ROTSE-I All Sky Survey as a Tool of Target Selection in the COROT Fields

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Abstract

A systematic variability search has been carried out on the ROTSE-I data in the direction of the first 'exoplanet field' of COROT satellite. The numerous identified variable stars allow us to call the attention some potentially interesting objects and help us to make our observational project more successful.

Data

The Robotic Optical Transient Search Experiment I (ROTSE-I) has generated CCD photometry for the northern sky in two epochs nightly since 1998 March by a robotic system of four comounted unfiltered telephoto lenses. The instruments have designed to search for astrophysical transients, especially those associated with gamma-ray bursts (Akerlof et al. 1999). The survey was conducted from Los Alamos, New Mexico.

The Northern Sky Variability Survey (NSVS) is a part of these sky patrol: it covers the entire northern sky with a 1 year baseline and typically 100-500 measurements per object in the range of the optical magnitude from 8 to 15.5. The spatial resolution of the observed frames were 14.4″/pixels. See Woźniak et al. (2004a) for any other details. All NSVS measurements are available for on-line public access from the Sky Database for Objects in Time-Domain (SkyDOT) at Los Alamos National Laboratory:

http://skydot.lanl.gov/

Search for Variable Stars

The ROTSE team have demonstrated the usefullness of NSVS data base to identify new variable stars. In the study of Akerlof et al. (2000) have been found 1781 variable stars in a set of sky patrol fields covering roughly 2000 deg^2. Through the combining the 2MASS data with the NSVS observations Woźniak et al. (2004b) have identified 6474 slowly pulsating red variable stars. No other variability search has been published. We present results of a search for variable stars derived from NSVS observations in the first exo-field of COROT satellite.

The data were filtered some subsequent steps:

- A bigger area was selected around the COROT field which will be observed in the first winter: $6^h40^m < \alpha < 6^h48^m$, $-3° < \delta < 1°$.
- Variability index $I_{\rm var}$ was defined as in Akerlof et al. (2000). The possible variable stars were selected by the criterion of $I_{\rm var} \geq 4.75\sigma$.
- An automatic period search was run on each selected stars by the modified MUFRAN program package (Kolláth 1990, Csubry & Kolláth 2004).

Variable identification and period determination are conducted via automatic algorithms, but all variable stars for this study have been manually confirmed. 35 variables have been found and 24 of them proved to be new discoveries. The mean results can be seen in the Table 1. Column 1. shows the ROTSE name of the stars, column 2. and 3. are included the positions, col. 4. is contained the variability indices. A simple arithmetic average of ROTSE brightnesses are included in column 5. The determined period are shown in col. 6. The possible type and cross identification are indicated in the last column.

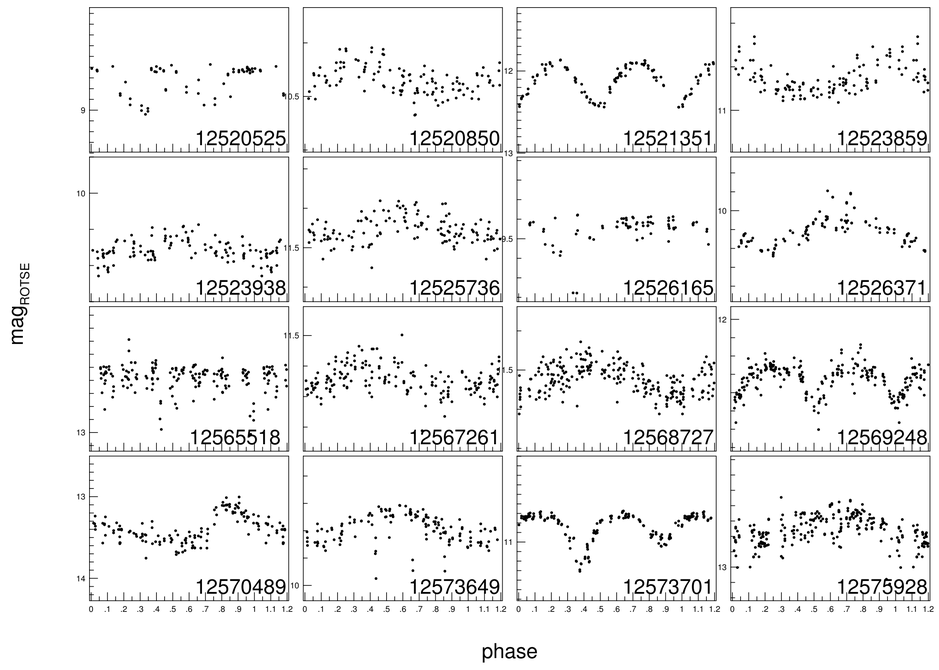

Figure 1: Phase diagrams of shorter period variable stars found in ROTSE-I (NSVS) database falling in the first exo-field of the COROT satellite. Each tickmark denotes 0.1 mag in the vertical axe.

