The Optical Gravitational Lensing Experiment. Cepheids in Star Clusters from the Magellanic Clouds*

G. P i e t r z y ń s k i, and A. U d a l s k i

Warsaw University Observatory, Al. Ujazdowskie 4, 00-478 Warszawa, Poland
e-mail: (pietrzyn,udalski)@astrouw.edu.pl

ABSTRACT

We present Cepheids located in the close neighborhood of star clusters from the Magellanic Clouds. 204 and 132 such stars were found in the LMC and SMC, respectively. The lists of objects were constructed based on catalogs of Cepheids and star clusters, recently published by the OGLE-II collaboration. Location of selected Cepheids on the sky indicates that many of them are very likely cluster members. Photometric data of Cepheids and clusters are available from the OGLE archive.

1 Introduction

Cepheids and star clusters are very important objects for empirical testing many fundamental problems in astronomy. Since the period-luminosity relation for Cepheids has been discovered by Leavitt (1912) they became one of the most important sources of information about distances in the nearby Universe. Observations of Cepheids also provide empirical constraints on theory of stellar structure, evolution etc. On the other hand star clusters are ideal tracers of stellar evolution and independent source of information about distances, ages, chemical composition, interstellar absorption etc. of the galaxies where they reside.

Cepheids belonging to star clusters are especially worth detailed studies. For instance, due to well defined evolutionary phase they provide precise information on age, superior to that obtained with the standard procedure of isochrone fitting. They also may help in studies of cluster dynamics.

*Based on observations obtained with the 1.3 m Warsaw telescope at the Las Campanas Observatory operated by the Carnegie Institution of Washington.

Unfortunately the number of Cepheids located in the regions of star clusters is still small in both the Magellanic Clouds and the Galaxy. Observations are highly inhomogeneous, obtained by many astronomers, using many different instruments. Microlensing surveys make it possible to select large number of variable stars, in particular those from the fields of star clusters. Following the list of 127 eclipsing systems in optical coincidence with star clusters from the SMC (Pietrzyński and Udalski 1999), in this paper we present Cepheids located in the regions of star clusters in the Magellanic Clouds.

2 Observational Data

The photometric data used in this paper were collected during the OGLE-II microlensing survey with the 1.3 m Warsaw telescope located at the Las Campanas Observatory, Chile, which is operated by the Carnegie Institution of Washington. The telescope was equipped with 2048×2048 CCD camera working in driftscan mode. Detailed description of the instrumental system and the OGLE-II project was presented by Udalski, Kubiak and Szymański (1997).

About 4.5 and 2.4 square degrees regions in the LMC and SMC, respectively, covering most of the bars of these galaxies were monitored regularly since January 1997 through the standard BVI filters. Coordinates of the observed fields and the schematic maps of the LMC and SMC with contours of observed fields can be found in Udalski *et al.* (1999c,d). Data reduction pipeline and data quality tests of the SMC photometry are described in Udalski *et al.* (1998). Quality of the LMC data is similar and it will be described with release of stellar maps of the LMC in the near future (Udalski *et al.* in preparation). In particular, accuracy of transformation to the standard system is about 0.01–0.02 mag for all BVI-bands.

3 Cepheids in the Magellanic Cloud Star Clusters

Tables 1 and 2 list Cepheids located in the close neighborhood of star clusters of the LMC and SMC, respectively. The lists were constructed based on Catalogs of Star Clusters from the LMC (Pietrzyński *et al.* 1999) and SMC (Pietrzyński *et al.* 1998) and Catalogs of Cepheids from the LMC and SMC (Udalski *et al.* 1999c,d).

