CHARACTERIZATION OF CoRoT TARGET FIELDS WITH BERLIN EXOPLANET SEARCH TELESCOPE. II. IDENTIFICATION OF PERIODIC VARIABLE STARS IN THE L Rc2 FIELD

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ABSTRACT

We report on photometric observations of the CoRoT L Rc2 field with the new robotic Berlin Exoplanet Search Telescope II (BEST II). The telescope system was installed and commissioned at the Observatorio Cerro Armazones, Chile, in 2007. BEST II is a small aperture telescope with a wide field of view dedicated to the characterization of the stellar variability primarily in CoRoT target fields with high stellar densities. The CoRoT stellar field L Rc2 was observed with BEST II up to 20 nights in 2007 July and August. From the acquired data containing about 100,000 stars, 426 new periodic variable stars were identified and 90% of them are located within the CoRoT exoplanetary CCD segments and may be of further interest for CoRoT additional science programs.

Key words: binaries; eclipsing – Cepheids – δ Scuti – methods: data analysis – stars: variables: other – techniques: photometric

Online-only material: color figure, extended figures, machine-readable and VO tables

1. INTRODUCTION

Small ground-based photometric survey telescopes with a wide field of view (FOV) are capable of monitoring several thousand stars over a wide magnitude range. The long duty cycle and a millimagnitude photometric precision favor small telescope systems to act as a ground-based support for space missions such as CoRoT (Baglin et al. 2002).

The scientific program of the CoRoT space mission includes the photometric search for extrasolar planets with the transit method, monitoring the asteroseismology of selected stars, and additional science programs on dedicated objects such as variable stars. CoRoT is pointed twice a year at two different target fields which are observed almost permanently for 150 days each. These so-called long-run target fields are located in the direction of the galactic center (L Rc) and in the opposite direction (L R a; Michel et al. 2006). They are complemented with an initial and short run fields monitored up to 30 days. All CoRoT target fields are characterized by a high stellar density. The FOV of CoRoT covers 2:70 × 2:05 and the CCD is divided into two segments dedicated to exoplanetary search and two segments dedicated to asteroseismology. The point-spread function (PSF) of the CoRoT exoplanetary CCD-camera segments spreads over 80 pixels for a 13th magnitude star of K2 spectral type (Boisnard & Auvergne 2006), thus the overlapping PSFs of nearby stars may hide the signal originating from a transiting planet. Small prisms in front of the CoRoT CCD provide color information on the observed objects which allows for a more precise classification of the stellar variability. Detection masks for ca. 10,000–12,000 interesting objects were set up within CoRoT’s exoplanet FOV. More detail can be found in The CoRoT Mission (2006).

The planet-detection scheme is organized in steps from the observations, reduction of the observational data to follow-up observations with ground-based telescopes (Deleuil et al. 2006). The first extrasolar planets detected and confirmed with CoRoT (Alonso et al. 2008; Barge et al. 2008; Moutou et al. 2008; Bouchy et al. 2008; Aigrain et al. 2008; Deleuil et al. 2008) were found in so-called alarm mode, i.e., by visual inspection of basically calibrated and reduced data. The CoRoT alarm mode data contain only few weeks of observations.

The Institute of Planetary Research of the Deutsches Zentrum für Luft- und Raumfahrt e. V. (DLR) is operating two small aperture telescope systems with wide FOVs. The Berlin Exoplanet Search Telescope (BEST; Rauer et al. 2004) is located at the Observatoire de Haute Provence (OHP), France. The telescope is operated in remote mode by an observer from Berlin. The site is characterized by good weather conditions of up to 60% of clear nights per year.