Table 1. Suspected variable stars found in ROTSE-I database in the direction of the first exo-field of COROT satellite. Asterisks detnote long period red variables found by Woźniak et al. (2004b).

ID	$\alpha(2000)$ [h:m:s]	$\delta(2000)$ [° : ′ : ″]	$I_{\rm var}$	$\langle {\rm mag_{ROTSE}} \rangle$	Period [day]	Remark
12565257	6:40:31.9848	−1:04:08.292	1.7061676	10.949	long	
12565518	6:40:41.7336	−1:06:40.392	0.3844953	12.56	7.021171	=V501 Mon, EA
12566100	6:41:05.28	−0:11:07.584	10.985338	9.438	long	
12566457	6:41:18.8376	−2:04:56.892	1.8697288	10.254	long	
12567261	6:41:49.9296	−0:20:27.06	0.9350481	11.648	43.5	
12567456	6:41:57.2808	−1:38:35.052	2.5408314	11.547	∼150	
12567479	6:41:58.1352	−2:25:29.82	2.9493436	10.764	long	
12568102	6:42:22.7064	−0:49:34.392	1.5809183	12.1	long	
12568694	6:42:44.7	−1:43:33.42	13.159593	8.976	∼135	=GT Mon, SRB
12568727	6:42:46.5048	−1:01:08.94	0.7007039	11.521	0.26625	
12518611	6:42:56.364	0:16:00.696	2.9677473	11.904	108.26	
12569248	6:43:06.804	−2:41:01.86	0.9673716	12.305	1.27673	EB?
12569441	6:43:14.0688	−0:36:32.94	4.5981545	11.769	long	SR*
12570088	6:43:38.9016	−2:21:50.328	2.8423219	10.669	long	
12570489	6:43:54.2064	−2:32:34.584	1.5317073	13.417	2.94612	DCEP?
12570536	6:43:56.1192	−0:01:17.256	0.9909679	11.028	long	
12520525	6:44:12.2592	0:37:04.944	1.0304161	8.637	1.93632	EA?
12520850	6:44:25.4064	0:04:08.112	0.9556334	10.472	0.245435	
12521351	6:44:46.848	0:13:16.932	2.6427235	12.077	0.896682	=GU Mon, EW
12572573	6:45:15.0432	−2:26:37.212	14.017616	13.23	long	
12572704	6:45:20.1696	−1:42:50.328	19.622774	10.924	>165	=DT Mon, SRB
12573372	6:45:45.444	−1:21:12.492	0.8132640	12.666	long	
12573649	6:45:56.0568	−1:26:03.552	2.9519436	9.775	0.56402	
12573701	6:45:57.7224	−0:17:31.884	5.0752926	10.789	0.56790	=DD Mon, EB
12523859	6:46:25.0536	0:19:32.916	1.2700895	10.937	2.41818	DCEP?
12523938	6:46:28.2456	0:17:29.472	1.0634554	10.158	0.31013	
12524882	6:47:03.8016	0:35:28.032	3.1059193	10.69	>150	
12525177	6:47:16.3104	0:13:40.548	5.4581042	9.219	long	=DE Mon, LB
12575928	6:47:22.4016	−1:32:45.168	1.2366510	12.742	89.75	
12525663	6:47:35.9856	0:40:58.332	1.8384385	8.651	long	=DF Mon, LB
12525736	6:47:38.892	0:29:36.924	0.7599534	11.458	0.053592	DSCT?
12576347	6:47:39.7608	−2:57:23.58	4.5078293	11.65	long	SR*
12526165	6:47:57.0024	0:46:32.34	1.3903318	9.43	0.241553	=V739 Mon, BE
12526371	6:48:05.172	0:32:16.872	4.4671447	10.106	127.1	=DG Mon, LB
12577199	6:48:12.4752	−0:57:41.256	0.3070586	11.78	long	