Cluster Cepheids were extracted from the Catalog of Cepheids when the

Table 1

Cepheids in star clusters from the LMC

Cluster name OGLE-CL-	Field	ID	D [R_{CL}]	P [days]	$T_0-2450000$ [HJD]	V [mag]	I [mag]	$E(B-V)$ [mag]	Type
LMC0005	LMC_SC15	45780	0.7	3.58788	723.23710	16.017	15.227	0.126	FU
LMC0038	LMC_SC14	109715	0.1	1.91300	723.27982	15.898	15.337	0.138	FO
LMC0051	LMC_SC14	160642	0.3	0.97211	724.94922	15.348	15.140	0.138	BR
LMC0052	LMC_SC14	143866	0.4	2.04587	724.55632	16.136	15.391	0.142	FO
LMC0054	LMC_SC14	170005	0.5	20.64642	712.44747	14.347	13.344	0.138	FA
LMC0058	LMC_SC14	220934	0.6	0.86912	724.83583	16.982	16.409	0.142	DM
LMC0058	LMC_SC14	221178	1.2	16.74144	717.42796	18.870	17.666	0.142	FA
LMC0069	LMC_SC12	200768	1.2	14.87020	716.87361	16.716	15.790	0.124	FA
LMC0074	LMC_SC12	37723	0.6	2.47581	444.05113	17.318	16.894	0.139	FA
LMC0090	LMC_SC13	111968	1.1	8.33337	722.56247	14.975	14.138	0.135	FU
LMC0093	LMC_SC13	111968	0.4	8.33337	722.56247	14.975	14.138	0.135	FU
LMC0113	LMC_SC13	173734	0.7	12.72593	713.03927	14.609	13.694	0.135	FU
LMC0115	LMC_SC13	178831	0.8	17.45740	713.31458	14.256	13.276	0.135	FU
LMC0125	LMC_SC11	228660	0.8	4.20424	722.18621	15.774	14.952	0.129	FU
LMC0136	LMC_SC11	118714	0.8	3.09884	723.48360	16.251	15.486	0.154	FU
LMC0142	LMC_SC11	250872	0.2	18.65508	717.25663	13.964	13.056	0.152	FU
LMC0142	LMC_SC11	250925	0.0	5.56688	719.67472	14.477	13.879	0.152	FO
LMC0142	LMC_SC11	250938	0.2	8.55890	719.65413	14.650	13.913	0.153	FU
LMC0152	LMC_SC11	257240	1.4	11.86131	713.17954	14.422	13.607	0.152	FU
LMC0154	LMC_SC11	338308	0.9	1.74277	723.93868	16.266	15.609	0.152	FO
LMC0156	LMC_SC11	338308	1.3	1.74277	723.93868	16.266	15.609	0.152	FO
LMC0157	LMC_SC11	306838	0.8	1.06752	724.41740	17.333	16.534	0.151	FO
LMC0164	LMC_SC11	49743	1.3	2.29575	443.10180	15.753	15.080	0.146	FO
LMC0164	LMC_SC11	49799	0.8	1.56520	444.92204	16.307	15.635	0.146	FO
LMC0164	LMC_SC11	54641	0.5	2.71388	444.56352	16.192	15.452	0.132	FU
LMC0164	LMC_SC11	331546	1.3	11.90536	713.18698	14.626	13.720	0.152	FU
LMC0164	LMC_SC11	331601	0.7	56.49819	686.12410	15.116	14.959	0.152	FA
LMC0209	LMC_SC10	250332	0.6	2.01253	443.28253	15.858	15.185	0.147	FO
LMC0211	LMC_SC10	245266	0.8	3.96572	443.23028	15.559	14.852	0.147	FU
LMC0261	LMC_SC8	76174	0.4	2.90619	442.43915	15.308	14.658	0.142	FO
LMC0261	LMC_SC8	76176	0.9	2.46017	444.78291	15.480	14.812	0.142	FO
LMC0261	LMC_SC8	76179	0.3	2.46242	443.09468	15.611	14.925	0.142	FO
