov. 17.084	CN	29.5	10.67	0.07
Nov. 17.085	CN	49.0	9.53	0.02
Nov. 17.088	CN	81.1	8.63	0.02
Nov. 17.089	CN	137.3	7.75	0.01
Nov. 17.090	CN	220.5	7.01	0.01
Nov. 17.094	C_3	29.5	10.92	0.03
Nov. 17.095	C_3	49.0	10.02	0.01
Nov. 17.097	C_3	81.1	9.42	0.02
Nov. 17.098	C_3	137.3	8.84	0.02
Nov. 17.099	C_3	220.5	8.38	0.02
Nov. 17.140	UC	29.5	13.11	0.01
Nov. 17.142	UC	49.0	11.59	0.04
Nov. 17.144	UC	81.1	11.17	0.08
Nov. 17.146	UC	137.3	10.39	0.10
Nov. 17.148	UC	220.5	9.71	0.06

Date and time UT 1985	Filter used	Diaphragm in arcsec	Magnitude	Standard error
Nov. 17.152	CO^+	29.5	11.25	0.10
Nov. 17.154	CO^+	49.0	10.49	0.03
Nov. 17.156	CO^+	81.1	9.97	0.02
Nov. 17.158	CO^+	137.3	9.50	0.03
Nov. 17.160	CO^+	220.5	9.11	0.04
Nov. 17.924	UC	29.5	13.51	0.15
Nov. 17.926	UC	49.0	12.42	0.10
Nov. 17.928	UC	81.1	11.24	0.10
Nov. 17.930	UC	137.3	10.54	0.10
Nov. 17.931	UC	220.5	9.83	0.10
Nov. 17.935	CO^+	29.5	11.59	0.04
Nov. 17.937	CO^+	49.0	10.73	0.04
Nov. 17.939	CO^+	81.1	10.15	0.04
Nov. 17.940	CO^+	137.3	9.57	0.04
Nov. 17.942	CO^+	220.5	9.18	0.04
Nov. 18.042	UC	49.0	12.35	0.18
Nov. 18.044	UC	81.1	11.53	0.22
Nov. 18.046	UC	137.3	10.72	0.07
Nov. 18.047	UC	220.5	10.03	0.06
Nov. 18.052	CO^+	29.5	12.93	0.12
Nov. 18.053	CO^+	49.0	11.15	0.08
Nov. 18.056	CO^+	81.1	10.29	0.03
Nov. 18.058	CO^+	137.3	9.65	0.02
Nov. 18.059	CO^+	220.5	9.23	0.03
Nov. 18.120	CN	29.5	11.17	0.12
Nov. 18.122	CN	49.0	10.27	0.05
Nov. 18.124	CN	81.1	9.13	0.03
Nov. 18.125	CN	137.3	8.07	0.01
Nov. 18.127	CN	220.5	7.15	0.03
Nov. 18.151	CO^+	29.5	11.64	0.13
Nov. 18.154	CO^+	49.0	10.83	0.06
Nov. 18.156	CO^+	81.1	10.09	0.07
Nov. 18.158	CO^+	137.3	9.56	0.06
Nov. 18.159	CO^+	220.5	9.09	0.06
Dec. 12.824	CN	29.5	8.80	0.02
Dec. 12.826	CN	49.0	7.86	0.03
Dec. 12.828	CN	81.1	7.02	0.01
Dec. 12.830	CN	137.3	6.14	0.01
Dec. 12.832	CN	220.5	5.44	0.01
Dec. 12.838	C_3	29.5	9.70	0.08
Dec. 12.840	C_3	49.0	8.80	0.02
Dec. 12.842	C_3	81.1	8.19	0.01
Dec. 12.843	C_3	137.3	7.62	0.02
Dec. 12.845	C_3	220.5	7.17	0.01

