MISCellaneous variables revision: new periods and classification for 10 MISC records in the VSX database

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Abstract: Updated periods and variability class for ten MISC records from the International Variable Star Index (VSX) database are presented. Initially, photometric variability of mentioned sources was determined using the fully automated algorithm (Pojmanski, 2002) and photometric data published by the All Sky Automated Survey (ASAS). Later, the results of Machine-learned ASAS Classification (Richards et al., 2012) became available. Own software is used for candidates selection, found a set of records for which periods can be improved considerably. Here the first portion of results is published along with the elements available for the selected sources from the mentioned research programs.

I. Introduction

The International Variable Star Index (VSX) is a comprehensive relational database of known and suspected variable stars gathered from a variety of respected published sources (Watson, 2006). The database is operated by the AAVSO and contains nearly 30000 records for which variability type is declared as MISC (miscellaneous). This is a considerable part of the whole database. For many of MISC sources light curve elements are available via the VSX web service. We noticed that for several of them the submitted value of a period can be improved. Particularly, this can be done for variables covered by the *All Sky Automated Survey* (ASAS; Pojmanski, 1997 and 2002)

Since the original data for many of selected sources was submitted to the VSX a decade ago, it was decided to look for updated elements in more recent publications. In 2012, Richards et al. published the Machine-learned ASAS Classification Catalog (MACC) containing the analysis of 50124 variable stars (Richards et al., 2012). This catalog was considered a good source for double-checking. To retrieve classification results the VizieR web service operated at the Centre de Données Astronomiques (Strasbourg) in France was used.

II. MISC candidates pre-selection

To make the first step of analysis there was a custom piece of software created by Ivan Adamin. The software allowed to iterate over the MISC variables retrieved from the VSX dump, download a corresponding set of photometric data from the ASAS web service and perform a precise periodogram analysis fully automatically.

For high-precision periodogram calculation both Lafler-Kinman (Lafler, Kinman, 1965) and phase-dispersion minimization (PDM; Stellingwerf, 1978) statistical algorithms implementations were used. This approach allowed to obtain independent period value and compare the given results with previously published data for objects. Once the period value was considerably different, such an object was proposed for further review.

The advantage of the method is that it tries to automatically determine whether the best-match period found from the calculated periodogram a false positive or not.

Using the same technique there were objects pre-selected for which more detailed analysis was conducted by Siarhey Hadon.

III. Improving a period value and variability class

The next step of analysis required a human attention being involved to improve the result quality. Siarhey Hadon has made use of a custom software *VSC Effect* created by Andrey Prokopovich and Ivan Adamin which finally led to a new period value and variability class updated.

Along with the ASAS photometric data, a search for other surveys coverage for the object was performed, such as the Northern Sky Variability Survey (Woźniak et al., 2004), The Catalina Real-time Transient Survey (Drake et al., 2012), The AAVSO Photometric All-Sky Survey (Henden et al., 2012). Where possible, the corresponding photometric data set was included into calculations to check if the period matches the value was found by the software. This improved the quality and confidence of the result as well.

Below the table containing ten MISC records with updated elements and light curves along with the data previously published is given.

Table 1. – *Updated data for ten MISC records presented in this paper, ordered by right ascension.*

	ID (ASAS)	Type	Epoch (HJD)	Period (d)	Mag. Range (V)	Src *
1	**ASAS J032020-7551.3**	**SR** MISC SRS-B	**2451946** 2451950.2	**51.65** 51 86.20785	**10.6-11.4 V** 10.46 (0.38) V 10.46 (0.28) V	**VSC** VSX MACC
2	**ASAS J061545-0335.5**	**EW** MISC EW	**2453458.798** 2451950.2	**0.66362** 117.4 0.33181	**12.20-12.57 V** 12.13 (0.35) V 12.13 (0.317) V	**VSC** VSX MACC
3	**ASAS J062040+0553.0**	**SR** MISC SR	**2454507** 2452885.2	**169** 329.401 1.00308	**12.5-13.2 V** 12.55 (0.42) V 12.55 (0.4885) V	**VSC** VSX MACC
4	**ASAS J064648+2353.6**	**SR** MISC SR	**2451585** 2452793.9	**64.5** 52.5 0.99890	**10.6-11.0 V** 10.69 (0.27) V 10.69 (0.3365) V	**VSC** VSX MACC
5	**ASAS J065313+1804.6**	**SR** MISC SRS-B	**2451469** 2452797.3	**48.2** 52.5 1.01882	**12.4-12.8 V** 12.54 (0.28) V 12.54 (0.3545) V	**VSC** VSX MACC
6	**ASAS J070634+1113.3**	**SR** MISC SRS-B	**2454803** 2452597	**55.5** 91.9 0.49343	**11.4-12.2 V** 11.52 (0.52) V 11.52 (0.4495) V	**VSC** VSX MACC
7	**ASAS J070803-2323.4**	**ELL** MISC RV	**2455354** 2452023.5	**160.2** 80.6 80.01960	**9.92-10.05 V** 9.93 (0.13) V 9.93 (0.1785) V	**VSC** VSX MACC
8	**ASAS J074800-2120.6**	**ELL** MISC RV	**2452008** 2452179.1	**219.5** 108.5 109.55139	**9.38-9.52 V** 9.26 (0.2) V 9.26 (0.1890) V	**VSC** VSX MACC
9	**ASAS J084351-4509.0**	**SR** MISC LSP	**2453732** 2452525.1	**74.8** 147.8 5494.95650	**12.1-12.8 V** 11.99 (0.38) V 11.99 (0.5460) V	**VSC** VSX MACC
10	**ASAS J124146-7012.1**	**EB** MISC SR	**2454929** 2452597	**257.5** 130.434784 128.87305	**12.02-12.84 V** 12.08 (0.56) V 12.08 (0.5760) V	**VSC** VSX MACC

*** VSC** = VS-COMPAS; **VSX** = Variable Star Index (AAVSO); **MACC** = Machine-learned ASAS Classification Catalog

Remarks on objects

1) J-K = 1.29; Range has been corrected.
ASAS-3 magnitudes are contaminated by 2MASS J03202022-7550552 (J-K = 0.74, V = 11.71, sep. 20").