LMC0262	LMC_SC8	86096	0.4	3.82230	444.32857	15.900	15.081	0.142	FU
LMC0263	LMC_SC8	21319	1.2	5.42859	440.73741	15.146	14.440	0.133	FU
LMC0266	LMC_SC8	39745	0.9	6.89000	441.24680	15.308	14.463	0.133	FU
LMC0269	LMC_SC8	64734	0.3	3.53975	443.36233	16.039	15.263	0.136	FU
LMC0276	LMC_SC8	145110	0.5	3.44680	443.93145	15.978	15.267	0.136	FU
LMC0278	LMC_SC8	118595	0.3	6.45160	440.43021	15.224	14.430	0.133	FU
LMC0285	LMC_SC8	151151	0.6	2.03362	444.28845	15.945	15.322	0.136	FO
LMC0303	LMC_SC8	242825	0.1	1.15426	444.15257	16.736	16.130	0.136	DM
LMC0304	LMC_SC8	363511	0.3	0.92234	444.30269	17.218	16.550	0.142	FO
LMC0305	LMC_SC8	298699	1.0	4.79323	444.01190	15.410	14.642	0.133	FU
LMC0306	LMC_SC8	337664	0.2	0.62980	444.55248	17.165	16.672	0.136	DM
LMC0309	LMC_SC8	318671	0.9	8.17005	443.08395	14.579	13.852	0.133	FU
LMC0312	LMC_SC8	318671	0.9	8.17005	443.08395	14.579	13.852	0.133	FU
LMC0318	LMC_SC7	21841	1.0	4.81308	442.24754	15.580	14.816	0.143	FU
LMC0321	LMC_SC7	30199	0.4	4.10536	441.92826	15.709	14.977	0.138	FU
LMC0321	LMC_SC7	30200	0.1	3.28632	442.74251	15.755	15.121	0.138	FU
LMC0332	LMC_SC7	192212	0.2	2.41249	444.85037	15.620	15.036	0.142	FO
LMC0336	LMC_SC7	174573	0.9	3.76557	444.39097	16.445	15.540	0.138	FU
LMC0344	LMC_SC7	325360	0.6	2.64961	443.25720	16.343	15.643	0.142	FU
LMC0350	LMC_SC7	311535	1.4	4.32379	444.14237	15.111	14.373	0.142	FO
LMC0362	LMC_SC7	86027	0.5	0.40354	444.87352	18.111	17.563	0.107	FO
LMC0362	LMC_SC7	425296	0.5	0.40354	444.87720	18.112	17.537	0.142	FO
LMC0365	LMC_SC21	40943	1.4	1.80312	724.92207	16.054	15.385	0.146	FO
LMC0375	LMC_SC6	66641	0.2	2.71388	444.00445	16.111	15.483	0.107	FU
LMC0379	LMC_SC6	66530	1.4	8.69372	442.84074	14.706	13.966	0.107	FU
LMC0394	LMC_SC6	254054	0.3	3.09206	442.57315	16.391	15.577	0.138	FU
LMC0394	LMC_SC6	254057	0.4	3.38313	443.41709	16.519	15.613	0.138	FU
LMC0394	LMC_SC6	254530	1.5	1.26602	444.93725	18.249	17.751	0.138	FA
LMC0395	LMC_SC6	254054	0.9	3.09206	442.57315	16.391	15.577	0.138	FU
LMC0395	LMC_SC6	254057	1.3	3.38313	443.41709	16.519	15.613	0.138	FU
LMC0395	LMC_SC6	254530	1.2	1.26602	444.93725	18.249	17.751	0.138	FA
LMC0401	LMC_SC6	267410	0.3	0.88863	444.49611	17.232	16.588	0.126	FO
LMC0407	LMC_SC6	422348	0.7	5.63875	443.91906	15.306	14.581	0.107	FU
LMC0408	LMC_SC6	431558	0.4	2.24761	444.31615	15.579	15.007	0.107	FO
LMC0410	LMC_SC6	26913	0.2	5.73854	444.31113	15.559	14.622	0.115	FU
LMC0410	LMC_SC6	377026	0.2	5.73913	444.22041	15.513	14.627	0.138	FU