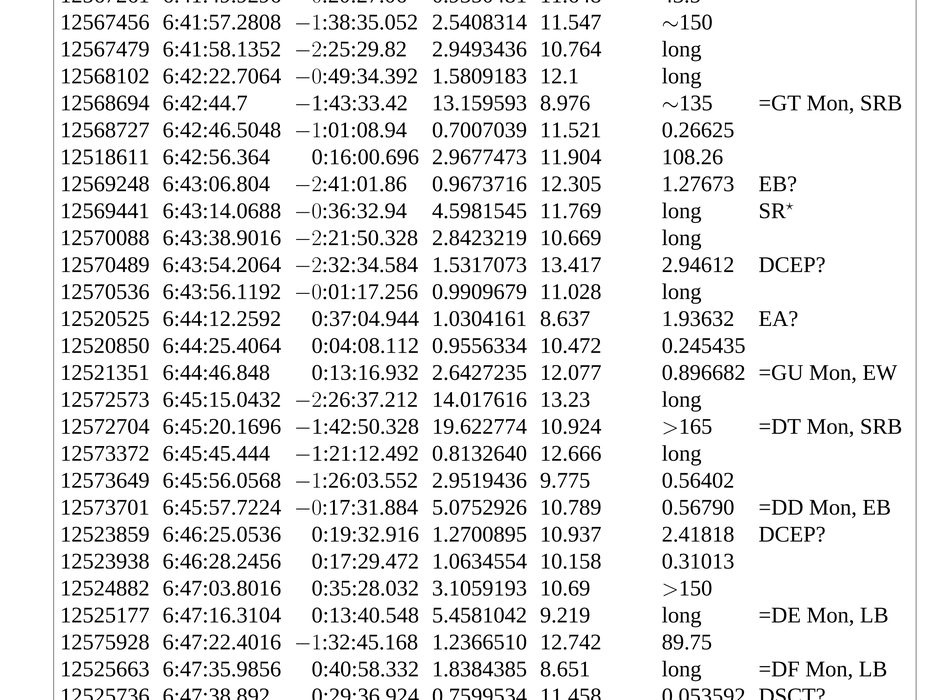

Figure 2: Light curves of long period variable stars found in ROTSE-I (NSVS) database falling in the first exo-field of the COROT satellite. Each tick denotes 0.1 mag in the vertical axe.

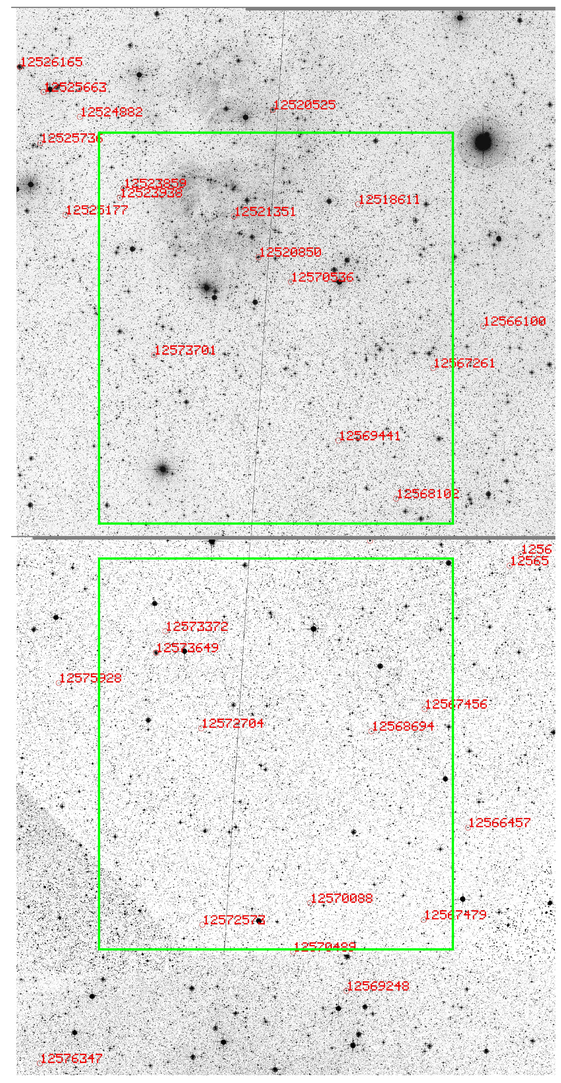

Figure 3: The investigated 2°×4° area reproduced from the Digital Sky Survey with the found variable stars. North is up, east is to the left.

Fig. 1. shows the folded light curves of shorter period variable stars. The long period ones are found in Fig. 2.

It has been concluded that NSVS data base is suitable for finding variable stars with the periods of $P \gtrsim 0.1$ days and amplitude $\gtrsim 0.1$ mag. Due to the sampling and noise character of the data it is hard to detect any flare stars or Algol type binaries.

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