The second telescope system, Berlin Exoplanet Search Telescope II (BEST II), was installed at the Observatorio Cerro Armazones (OCA), Chile, in 2007 and has operated since 2007 July. The OCA observatory is run by the Ruhr Universität Bochum and the Universidad Católica del Norte in cooperation with the DLR. BEST II is dedicated to supporting the CoRoT space mission from the ground with the search for stellar variability in the selected stellar fields. About 73% of the nights are photometric per year at the OCA site (see Rauer et al. 2008) yielding a potential increase of the duty cycle by more than 30% compared to OHP. Moreover, typical value for seeing at OCA is about 0′′66.6 For comparison, the FWHM of stellar profiles is typically about 9′. Due to limited internet bandpass, BEST II was designed and set up as a robotic survey telescope operated autonomously and independently on the Berlin control center.

BEST and BEST II contribute to the identification and detection of new variable stars in the CoRoT stellar fields (Kabath et al. 2007, 2008; Karoff et al. 2007). The obtained

6 Value adopted from the nearby located ESO Paranal observatory:
http://www.eso.org/gen-fac/pubs/astclim/paranal/seeing/
information on new variable stars may be further used in the frame of CoRoT additional science programs. The contribution to the search for the periodic variable stars will be presented in this paper. Moreover, BEST and BEST II can also contribute to confirmation and fine tuning for the ephemerides of Jupiter-sized transiting extrasolar planets in the CoRoT alarm mode (Rauer et al. 2009).

In Section 2, the BEST II telescope system setup and the observational strategy will be described. In Section 3, the calibration and the data reduction process will be introduced and the photometric quality of the data will be shown. In Sections 4 and 5, the search for the periodic variable stars and the newly discovered variable stars will be presented.

2. BEST II SETUP AND OBSERVATIONS

The BEST II system will be described in detail in further publications. It consists of a Baker–Ritchey–Chrétien telescope with an aperture of 25 cm and a focal ratio of f/5.0 accompanied with electronics needed for controlling the robotic operations. The telescope is equipped with Peltier-cooled 4k × 4k Finger Lakes Imager CCD KAF-16801E2 and pixel size of 9 μm. The image scale corresponds to 1″/5 per pixel and the FOV is 1.7′ × 1.7′. The digital resolution is 16 bit with a saturation level of 100000 e−. The peak quantum efficiency reaches up to 68% at 650 nm. All observations are performed without any filter. The registered light corresponds approximately to a wide R-band range. The telescope mount was manufactured by 10 Micron, Italy and Baader Planetarium, Germany especially for the Chilean site latitude. We are able to alternate between two or more stellar fields during the night. A meteorological station is monitoring the local weather conditions continuously and installed Web cams can be used to control the telescope operations in case of remote access.

The center coordinates of the target fields observed are αa = 18h41m02s, δa = +07°12′ 54″ for LRc2a and αb = 18h43m33s, δb = +05° 59′ 53″ for LRc2b. The FOVs of both observed fields together approximately correspond to the exoplanetary segment of CoRoT. The total coverage is higher than the simple FOV of BEST II due to shifts in pointing which differed slightly during the observing period. The pointing offsets are caused by the, at this point still insufficient, pointing model which was set up for the test observational runs described here only. Groups of images with slightly different pointing were treated separately and later stacked together. The total observed part of the sky is shown in Figure 1 with respect to the CoRoT exoplanetary field. The fields were observed on 20 and 17 nights, for LRc2a and LRc2b, respectively, between 2007 July 16 and August 21. The exact time span between the first and last observation is 36.017 days. No data were obtained during full Moon and nights with strong wind. The rest of four nights without observations was due to technical problems.

The observational sequence consisted of 240 s exposures which were taken in a sequence for both target fields per night. Calibration frames were taken before, during and after the observations. The CCD detector of BEST II is linear for the exposure time of 240 s for magnitudes 11 to about 19. Given dynamical range covers the magnitude range of CoRoT. The acquired data set contains a maximum of 373 frames on the LRc2a field and 232 frames on the LRc2b field.

3. DATA REDUCTION

3.1. Basic Calibrations and Data Pipeline

The calibration and data reduction process were realized with an automated pipeline which is based on previous versions used for the BEST system and modified appropriately for BEST II. In the following paragraphs, the path from the raw images to the reduced data will be described.