T a b l e 1

continued

Cluster name OGLE-CL-	Field	ID	D [R_{CL}]	P [days]	$T_0-2450000$ [HJD]	V [mag]	I [mag]	$E(B-V)$ [mag]	Type
LMC0411	LMC_SC21	12	0.1	3.23227	442.70858	16.226	15.323	0.130	FU
LMC0411	LMC_SC21	187786	0.2	3.85993	723.67241	15.929	15.066	0.146	FU
LMC0411	LMC_SC21	187788	0.2	2.81419	722.79915	15.636	15.081	0.146	FU
LMC0411	LMC_SC21	187792	0.1	4.52988	724.83766	15.797	14.927	0.146	FU
LMC0411	LMC_SC21	187797	0.6	2.97310	723.45071	16.460	15.488	0.146	FU
LMC0411	LMC_SC21	187840	0.6	2.01501	724.55164	16.050	15.339	0.146	FO
LMC0411	LMC_SC21	187849	0.1	3.28019	724.58073	16.187	15.261	0.146	FU
LMC0411	LMC_SC21	187853	0.1	3.35487	724.73951	16.604	15.598	0.146	FU
LMC0411	LMC_SC21	187856	0.3	3.16725	723.96832	16.067	15.201	0.146	FU
LMC0412	LMC_SC6	422324	0.7	2.23825	443.72420	15.785	15.135	0.107	FO
LMC0431	LMC_SC5	275320	0.1	3.66130	444.10632	14.994	14.356	0.115	FO
LMC0431	LMC_SC5	275412	1.5	2.37496	443.48611	16.361	15.668	0.115	FU
LMC0436	LMC_SC5	372083	1.0	5.67416	442.21699	15.474	14.629	0.115	FU
LMC0438	LMC_SC5	399066	0.7	5.40730	442.52121	15.393	14.579	0.115	FU
LMC0457	LMC_SC4	53463	0.5	5.39550	440.52924	15.308	14.392	0.120	FO
LMC0457	LMC_SC4	53514	1.3	5.97551	442.02593	15.533	14.642	0.120	FU
LMC0457	LMC_SC4	53518	0.1	5.56684	443.02577	15.930	14.998	0.120	FU
LMC0457	LMC_SC4	53527	0.2	7.68466	440.55810	16.029	14.834	0.120	FU
LMC0457	LMC_SC4	53528	0.3	9.37703	440.78678	16.417	15.003	0.120	FU
LMC0457	LMC_SC4	53546	1.2	6.40602	444.56575	15.237	14.435	0.120	FU
LMC0457	LMC_SC4	53796	0.5	1.29505	443.98043	17.610	16.614	0.120	DM
LMC0457	LMC_SC4	176266	1.4	8.80196	439.87795	15.249	14.295	0.120	FU
LMC0459	LMC_SC4	36266	1.2	6.80614	438.48105	15.512	14.563	0.120	FU
LMC0461	LMC_SC4	53463	1.4	5.39550	440.52924	15.308	14.392	0.120	FO
LMC0461	LMC_SC4	176266	1.5	8.80196	439.87795	15.249	14.295	0.120	FU
LMC0461	LMC_SC4	176307	1.2	2.97632	444.48446	15.265	14.637	0.120	FO
LMC0466	LMC_SC4	167947	0.3	4.68002	443.46227	15.743	14.949	0.120	FU
LMC0468	LMC_SC4	220148	1.3	0.74088	444.47941	17.327	16.731	0.118	DM
LMC0477	LMC_SC4	296000	0.3	4.13355	443.50669	15.629	14.939	0.120	FU
LMC0478	LMC_SC4	296023	0.2	3.54545	444.94859	15.904	15.194	0.120	FU
LMC0480	LMC_SC4	295932	1.1	4.16628	441.63659	14.996	14.338	0.120	FO
LMC0482	LMC_SC4	305691	0.8	7.45743	443.64407	14.970	14.173	0.105	FU
LMC0487	LMC_SC4	417848	1.3	5.88305	442.73212	15.114	14.373	0.120	FU
LMC0490	LMC_SC4	391255	0.1	3.47904	442.50816	15.435	14.667	0.120	FO
LMC0491	LMC_SC4	408742	0.3	7.07075	438.18394	14.996	14.208	0.120	FU
LMC0495	LMC_SC4	408738	0.5	7.32026	443.12864	14.831	14.028	0.120	FU
LMC0496	LMC_SC3	35233	0.4	4.01553	444.36757	14.970	14.265	0.120	FO
LMC0507	LMC_SC3	170205	1.4	7.57042	444.30099	15.135	14.284	0.120	FU
LMC0508	LMC_SC3	201460	1.1	2.72805	443.37541	15.621	14.943	0.123	FO
LMC0512	LMC_SC3	170246	0.0	2.62452	444.94181	15.567	14.913	0.120	FO
LMC0512	LMC_SC3	170248	0.2	5.29412	443.84860	15.546	14.717	0.120	FU
LMC0514	LMC_SC3	250776	0.8	4.61320	440.42176	16.794	15.582	0.134	FU
LMC0527	LMC_SC3	368172	0.6	4.92028	444.23791	15.639	14.807	0.120	FU
LMC0532	LMC_SC2	47348	1.3	6.29131	444.72622	15.066	14.313	0.121	FU
LMC0533	LMC_SC3	47348	0.9	6.29131	444.72622	15.066	14.313	0.121	FU
LMC0538	LMC_SC2	78835	0.9	2.58776	443.97512	16.129	15.456	0.151	FU
LMC0540	LMC_SC2	70874	1.3	2.75064	442.37314	15.496	14.842	0.150	FO
LMC0541	LMC_SC2	91891	1.2	4.16669	443.54047	15.770	14.991	0.131	FU
LMC0543	LMC_SC2	180132	0.1	7.09089	440.20200	15.172	14.329	0.150	FU
LMC0551	LMC_SC2	158664	0.5	7.02416	440.35802	15.184	14.383	0.121	FU
LMC0551	LMC_SC2	158669	1.1	3.04825	444.97874	15.523	14.823	0.121	FO
LMC0552	LMC_SC2	127941	0.3	2.36507	443.41876	15.557	14.984	0.121	FO
LMC0556	LMC_SC2	232835	0.6	4.63835	441.82571	15.676	14.901	0.121	FU
LMC0559	LMC_SC2	263427	1.4	3.30708	444.08152	15.973	15.273	0.121	FU
LMC0559	LMC_SC2	263433	0.3	3.23673	442.04624	15.375	14.710	0.121	FO
LMC0559	LMC_SC2	263498	0.7	3.88073	443.61059	16.104	15.269	0.121	FU
LMC0565	LMC_SC2	240715	1.1	2.52449	444.07778	16.366	15.672	0.121	FU
LMC0565	LMC_SC2	240852	1.5	0.80429	444.25721	17.318	16.722	0.121	FO
LMC0565	LMC_SC2	334165	1.1	3.29488	442.81323	16.171	15.350	0.121	FU
LMC0566	LMC_SC2	334165	1.3	3.29488	442.81323	16.171	15.350	0.121	FU
LMC0569	LMC_SC2	357821	0.5	4.29598	441.30282	15.797	14.973	0.121	FU
LMC0571	LMC_SC1	51886	1.4	4.65494	442.59661	15.638	14.826	0.147	FU
LMC0574	LMC_SC1	66584	0.9	1.83677	444.77986	16.443	15.678	0.147	FO
LMC0585	LMC_SC1	150925	0.1	4.29163	443.64129	15.893	15.055	0.147	FU
LMC0585	LMC_SC1	150939	1.4	2.36133	444.75922	15.790	15.124	0.147	FO
LMC0591	LMC_SC1	158021	0.2	2.93704	444.49429	16.079	15.372	0.147	DM
LMC0591	LMC_SC1	158027	1.4	2.28500	444.56718	16.020	15.284	0.147	FO
LMC0591	LMC_SC1	158066	1.4	2.20349	443.00294	16.102	15.365	0.147	FO