Date and time UT 1985	Filter used	Diaphragm in arcsec	Magnitude	Standard error
Dec. 12.851	BC	29.5	9.69	0.05
Dec. 12.852	BC	49.0	8.90	0.03
Dec. 12.854	BC	81.1	8.40	0.03
Dec. 12.856	BC	137.3	7.92	0.01
Dec. 12.858	BC	220.5	7.52	0.01
Dec. 12.876	UC	49.0	10.26	0.08
Dec. 12.877	UC	81.1	9.68	0.01
Dec. 12.879	UC	137.3	9.16	0.02
Dec. 12.881	UC	220.5	8.72	0.04
Dec. 13.706	CN	29.5	9.06	0.04
Dec. 13.708	CN	49.0	8.16	0.04
Dec. 13.710	CN	81.1	7.26	0.04
Dec. 13.714	CN	137.3	6.43	0.03
Dec. 13.716	CN	220.5	5.76	0.03
Dec. 13.723	C_3	49.0	9.24	0.03
Dec. 13.725	C_3	81.1	8.64	0.04
Dec. 13.727	C_3	137.3	8.10	0.04
Dec. 13.728	C_3	220.5	7.72	0.04
Dec. 13.735	BC	49.0	9.48	0.04
Dec. 13.738	BC	81.1	8.88	0.03
Dec. 13.739	BC	137.3	8.42	0.03
Dec. 13.741	BC	220.5	8.05	0.03
Dec. 13.781	UC	49.0	10.68	0.04
Dec. 13.783	UC	81.1	10.10	0.03
Dec. 13.784	UC	137.3	9.58	0.01
Dec. 13.786	UC	220.5	9.25	0.01
Dec. 13.817	CN	49.0	8.20	0.04
Dec. 13.819	CN	81.1	7.31	0.04
Dec. 13.822	CN	137.3	6.48	0.02
Dec. 13.823	CN	220.5	5.77	0.01
Dec. 13.839	C_3	81.1	8.66	0.04
Dec. 13.841	C_3	137.3	8.10	0.02
Dec. 13.843	C_3	220.5	7.74	0.02
Dec. 13.856	BC	49.0	9.48	0.02
Dec. 13.857	BC	81.1	8.82	0.02
Dec. 13.859	BC	137.3	8.28	0.02
Dec. 13.861	BC	220.5	7.92	0.02
Dec. 22.712	CN	29.5	8.69	0.09
Dec. 22.714	CN	49.0	7.55	0.09
Dec. 22.716	CN	81.1	6.84	0.08
Dec. 22.717	CN	137.3	6.21	0.08
Dec. 22.719	CN	220.5	5.70	0.08
Dec. 22.725	C_3	29.5	9.74	0.09
Dec. 22.726	C_3	49.0	8.87	0.09

Date and time UT 1985/1986	Filter used	Diaphragm in arcsec	Magnitude	Standard error
Dec. 22.728	C_3	81.1	8.35	0.10
Dec. 22.730	C_3	137.3	7.98	0.10
Dec. 22.732	C_3	220.5	7.71	0.09
Dec. 22.740	BC	81.1	8.37	0.02
Dec. 22.742	BC	137.3	7.90	0.01
Dec. 22.743	BC	220.5	7.59	0.01
Dec. 22.781	UC	29.5	11.14	0.07
Dec. 22.783	UC	49.0	10.49	0.02
Dec. 22.784	UC	81.1	9.94	0.04
Dec. 22.785	UC	137.3	9.54	0.01
Dec. 22.788	UC	220.5	9.11	0.01
Dec. 30.719	CN	29.5	7.26	0.01
Dec. 30.721	CN	49.0	6.44	0.01
Dec. 30.722	CN	81.1	5.74	0.01
Dec. 30.724	CN	137.3	5.09	0.01
Dec. 30.724	CN	220.5	4.67	0.01
Dec. 30.727	C_3	49.0	7.59	0.01
Dec. 30.728	C_3	81.1	7.16	0.01
Dec. 30.730	C_3	137.3	6.87	0.01
Dec. 30.731	C_3	220.5	6.70	0.02
Dec. 30.734	BC	29.5	8.48	0.01
Dec. 30.736	BC	49.0	8.06	0.03
Dec. 30.738	BC	81.1	7.64	0.01
Dec. 30.742	BC	137.3	7.28	0.02
Dec. 30.744	BC	220.5	7.04	0.01
Jan. 5.685	CN	29.5	6.97	0.03
Jan. 5.688	CN	220.5	4.06	0.02
Jan. 5.689	C_3	29.5	8.55	0.04
Jan. 5.691	C_3	220.5	6.69	0.02
Jan. 5.693	BC	29.5	8.48	0.10
Jan. 5.697	BC	220.5	6.60	0.02
Jan. 5.712	CO^+	29.5	8.74	0.01
Jan. 5.714	CO^+	220.5	7.01	0.02
Jan. 5.716	UC	29.5	9.16	0.06
Jan. 5.719	UC	220.5	7.40	0.02
Jan. 5.731	CN	81.1	5.11	0.03
Jan. 5.733	C_3	81.1	7.06	0.02
Jan. 5.735	BC	81.1	7.06	0.02
Jan. 5.736	CO^+	81.1	7.60	0.01
Jan. 5.738	UC	81.1	8.00	0.01
May 1.865	C_3	29.5	10.34	0.06
May 1.868	C_3	49.0	9.76	0.07
May 1.870	C_3	81.1	8.99	0.06
May 1.872	C_3	137.3	8.18	0.07