In order to calibrate the raw scientific data properly, flat fields were taken at dusk and dawn every night with a set of calibration bias and dark frames. Single flat-field images from different nights were combined together with a median function. More bias and dark frames were taken about every 30 minutes and used for the basic photometric calibration of the raw scientific images.

The second step was the astrometric and photometric data processing with the image subtraction package ISIS (Alard & Lupton 1998). One frame was selected for interpolation of every image to the same CCD-x, y coordinate system. Images with good seeing were selected and stacked into the reference frame for image subtraction. The kernel function was found on the reference frame and subtracted from every PSF of every star on all images.

In the third step, single unit weighted aperture photometry was applied on the reference frame and on the convoluted frames. We applied an aperture radius of 5 pixels which was found to be the optimal aperture size for our data set. The obtained magnitude was corrected for extinction variations, whereas the astrometric routines GRMATCH and GTRANS by Pál &
Bakos (2007) were applied to find the transformation of CCD coordinates to right ascension and declination. We achieved subarcsecond precision with the coordinate transformation. Finally, the BEST II instrumental magnitudes were compared to magnitudes of corresponding stars from the USNOA-2.0 catalog. Due to the fact that USNOA-2.0 is not a photometric catalog, these corrections may introduce a slight uncertainty in the zero point of the magnitude for individual stars. Thus, BEST II magnitudes must not be taken as the standardized ones since we are primarily interested in the differential photometry. In particular, potential zero-magnitude shifts do not cause any problems for the identification of variable stars.

3.2. Photometric Accuracy

Since we observe without any bandpass filter in order to detect the maximum number of photons, systematic errors due to, e.g., color effects may occur in the stellar light curves. Systematic effects may introduce an artificial periodicity, e.g., multiples of days due to the diurnal cycle, and thus lead to misidentification of variable stars. Therefore, we apply the SYSREM algorithm (Tamuz et al. 2005) which reduces systematic effects from the calibrated and reduced light curves. The algorithm works only for systematic effects which affect a significant amount of the stellar light curves so that the real stellar variability will not be miscorrected. In Figure 2, the rms of all detected stars is shown after applying SYSREM for both observed stellar fields. The typical number of detected stars reaches ca. 50,000 per observed field. The displayed rms plots contain the data collected over the whole campaign. The resulting accuracy is thus influenced by varying photometric conditions over the whole campaign. However, on a typical night with excellent photometrical conditions, we can detect more than 5500 stars with an rms better than 0.01 mag. In general, the 0.01 mag photometric accuracy level is reached for stars in the magnitude range of 11–15 mag.

4. PERIODIC VARIABLE STARS DETECTION

The light curves resulting from the calibrated and reduced raw science data were searched for periodic variable stars. In the first step, potentially variable stars are marked and a flag is set in the BEST data archive to the corresponding star. The BExodat will be correlated with CoRoT’s Exodat (Deleuil et al. 2006) database. In this paper, we focus only on the periodic variable stars. In general, light curves and information about variability from our data archive can be provided upon request to interested observers for further investigations.

Our data set contains several thousands of light curves. As the visual inspection of each single light curve would be too time consuming, we used the variability index \( j \) to identify potential variable stars automatically. The \( j \) index for every star was calculated using the formula introduced by Stetson (1996) and modified by Zhang et al. (2003). In Figure 3, the distribution of
the j index as a function of magnitude of the corresponding star is shown. From the obtained j-index distribution, we defined the empirical limit of j > 0.5 for potentially variable stars, as higher j indices yield a higher probability for variability. The whole number of detected stars was 43,616 in the LRc2a and 54,603 in the LRc2b stellar field. From that, 1467 stars for the LRc2a and 1976 stars for the LRc2b field possess a variability index above the given limit. As described in the following section, only part of the marked stars showed clear periodicity. The rest of the stars with a high variable index may show variability on an irregular basis, on long timescales or the light curves can be influenced by instrumental effects (e.g., hot pixels).