Table 1

concluded

Cluster name OGLE-CL-	Field	ID	D [R_{CL}]	P [days]	$T_0-2450000$ [HJD]	V [mag]	I [mag]	$E(B-V)$ [mag]	Type
LMC0592	LMC_SC1	164361	1.0	1.88935	444.79581	16.414	15.641	0.163	FO
LMC0599	LMC_SC1	201683	0.9	2.31922	444.82428	15.870	15.174	0.152	FO
LMC0603	LMC_SC1	306814	1.3	2.23221	444.53573	15.883	15.192	0.147	FO
LMC0603	LMC_SC1	306872	1.1	3.55525	442.84736	16.065	15.252	0.147	FU
LMC0607	LMC_SC1	266530	0.0	4.11529	441.55075	15.541	14.857	0.117	FU
LMC0609	LMC_SC1	324972	0.5	4.65729	443.11470	15.467	14.732	0.147	FU
LMC0620	LMC_SC16	37107	0.3	2.85225	722.24340	15.524	14.859	0.185	FO
LMC0622	LMC_SC16	26114	0.7	2.45436	723.55163	15.646	15.015	0.148	FO
LMC0622	LMC_SC16	99253	0.7	3.21026	723.51146	15.854	15.197	0.148	FU
LMC0622	LMC_SC16	99255	0.2	3.63447	724.98569	15.888	15.073	0.148	FU
LMC0622	LMC_SC16	99257	0.1	2.25531	724.55848	15.665	15.083	0.148	FO
LMC0622	LMC_SC16	99259	1.2	2.54551	724.46521	15.552	14.921	0.148	FO
LMC0622	LMC_SC16	99294	0.3	2.05606	723.61242	15.770	15.181	0.148	FO
LMC0626	LMC_SC16	104483	0.7	4.18017	724.95320	15.809	15.013	0.148	FU
LMC0627	LMC_SC16	115249	0.6	4.32412	720.90521	16.211	15.224	0.185	FU
LMC0627	LMC_SC16	115254	1.4	3.88261	724.25392	16.064	15.247	0.185	FU
LMC0631	LMC_SC16	172438	1.5	3.67029	724.88064	16.237	15.423	0.148	FU
LMC0631	LMC_SC16	172452	0.2	2.12037	724.14454	15.798	15.212	0.148	FO
LMC0631	LMC_SC16	177829	1.5	2.70457	723.74610	16.295	15.554	0.185	FU
LMC0632	LMC_SC16	177811	0.1	4.88909	722.06980	15.515	14.761	0.185	FU
LMC0633	LMC_SC16	172383	0.1	5.33924	722.54152	15.592	14.776	0.148	FU
LMC0633	LMC_SC16	172435	0.5	2.27102	723.10424	15.964	15.285	0.148	FO
LMC0633	LMC_SC16	172447	0.4	3.64388	723.94776	15.832	15.154	0.148	FU
LMC0633	LMC_SC16	172450	0.2	2.12318	724.80143	15.955	15.307	0.148	FO
LMC0633	LMC_SC16	172455	0.1	1.97267	723.60901	15.894	15.295	0.148	FO
LMC0633	LMC_SC16	172459	0.2	2.08792	724.43182	15.889	15.276	0.148	FO
LMC0633	LMC_SC16	172460	0.1	3.34067	723.46521	15.989	15.249	0.148	FU
LMC0633	LMC_SC16	177773	0.7	4.14658	723.88892	15.933	15.054	0.185	FU
LMC0633	LMC_SC16	177774	0.2	4.97643	723.99702	15.496	14.761	0.185	FU
LMC0633	LMC_SC16	177777	0.3	4.67694	723.82548	15.476	14.792	0.185	FU
LMC0633	LMC_SC16	177781	0.8	5.34543	724.04817	15.580	14.800	0.185	FU
LMC0633	LMC_SC16	177823	0.3	1.91792	724.12452	16.033	15.415	0.185	FO
LMC0633	LMC_SC16	235480	0.8	2.04557	724.33725	16.041	15.367	0.148	FO
LMC0633	LMC_SC16	240725	1.3	17.56780	716.34020	9.999	17.212	0.185	FA
LMC0634	LMC_SC16	167363	0.8	4.72921	723.64560	15.599	14.849	0.148	FU
LMC0635	LMC_SC16	194262	0.3	2.14536	723.91789	16.551	15.619	0.181	FO
LMC0636	LMC_SC16	240459	1.0	5.57865	724.29562	15.574	14.702	0.185	FU
LMC0636	LMC_SC16	240469	0.5	3.30523	721.83339	15.636	14.862	0.185	FO
LMC0636	LMC_SC16	240517	1.1	2.23872	724.40841	15.982	15.290	0.185	FO
LMC0636	LMC_SC16	240518	0.8	2.12913	724.77135	16.041	15.347	0.185	FO
LMC0636	LMC_SC16	240524	0.2	2.21601	723.11858	15.831	15.212	0.185	FO
LMC0636	LMC_SC16	240525	0.5	1.86071	723.50445	16.006	15.419	0.185	FO
LMC0638	LMC_SC16	257336	1.1	2.40550	723.83795	16.613	15.552	0.181	FO
LMC0648	LMC_SC17	33286	0.4	2.21517	723.84675	15.829	15.157	0.175	FO
LMC0648	LMC_SC17	33289	0.4	4.82058	721.57077	15.522	14.760	0.175	FU
LMC0648	LMC_SC17	33290	0.2	2.55444	722.78060	15.864	15.110	0.175	DM
LMC0648	LMC_SC17	33292	0.3	4.39425	722.62297	15.833	14.977	0.175	FU
LMC0648	LMC_SC17	33296	0.4	2.33253	723.97765	15.842	15.135	0.176	FO
LMC0648	LMC_SC17	33299	0.6	4.04385	722.43556	15.921	15.035	0.175	FU
LMC0648	LMC_SC17	33301	0.9	5.78371	722.82435	15.839	14.842	0.175	FU
LMC0648	LMC_SC17	33306	0.9	3.36728	723.64425	16.318	15.423	0.176	FU
LMC0648	LMC_SC17	33351	0.8	1.85403	724.42809	16.059	15.347	0.175	FO
LMC0648	LMC_SC17	33368	0.2	3.64424	724.56633	15.956	15.145	0.175	FU
LMC0650	LMC_SC17	45207	0.4	3.17309	723.74520	16.245	15.390	0.175	FU
LMC0656	LMC_SC17	102941	0.3	4.48780	724.93418	15.886	15.067	0.175	FU
LMC0659	LMC_SC17	117748	0.8	3.57231	723.51809	15.652	14.815	0.201	FO
LMC0665	LMC_SC17	161761	0.2	2.94886	724.58682	16.444	15.620	0.175	FU
LMC0678	LMC_SC18	69137	0.2	4.18875	722.84863	16.345	15.346	0.178	FU
LMC0681	LMC_SC18	81454	1.0	2.02331	724.11582	16.256	15.484	0.173	FO
LMC0683	LMC_SC18	89202	0.9	1.47140	724.51654	17.011	16.244	0.173	DM
LMC0685	LMC_SC18	144662	0.6	2.38412	724.29685	15.956	15.221	0.173	FO
LMC0690	LMC_SC18	110903	0.1	3.08563	724.29846	16.534	15.613	0.182	FU
LMC0694	LMC_SC19	28796	0.5	2.39931	723.84475	16.546	15.740	0.187	FU
LMC0702	LMC_SC19	81235	0.4	3.60974	724.58983	16.239	15.357	0.187	FU
LMC0703	LMC_SC19	77859	0.9	3.61971	722.02986	16.087	15.262	0.187	FU
LMC0715	LMC_SC19	148467	1.2	2.85623	722.32707	16.422	15.583	0.153	FU
LMC0715	LMC_SC19	148475	0.2	2.97442	724.16899	16.233	15.454	0.153	FU
LMC0739	LMC_SC20	145017	1.3	2.66457	724.82090	16.352	15.541	0.142	FU