Date and time UT 1986		Filter used	Diaphragm in arcsec	Magnitude	Standard error
May	1.874	C_3	220.5	7.81	0.12
May	1.876	BC	29.5	11.40	0.25
May	1.878	BC	49.0	10.01	0.08
May	1.879	BC	81.1	9.17	0.08
May	1.881	BC	137.3	8.37	0.10
May	1.883	BC	220.5	7.79	0.09
May	1.903	C_2	29.5	10.22	0.07
May	1.906	C_2	49.0	9.02	0.06
May	1.907	C_2	81.1	8.02	0.06
May	1.909	C_2	137.3	7.14	0.05
May	1.910	C_2	220.5	6.48	0.02
May	2.832	CN	29.5	9.35	0.02
May	2.848	CN	81.1	7.50	0.02
May	2.851	CN	137.3	6.68	0.02
May	2.853	CN	220.5	5.95	0.02
May	2.857	C_3	49.0	9.45	0.05
May	2.860	C_3	81.1	9.02	0.16
May	2.862	C_3	137.3	8.10	0.10
May	2.864	C_3	220.5	7.48	0.03
May	2.866	BC	29.5	11.42	0.11
May	2.869	BC	49.0	10.15	0.07
May	2.871	BC	81.1	9.31	0.12
May	2.874	BC	137.3	8.07	0.04
May	2.876	BC	220.5	7.59	0.03
May	2.892	C_2	29.5	9.38	0.02
May	2.894	C_2	49.0	8.24	0.02
May	2.896	C_2	81.1	7.43	0.01
May	2.899	C_2	137.3	6.56	0.01
May	2.899	C_2	220.5	5.88	0.01
May	2.901	UC	29.5	11.02	0.10
May	2.903	UC	49.0	10.18	0.03
May	2.905	UC	81.1	9.56	0.06
May	2.906	UC	137.3	8.92	0.05
May	2.908	UC	220.5	8.36	0.03
May	3.825	CN	29.5	10.16	0.15
May	3.828	CN	49.0	9.30	0.09
May	3.833	CN	81.1	8.43	0.08
May	3.843	C_3	49.0	10.11	0.05
May	3.846	C_3	81.1	9.38	0.06
May	3.848	C_3	137.3	8.73	0.04
May	3.850	C_3	220.5	8.19	0.04
May	3.853	BC	29.5	10.72	0.07
May	3.857	BC	81.1	9.04	0.08
May	3.858	BC	137.3	8.31	0.03

Date and time UT 1986		Filter used	Diaphragm in arcsec	Magnitude	Standard error
May	3.860	BC	220.5	7.77	0.04
May	3.875	C_2	29.5	10.30	0.05
May	3.876	C_2	49.0	8.88	0.04
May	3.878	C_2	81.1	7.96	0.02
May	3.880	C_2	137.3	7.12	0.03
May	3.881	C_2	220.5	6.34	0.03
May	3.883	UC	29.5	11.33	0.01
May	3.885	UC	49.0	10.63	0.01
May	3.886	UC	81.1	9.98	0.09
May	3.888	UC	137.3	9.29	0.05
May	3.890	UC	220.5	8.69	0.03
May	3.901	CN	29.5	10.04	0.16
May	3.903	CN	220.5	6.08	0.01
May	4.820	CN	29.5	9.27	0.05
May	4.822	CN	49.0	8.38	0.02
May	4.824	CN	81.1	7.56	0.03
May	4.825	CN	137.3	6.82	0.02
May	4.826	CN	220.5	6.29	0.02
May	4.828	C_3	29.5	9.95	0.02
May	4.830	C_3	49.0	9.20	0.01
May	4.831	C_3	81.1	8.59	0.02
May	4.833	C_3	137.3	8.03	0.01
May	4.835	C_3	220.5	7.65	0.01
May	4.836	BC	29.5	9.90	0.02
May	4.838	BC	49.0	9.34	0.01
May	4.840	BC	81.1	8.70	0.01
May	4.841	BC	137.3	8.16	0.02
May	4.842	BC	220.5	7.70	0.01
May	4.858	C_2	29.5	9.08	0.02
May	4.859	C_2	49.0	8.44	0.05
May	4.860	C_2	81.1	7.54	0.02
May	4.862	C_2	137.3	6.79	0.01
May	4.864	C_2	220.5	6.18	0.02
May	4.867	UC	49.0	10.31	0.02
May	4.869	UC	81.1	9.74	0.03
May	4.870	UC	137.3	9.08	0.01
May	4.872	UC	220.5	8.54	0.05
May	4.885	CN	29.5	9.10	0.02
May	4.888	CN	220.5	6.10	0.01
May	4.889	C_3	29.5	9.98	0.02
May	4.890	C_3	220.5	7.66	0.01
May	4.894	BC	220.5	7.56	0.01
May	4.898	C_2	220.5	6.12	0.01

Date and time UT 1986		Filter used	Diaphragm in arcsec	Magnitude	Standard error
May	4.899	UC	29.5	10.80	0.03
May	4.901	UC	220.5	8.52	0.04

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