### 5. DETECTED PERIODIC VARIABLES

We searched for the period with an algorithm by Schwarzenberg-Czerny (1996) which fits a set of orthogonal periodic polynomials to the observational data. The period range searched was between 0.1 and 25 days. All suspected periodic variable stars were examined visually. Most of the rejected stars showed periods about 1 day or multiples thereof. In total, we identified 426 periodic variable stars in both fields with 253 in LRc2a and 175 in LRc2b, respectively.

A detailed list containing all identified periodic variable stars with their coordinates, Two Micron All Sky Survey (2MASS) catalog numbers, and the type of variability can be found in Tables 1 and 2. The folded light curves of the newly found periodic variable stars are shown in Figures 4 and 5. The finding charts can be provided upon request.

#### 5.1. Variability Classification

The variability of stars is usually caused by a companion (eclipsing stars) or by physical processes, e.g., pulsations, rotation, or processes in the stellar atmospheres (pulsating, rotating, and spotted stars). In some cases, both types of variability are combined.

Instead of a detailed GCVS classification scheme, we used a GCVS-based reduced classification (see Sterken & Jaschek 1996) introducing the following classes: δ Cep pulsating stars), DSCT (δ Scut type pulsating stars), RR Lyrae—where possible also subtypes RRa, RRb, RRc—SX Phe, and γ Dor (prototype γ Doradus). We also introduce a category PULS for the cases where we were not able to decide precisely about the type of pulsating star but the variability in the light curve is obvious. The groups used for eclipsing variables are EA (Algol type eclipsing stars), EB (β Lyrae type eclipsing stars), and EW (W UMa type eclipsing stars). Stars showing variability characteristic for the spotted (stellar spots) or elliptical stars were classified as ELL and/or SP. Some stars were classified as α2CVn whose light curve variation is due to their rotation.

Some stars in the BEST II data set possess also longer periods of more than 5 days. The light curves of such stars are not fully

### Table 1

Periodic Variable Stars Detected in BEST II lrcb Stellar Field

| BEST ID  | 2MASS ID         | α (J2000) | δ (J2000) | Mean Magnitude (mag) | Period (days) | Amplitude (mag) | Type     |
|---------|------------------|-----------|-----------|----------------------|---------------|----------------|----------|
| lrcba-91| 18432875+0570580 | 18 43 28.74 | 5 70 50.7  | 15.246               | 0.472         | 0.45           | EW       |
| lrcba-817| 18404845+0747198 | 18 40 48.45 | 7 47 20.0  | 16.571               | 0.360         | 0.40           | EW       |
| lrcba-820c| 18440510+0742510 | 18 40 45.09 | 7 42 50.9  | 15.657               | 0.549         | 0.60           | RR Lyrae |
| lrcba-831c| 18444720+0742554 | 18 40 44.73 | 7 42 55.1  | 15.743               | 0.551         | 0.50           | RR Lyrae |
| lrcba-838c| 18440436+0746559 | 18 40 43.63 | 7 46 56.5  | 14.823               | 0.086         | 0.26           | SX Phe   |
| lrcba-840c| 18440325+0746596 | 18 40 43.25 | 7 46 59.5  | 14.642               | 0.086         | 0.30           | SX Phe   |
| lrcba-926| 18402674+0640416 | 18 40 26.77 | 6 40 41.8  | 16.591               | 0.384         | 0.20           | EW       |
| lrcba-974| 18401815+0754065 | 18 40 18.14 | 7 54 06.5  | 16.663               | 0.419         | 0.20           | EW       |
| lrcba-984| 18401709+0751498 | 18 40 17.09 | 7 51 49.8  | 17.011               | 0.157         | 0.30           | EW/DSCET |
| lrcba-989| 18401605+0756184 | 18 40 16.05 | 7 56 18.4  | 16.187               | 0.429         | 0.40           | EW       |

### Notes.

Magnitudes are based on calibration against USNO catalog only. Stars marked with c may be affected by crowding and thus the variability information can be influenced by the nearby neighbor.