T a b l e 2

Cepheids in star clusters from the SMC

Cluster name OGLE-CL-	Field	ID	D $[R_{CL}]$	P [days]	$T_0-2450000$ [HJD]	V [mag]	I [mag]	$E(B-V)$ [mag]	Type
SMC0007	SMC_SC2	41567	0.4	1.40886	618.74916	16.936	16.346	0.078	FO
SMC0008	SMC_SC2	35276	0.2	17.46250	610.07361	14.720	13.819	0.078	FU
SMC0009	SMC_SC2	35278	0.2	10.28820	618.88967	15.299	14.417	0.078	FU
SMC0015	SMC_SC3	19968	1.4	6.22889	615.49328	15.964	15.247	0.089	FU
SMC0016	SMC_SC3	28018	0.6	1.85081	619.56624	16.509	15.747	0.089	FU
SMC0016	SMC_SC3	28026	0.8	3.24153	619.57762	16.502	15.879	0.089	FU
SMC0016	SMC_SC3	28071	0.1	1.73099	618.87379	17.348	16.609	0.089	FU
SMC0016	SMC_SC3	28166	0.5	1.61426	619.28998	17.618	16.925	0.089	FU
SMC0016	SMC_SC3	28170	0.5	0.96090	619.64731	17.460	16.887	0.089	FO
SMC0021	SMC_SC3	100628	0.9	1.69913	618.31681	17.210	16.593	0.089	FU
SMC0024	SMC_SC3	226052	0.8	2.35922	619.87879	16.414	15.729	0.089	FO
SMC0024	SMC_SC3	226093	0.9	1.67881	619.30658	17.008	16.437	0.089	FU
SMC0024	SMC_SC3	226219	0.7	1.42663	618.92733	17.631	16.947	0.089	FU
SMC0025	SMC_SC3	202814	1.3	1.35409	619.36886	17.147	16.497	0.089	FO
SMC0026	SMC_SC3	193306	0.7	3.55879	616.75811	15.431	14.786	0.089	FO
SMC0026	SMC_SC3	193346	0.9	1.35113	618.92071	17.353	16.619	0.089	FO
SMC0027	SMC_SC3	184934	1.3	2.29836	618.48704	16.974	16.279	0.089	FU
SMC0030	SMC_SC4	26050	1.2	2.24353	618.07520	17.082	16.256	0.094	FU
SMC0032	SMC_SC4	2200	0.2	8.03958	618.41522	15.251	14.525	0.094	FU
SMC0033	SMC_SC4	56758	0.4	8.49275	615.16825	15.734	14.805	0.094	FU
SMC0034	SMC_SC4	75328	0.2	1.84920	619.40231	17.170	16.396	0.094	FO
SMC0038	SMC_SC4	113676	0.4	1.84525	618.31789	17.293	16.631	0.094	FU
SMC0039	SMC_SC4	101175	1.5	5.09495	617.96620	16.162	15.361	0.094	FU
SMC0039	SMC_SC4	101254	0.3	2.12686	619.33069	17.085	16.412	0.094	FU
SMC0042	SMC_SC4	103754	1.4	1.42543	618.67533	16.608	16.111	0.094	FO
SMC0043	SMC_SC4	167207	1.2	11.77230	615.62092	15.444	14.393	0.094	FU
SMC0043	SMC_SC4	167294	0.6	1.12408	619.63158	16.518	15.982	0.094	SO
SMC0044	SMC_SC4	182573	1.3	3.36192	618.08487	15.819	15.135	0.094	FO
SMC0044	SMC_SC4	182698	0.4	1.27799	619.48514	17.019	16.418	0.094	FO
SMC0045	SMC_SC4	149863	0.0	2.10220	618.11212	16.724	15.966	0.094	FU
SMC0045	SMC_SC4	149945	0.6	1.93618	618.33651	17.078	16.364	0.094	FU
SMC0045	SMC_SC4	149961	0.2	1.70359	619.88353	17.159	16.571	0.094	FU
SMC0046	SMC_SC4	149830	1.0	3.12054	618.25082	15.747	15.113	0.094	FO
SMC0048	SMC_SC4	163672	0.5	0.57435	619.97776	18.330	17.705	0.094	DM
SMC0048	SMC_SC5	21147	1.0	1.71604	464.05698	17.325	16.636	0.101	FU
SMC0048	SMC_SC5	21488	0.5	0.57434	464.90685	18.305	17.691	0.101	FO
SMC0048	SMC_SC5	160151	1.2	0.95653	619.48722	18.182	17.459	0.101	FO
SMC0054	SMC_SC5	95232	0.9	1.62340	463.52647	16.436	15.870	0.101	FO
SMC0054	SMC_SC5	95332	1.2	1.43148	464.63410	17.564	16.944	0.101	FU
SMC0057	SMC_SC5	123315	0.4	9.93769	456.85612	15.375	14.495	0.101	FU
SMC0057	SMC_SC5	123380	1.0	1.88441	464.34760	16.694	16.018	0.101	FO
SMC0058	SMC_SC5	140700	1.3	2.75631	464.78389	16.774	16.011	0.101	FU
SMC0058	SMC_SC5	140909	1.0	1.39567	464.36678	18.036	17.222	0.101	FU
SMC0060	SMC_SC5	170190	1.3	3.38513	462.26488	15.732	15.107	0.101	FO
SMC0063	SMC_SC5	202240	0.4	1.94635	464.87498	17.038	16.417	0.101	FU
SMC0064	SMC_SC5	213952	0.6	27.41300	447.26716	14.176	13.178	0.101	FU
SMC0064	SMC_SC5	213983	1.2	3.61449	461.66443	9.999	15.327	0.101	FO
SMC0066	SMC_SC5	266150	1.0	1.58000	464.93150	17.499	16.823	0.101	FU
SMC0066	SMC_SC5	271051	0.1	15.64740	451.81515	14.607	13.704	0.101	FU
SMC0067	SMC_SC5	316843	0.7	1.11613	464.67251	17.220	16.630	0.101	FO
SMC0068	SMC_SC5	260821	0.8	6.81805	461.30849	15.488	14.714	0.101	FU
SMC0068	SMC_SC5	260976	1.4	1.55747	463.96344	17.170	16.603	0.101	FU
SMC0068	SMC_SC5	260992	1.4	1.28816	463.83946	17.299	16.628	0.101	FO
SMC0069	SMC_SC5	271164	0.3	2.30034	463.15391	16.886	16.157	0.101	FU
SMC0071	SMC_SC6	288734	1.1	4.88882	463.95655	15.961	15.188	0.094	FU
SMC0071	SMC_SC6	288872	1.4	1.46495	463.80656	17.775	17.042	0.094	FU
SMC0074	SMC_SC6	49142	0.3	3.92114	463.79105	15.962	15.360	0.094	FU
SMC0074	SMC_SC6	49153	0.6	2.72070	464.39482	16.325	15.531	0.094	FO
SMC0074	SMC_SC6	49155	1.1	5.88439	464.86236	16.098	15.234	0.094	FO
SMC0074	SMC_SC6	49197	0.9	2.58151	464.21633	16.479	15.874	0.094	FU
SMC0074	SMC_SC6	49238	0.9	2.07911	463.23369	17.246	16.486	0.094	FU
SMC0074	SMC_SC6	49351	0.1	2.07796	463.10747	16.192	15.690	0.094	FO
SMC0075	SMC_SC6	29034	0.6	3.93931	463.57879	16.260	15.545	0.094	FU
SMC0078	SMC_SC6	128740	0.2	9.88728	462.12553	15.358	14.495	0.094	FU
SMC0078	SMC_SC6	128892	1.4	0.76210	464.27047	16.945	16.698	0.094	FO
SMC0079	SMC_SC6	94519	0.4	3.11878	464.05801	16.743	16.003	0.094	FU