2) J-K = 0.303.

3) J-K = 1.87; Carbon star;
ASAS-3 and NSVS magnitudes are contaminated by 2MASS J06204045+0552546 (J-K = 2.68, V = 16.5, sep. 10").
NSVS magnitudes are contaminated by: 2MASS J06204102+0553285 (J-K = 0.48, V = 15.6, sep. 33"),
2MASS J06203804+0552346 (J-K = 0.44, V = 16.1, sep. 36").

4) J-K = 1.22.

5) J-K = 1.16; Range has been corrected.
NSVS magnitudes are contaminated by 2MASS J06531409+1804274 (J-K = 0.42, V = 16.28, sep. 24"),
2MASS J06531263+1804130 (J-K= 0.26, V= 15.12, sep. 26").

6) J-K = 1.25; Range has been corrected.
ASAS-3 and NSVS magnitudes are contaminated by 2MASS J07063461+1113219 (J-K = 0.85, V = 13.41, sep. 10.6").
Possible other period: Max = 2451511 + 41.8* E.

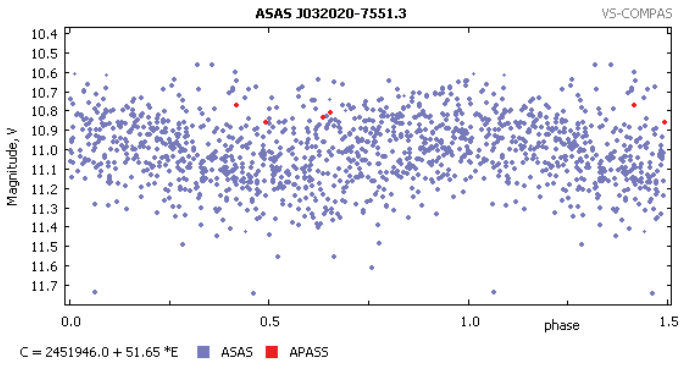
7) J-K = 1.11; Sp. M3 (Catalogue of Stellar Spectral Classifications (Skiff, 2009-2013)).

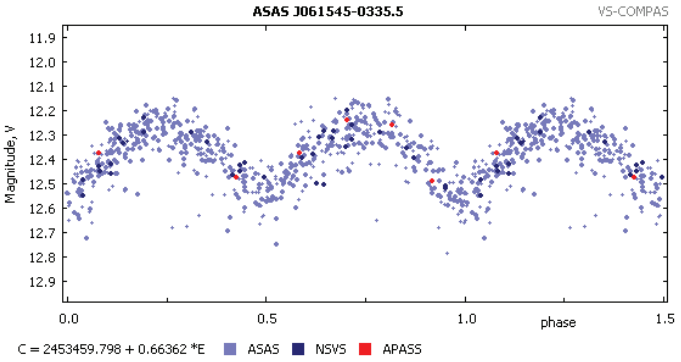
8) J-K = 1.10;
ASAS-3 and NSVS magnitudes are contaminated by 2MASS J07475898-2120498 (J-K = 0.77, V = 13.66, sep. 18").
Range has been corrected. Sp. M0.5II-III (Catalogue of Stellar Spectral Classifications (Skiff, 2009-2013)).

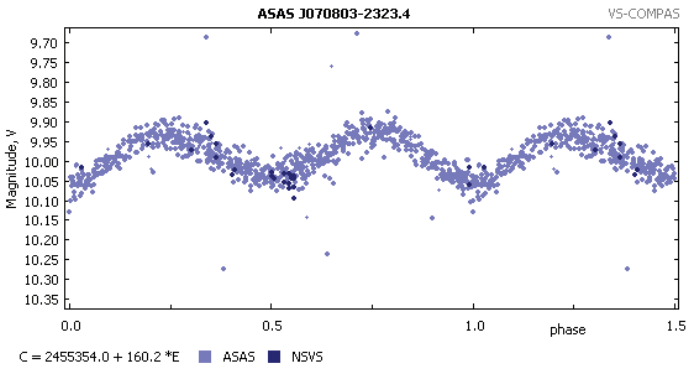
9) J-K = 1.51; Possible cycle: Max = 2454125 + 2230* E.

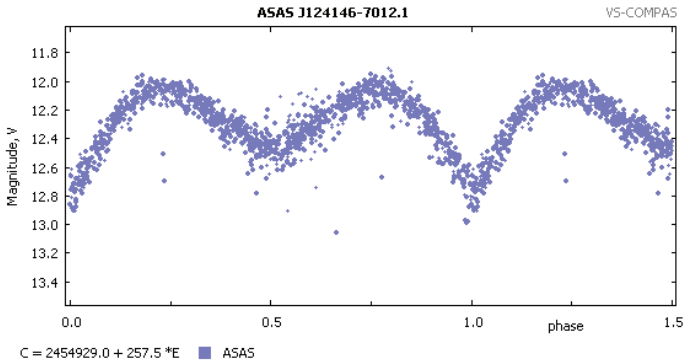
10) J-K = 1.33; Min II 12.52 V. Large period for eclipsing binary system. It may be of type ELL.

Remarkable Light Curves









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