(This table is available in its entirety in machine-readable and Virtual Observatory (VO) forms in the online journal. A portion is shown here for guidance regarding its form and content.)

### Table 2

Periodic Variable Stars Detected in BEST II lrcb Stellar Field

| BEST ID  | 2MASS ID         | α (J2000) | δ (J2000) | Mean Magnitude (mag) | Period (days) | Amplitude (mag) | Type     |
|---------|------------------|-----------|-----------|----------------------|---------------|----------------|----------|
| lrcbx-201| 18454511+0518256 | 18 45 45.11 | 5 18 25.6  | 18.384               | 0.340         | 0.66           | EW       |
| lrcbx-459| 18450212+0517534 | 18 45 2.13  | 5 17 53.2  | 17.774               | 0.345         | 0.42           | EW       |
| lrcbx-472| 18450116+0538116 | 18 45 1.16  | 5 38 11.6  | 12.295               | 0.332         | 0.01           | DSCT     |
| lrcbx-535| 18445250+0516319 | 18 44 52.51 | 5 16 31.8  | 16.152               | 0.354         | 0.10           | EB       |
| lrcbx-631| 18444160+0601340 | 18 44 41.60 | 6 1 34.0   | 13.375               | 0.370         | 0.05           | α2CVn    |
| lrcbx-645| 18444095+0618481 | 18 44 40.95 | 6 18 48.0  | 14.391               | 0.529         | 0.23           | RR Lyrae |
| lrcbx-673| 18443905+0618245 | 18 44 39.05 | 6 18 24.6  | 14.132               | 0.694         | 0.06           | SP       |
| lrcbx-958| 18441356+0608576 | 18 44 13.66 | 6 8 56.3   | 13.509               | 2.541         | 0.08           | SP       |
| lrcbx-1039| 18440691+0610058 | 18 44 6.93  | 6 10 6.0  | 13.772               | 2.115         | 0.06           | SP       |
| lrcbx-1069| 18440322+0516467 | 18 44 3.24  | 5 16 46.3  | 17.105               | 0.412         | 0.30           | EW       |

### Notes.

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covered with data points but show clear variability. This group is marked as LP (long periodic) and the period may not be well determined.

We possess only a limited data set with no color information, which makes the proper identification of the stellar variability for some particular cases difficult. We cross-identified detected variable stars with 2MASS catalog where possible in order to extend, e.g., spectral information for our variable stars. The 2MASS IDs are inserted in Tables 1 and 2. Cross-identified variable stars can be further matched with CMC-14 catalog based on 2MASS identifier and coordinates. CMC-14 catalog includes data obtained with $r'$ Sloan filter. The second limiting factor is our pixel scale of 1.5 which is good but might still lead to multiple identifications of a single variable star due...
to overlapping PSFs, especially for crowded regions near the galactic center. The stars influenced possibly by their neighbors are marked in Tables 1 and 2.

5.2. Pulsating Variable Stars

Pulsating stars with periods below 0.3 days were classified as DSCT. However, a few stars with periods shorter than 0.1 days were classified as SXPHE due to the characteristic light curve and period for the prototype star SX Phoenicis. For the DSCT with periods below 0.3 days, the classification should be fairly unique. In some cases, (e.g., lrcax-497) the DSCT stars may show multiperiodicity for which a further frequency analysis of the light curves would be needed. Based on light curves, some objects seemed to be DSCT stars too but their period