Table 2

concluded

Cluster name OGLE-CL-	Field	ID	D [R_{CL}]	P [days]	$T_0-2450000$ [HJD]	V [mag]	I [mag]	$E(B-V)$ [mag]	Type
SMC0085	SMC_SC6	153030	1.2	2.13571	463.76086	17.331	16.596	0.094	FU
SMC0087	SMC_SC6	89698	1.4	1.91914	463.17510	17.277	16.607	0.094	FU
SMC0088	SMC_SC6	141593	0.5	5.72171	459.60445	15.721	14.933	0.094	FU
SMC0088	SMC_SC6	141749	1.2	1.49391	464.23696	17.638	16.988	0.094	FU
SMC0090	SMC_SC6	175773	1.2	2.31818	464.18010	16.253	15.516	0.094	FO
SMC0090	SMC_SC6	180129	0.9	1.59418	464.19936	17.503	16.836	0.094	FU
SMC0092	SMC_SC6	232227	0.6	2.67844	462.60605	16.201	15.493	0.094	FO
SMC0093	SMC_SC6	242093	1.2	2.00387	464.11086	16.908	16.301	0.094	FU
SMC0099	SMC_SC7	70819	0.9	2.87953	619.52783	15.974	15.359	0.097	FU
SMC0103	SMC_SC7	91545	0.2	1.78021	619.30486	16.725	16.101	0.097	FO
SMC0105	SMC_SC7	110088	0.5	6.09280	619.69447	15.868	15.037	0.097	FU
SMC0105	SMC_SC7	110197	0.6	0.95703	619.44017	18.047	17.196	0.097	FO
SMC0105	SMC_SC7	110251	1.5	1.70804	618.96889	17.660	16.937	0.097	FU
SMC0107	SMC_SC7	206038	1.1	1.18480	619.77435	17.051	16.498	0.097	FO
SMC0117	SMC_SC8	139531	1.0	1.67514	619.00859	9.999	16.983	0.100	FU
SMC0118	SMC_SC8	204460	0.2	2.49360	617.62931	15.781	15.186	0.100	FO
SMC0119	SMC_SC8	201506	0.7	5.37653	619.80231	15.893	15.093	0.100	FU
SMC0120	SMC_SC8	201506	1.0	5.37653	619.80231	15.893	15.093	0.100	FU
SMC0122	SMC_SC8	163502	0.6	3.48000	617.07068	16.570	15.763	0.100	FO
SMC0122	SMC_SC8	163504	0.4	1.44514	619.24474	16.367	15.804	0.100	FO
SMC0124	SMC_SC9	33090	0.9	0.67490	619.80537	17.929	17.393	0.076	FO
SMC0127	SMC_SC9	86924	0.1	1.90782	618.16653	15.933	15.479	0.076	FO
SMC0129	SMC_SC9	70439	1.2	0.78463	619.71184	17.288	16.841	0.076	FO
SMC0130	SMC_SC9	89376	0.3	2.11771	619.34262	16.089	15.536	0.076	FO
SMC0130	SMC_SC9	129534	1.1	18.11310	611.88043	14.440	13.519	0.076	FU
SMC0132	SMC_SC9	94309	0.5	1.04715	619.14816	17.345	16.809	0.076	FO
SMC0135	SMC_SC9	147031	0.2	0.66243	620.00063	17.877	17.307	0.076	FO
SMC0137	SMC_SC10	8949	0.4	1.01211	619.92625	16.677	16.181	0.079	FO
SMC0141	SMC_SC10	52210	0.9	1.76375	619.32186	16.289	15.725	0.079	FO
SMC0141	SMC_SC10	52222	1.5	1.46101	618.65742	16.915	16.358	0.079	FO
SMC0141	SMC_SC10	52269	0.2	2.35633	618.20938	17.166	16.437	0.079	FU
SMC0149	SMC_SC10	108084	1.0	2.07929	618.05528	15.991	15.458	0.079	FO
SMC0149	SMC_SC10	108101	0.6	3.12498	617.76822	16.303	15.612	0.079	FU
SMC0149	SMC_SC10	108122	0.6	3.22932	619.75437	16.395	15.678	0.079	FU
SMC0149	SMC_SC10	108123	0.8	2.40357	619.61427	16.552	15.925	0.079	FU
SMC0151	SMC_SC10	114449	0.2	2.29254	619.27995	16.241	15.592	0.079	FO
SMC0154	SMC_SC11	46557	1.3	2.93693	618.62552	16.127	15.535	0.084	FU
SMC0154	SMC_SC11	46577	0.6	1.70625	619.98375	17.179	16.333	0.084	FO
SMC0155	SMC_SC11	50956	0.4	5.91124	614.99409	15.419	14.784	0.084	FU
SMC0156	SMC_SC11	40376	1.0	1.65571	618.64254	17.218	16.627	0.084	FU
SMC0156	SMC_SC11	42383	1.2	0.80714	619.79471	17.703	17.128	0.084	DM
SMC0157	SMC_SC11	32136	1.1	1.93392	618.19445	16.673	16.133	0.084	FU
SMC0157	SMC_SC11	32190	0.3	1.17536	619.68682	17.745	17.148	0.084	FU
SMC0158	SMC_SC11	87074	1.3	2.87814	618.26466	15.673	15.089	0.084	FO
SMC0158	SMC_SC11	87075	0.7	3.20045	619.65570	16.305	15.607	0.084	FU
SMC0158	SMC_SC11	89112	0.6	3.07455	618.83560	16.074	15.438	0.084	FU
SMC0159	SMC_SC11	68073	0.7	0.91530	619.48105	17.613	17.014	0.084	FO
SMC0159	SMC_SC11	70009	0.8	1.42400	619.81444	16.250	15.488	0.084	BR
SMC0159	SMC_SC11	99428	1.1	1.83184	618.92241	16.935	16.258	0.084	FU
SMC0171	SMC_SC2	78238	0.4	0.64958	619.91618	18.100	17.531	0.078	FO
SMC0179	SMC_SC3	217715	1.2	1.45733	619.54705	17.636	16.947	0.089	FU
SMC0189	SMC_SC4	167230	0.4	3.90049	617.53356	16.788	15.889	0.094	FU
SMC0190	SMC_SC4	192867	0.6	3.69281	616.72477	16.061	15.418	0.094	FU
SMC0190	SMC_SC4	193064	0.4	1.28378	619.38448	17.781	17.094	0.094	FU
SMC0191	SMC_SC4	192867	1.2	3.69281	616.72477	16.061	15.418	0.094	FU
SMC0197	SMC_SC5	170398	1.2	0.84209	464.19162	17.396	16.817	0.101	DM
SMC0198	SMC_SC5	190473	1.2	5.74893	464.56259	16.363	15.448	0.101	FU
SMC0205	SMC_SC5	288813	0.6	1.92043	464.31693	16.995	16.305	0.101	FU
SMC0210	SMC_SC6	122308	0.8	3.19828	463.27989	16.669	15.961	0.094	FU
SMC0216	SMC_SC6	296732	1.3	2.16626	462.86401	16.300	15.659	0.094	FO
SMC0216	SMC_SC6	296748	1.0	1.84556	463.27691	17.558	16.737	0.094	FU
SMC0216	SMC_SC6	296846	1.4	1.36357	463.75244	17.305	16.535	0.094	FO
SMC0225	SMC_SC7	236366	0.6	1.14305	619.93406	18.205	17.509	0.097	FU
SMC0233	SMC_SC9	163578	0.9	5.09339	615.80084	15.890	15.179	0.076	FU
SMC0237	SMC_SC10	41744	1.5	1.84743	618.57129	17.230	16.606	0.079	FU
NGC 346	SMC_SC8	160784	–	1.10730	619.49347	17.354	16.770	0.100	FO

location of a given object on the sky was smaller than 1.5 radius from the center of a given cluster. Beside classical Cepheids listed in the Catalogs also double-mode and second overtone objects from the SMC (Udalski *et al.* 1999a,b) and LMC (Udalski *et al.* in preparation) were checked.

204 and 132 Cepheids in the LMC and SMC, respectively, satisfied our criterion. Basic parameters of these objects are given in Tables 1 and 2. First column is the cluster designation according to the OGLE scheme. Cross-identification of clusters with other catalogs can be found in Catalogs of Star Clusters. Star ID number (OGLE identification: field and number) and distance from the cluster center, measured in units of cluster radius are given in columns 2, 3 and 4. Periods, zero phases corresponding to maximum brightness, *VI* photometry, interstellar reddening and classification taken from the Catalogs of Cepheids (Udalski *et al.* 1999c,d) are presented in the following columns. FU, FO, BR and FA symbols in the last column indicate that a given object belongs to the classical Cepheids pulsating in the fundamental mode, first overtone mode, it is brighter than FO or fainter than FU, respectively. DM indicates double mode Cepheid while SO – second overtone object. For the sake of completeness we additionally included to the SMC list one Cepheid which is likely a NGC346 member. Large part of that cluster is located outside the OGLE-II fields and therefore it was not included in the Catalog of Star Clusters from the SMC.

4 Conclusions

We present lists of Cepheids located in the close neighborhood of star clusters from the 4.5 square degrees field of the LMC and 2.4 square degrees area of the SMC. Thus far, presented Cepheids constitute the most complete sample of such objects with homogeneous observational data and high statistical completeness. The sample is very well suited for further detailed studies. Results of analysis of these objects will be presented in separate papers.

Photometry of Cepheids and star clusters in the LMC and SMC is available from the OGLE Internet archive: *http://www.astrouw.edu.pl/~ogle*
or its US mirror *http://www.astro.princeton.edu/~ogle*

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