Figure 5. Variable stars detected in the BEST II lrcb(xy) field with the second phase mirrored. (An extended version of this figure is available in the online journal.)
was longer than 0.3 days. They can be W UMa objects but we are not able to distinguish them in all cases. A few stars were classified based on the light-curve shape, period range of 0.3–5 days, and low amplitudes <0.1 mag as γ Dor (Kaye et al. 1999). In general, stars with periods longer than 1 day and amplitudes >0.1 mag were classified as δCEP stars. The RR Lyr stars were classified based on the characteristic shape of the light curve. They possess periods between 0.3 and 1 day. Some of the RR Lyr stars show a modulation of the main pulsation period in their light curves known as the Blažko effect (Blažko 1907), e.g., lrcax-788, lrcax-836, and lrcax-1023. Since the discovery of the alternative period modulation, the effect still cannot be satisfactory theoretically explained (Kolenberg et al. 2006). Some examples of RR Lyr stars showing the Blažko effect can be found in La Cluyzeé et al. (2004) or Szczygiel & Fabrycky (2007).

5.3. Eclipsing, Elliptic/Spotted, and α² CVn Variable Stars

The eclipsing stars of EA class show nearly constant light curves between eclipses. They can show the so-called reflection effect causing some small modulation of the light curve between eclipses (Vaz 1985; Peraiah & Srinivasa Rao 1998), such as, e.g., lrcax-1115, lrcbx-2723, and lrcby-1814. Stars belonging to the EB class vary continuously between eclipses and stars from the EW class have generally near equal depth and periods shorter than 1 day. Several eclipsing binaries, primarily some EW, show the O’Connell effect which is a deformation of the light curve due to the presence of stellar spots (see the introduction in Maceroni & van’t Veer 1993). Examples in our database set stars no.: lrcax-1583, lrcax-227, lrcax-276, lrcax-277, lrcax-825, lrcax-828, lrcbx-2519, lrcby-107, lrcby-830, lrcby-995, lrcby-1030, and lrcby-1034.

The classification for the rotating and spotted stars ELL/SP is based on the changing minima/maxima depth of the light curves. The stars lrcax-1115, lrcax-1567, lrcax-280, lrcax-967, lrcax-970, lrcax-988, lrcbx-673, lrcbx-2859, and lrcby-1143 show also an evidence for the stellar spots and thus perturbations in the periodicity. Some of the systems classified as spotted may also be cataclysmic variable stars in quiescent phase. Further color and spectroscopic information is needed to clarify this.

Stars showing a slight amplitude variability in the region of a few percent which do not fulfill the classification criteria for any of the above-mentioned variability type were classified as α²CVn. The prototype is Cor Caroli from the constellation Canum Venaticorum, and the characteristics are usually fast rotation and the presence of emission lines in the Ca ii H, K, and Hα bands indicating strong chromospheric activity (Fernandez-Figueroa et al. 1994).

5.4. BEST II Data Set and Known Variable Stars

Recalling the numbers from the previous sections, we found that the percentage of potentially variable stars from the total amount of stars detected is 0.6% and 0.3% for LRc2a and LRc2b, respectively. The counts on periodic variable stars separated into variability types are summed in Table 3. In general, the most interesting cases of variability will be discussed in a forthcoming paper.

We compared the periodic variable stars found with the GCVS catalog via a SIMBAD7 and AAVSO catalog.8 Light curves of stars matched with both catalogs are shown in Figures 6 and 7. We were not able to confirm the variability for the following known stars: NSVS 13909862, NSVS 13907920, NSVS 7

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7 http://simbad.u-strasbg.fr/simbad/
8 http://www.aavso.org/vsx/index.php
Figure 7. Light curves of known variable stars in the LRc2 fields with long periods or without clear periodicity.

Table 3

| Detected Objects | LRc2a | LRc2b |
|------------------|-------|-------|
| No. of stars detected | 43,616 | 54,603 |
| Stars with \( j > 0.5 \) | 1467 (3.4\%) | 1976 (3.6\%) |
| Periodic variable stars | 251 (0.6\%) | 175 (0.3\%) |
| DSCT | 22 | 13 |
| DCEP | 8 | 10 |
| RR Lyr | 28 | 13 |
| \( \alpha^2 \text{CVn} \) | 5 | 2 |
| EA (Algol) | 20 | 25 |
| EB (\( \beta \) Lyr) | 31 | 36 |
| EW (W Uma) | 117 | 55 |
| Other | 19 | 21 |

**Note.** Percentages given are related to the number of stars detected for each field.

The new robotic BEST II telescope system was observing the CoRoT LRc2 exoplanetary CCD segments in the time span of 36 nights during 2007 July and August. BEST II observed two stellar fields, internally named LRc2a and LRc2b, in order to cover the whole exoplanetary FOV of CoRoT. The obtained observational data were searched for periodic variable stars. A total number of about 100,000 stars were detected in both BEST II stellar fields, and about 3500 were marked as potentially variable stars. However, all of the stars are reported by Benko & Csurby (2007) and Hoffmeister (1967) as long periodic with periods >200 days. On the other hand, variability was confirmed and, where possible, the period determined in our data set for the following stars. Star NSVS 13906750 (Benko & Csurby 2007) shows a variability, however the period could not be determined. Mira star V1116 Oph reported by Hoffmeister (1967) shows a smooth trend in the light curve in our data set. Star ASAS184254+0731.1 (Pojmanski 2002) shows a variability, however the period could not be determined from our data set. Star V1117 (Hoffmeister 1967) was detected within our data set with a period of 1.4674 days. Star NSVS 13910069 (Benko & Csurby 2007) was detected in our data set with a period of 0.758 days. We could confirm variability but we were not able to determine the period for V0656 Oph discovered by Ahnert (1943). Star NSVS 13913191 was confirmed in our data set with a period of 0.8237 days which is twice the period reported by Benko & Csurby (2007) and with type EW class variability. Star ASAS 184150+0603.0 was found to have a period of 0.3820 days and the type is according to our detection; a clear EW type in contrast to identification by Pojmanski (2002).

6. SUMMARY

The new robotic BEST II telescope system was observing the CoRoT LRc2 exoplanetary CCD segments in the time span of 36 nights during 2007 July and August. BEST II observed two stellar fields, internally named LRc2a and LRc2b, in order to cover the whole exoplanetary FOV of CoRoT. The obtained observational data were searched for periodic variable stars. A total number of about 100,000 stars were detected in both BEST II stellar fields, and about 3500 were marked as potentially variable stars. However, all of the stars are reported by Benko & Csurby (2007) and Hoffmeister (1967) as long periodic with periods >200 days. On the other hand, variability was confirmed and, where possible, the period determined in our data set for the following stars. Star NSVS 13906750 (Benko & Csurby 2007) shows a variability, however the period could not be determined. Mira star V1116 Oph reported by Hoffmeister (1967) shows a smooth trend in the light curve in our data set. Star ASAS184254+0731.1 (Pojmanski 2002) shows a variability, however the period could not be determined from our data set. Star V1117 (Hoffmeister 1967) was detected within our data set with a period of 1.4674 days. Star NSVS 13910069 (Benko & Csurby 2007) was detected in our data set with a period of 0.758 days. We could confirm variability but we were not able to determine the period for V0656 Oph discovered by Ahnert (1943). Star NSVS 13913191 was confirmed in our data set with a period of 0.8237 days which is twice the period reported by Benko & Csurby (2007) and with type EW class variability. Star ASAS 184150+0603.0 was found to have a period of 0.3820 days and the type is according to our detection; a clear EW type in contrast to identification by Pojmanski (2002).
variable. We were searching especially for periodic variable stars, and from the marked potentially variable stars 426 showed clear periodicity within the period interval of 0.05–25 days. The BEST II stellar variability survey presents the data on newly identified variable periodic variable stars containing the information on, e.g., RR Lyr stars showing the Blažko effect, fast rotating α²CVn stars, or some eclipsing binary systems. In addition, we present our light curves for the stars which were previously identified as variable. Information about the variability is stored in the BExodat archive and may be provided upon request.

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