

108 New Variable Stars in the NSVS Database

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Abstract

In this paper we present 105 SR+L, 1 Orion T Tau and 2 RS CVn type variable stars found in the Northern Sky Variability Survey (NSVS) database. This work is designated to complement and finalize our previous publication of the Extended Catalog of Red AGB Variable Stars found in the NSVS database as is primarily designated to find SR+L stars. While the previous work employed the AOV ratio cutoff at >1.6 to pick stars showing slow variability pattern, we have manually processed all the remaining objects originally filtered out by the smaller AOV ratio and picked the ones with light curves showing obvious variability pattern. All the stars presented have no identification in General Catalogue of Variable Stars, SIMBAD and VSX databases thus most likely the stars presented are new discoveries.

Methodology

The main target of this work is SR+L stars that are mostly found rather close to the 1.6 AOV ratio cutoff criteria. The methodology used to find new variable stars in the NSVS database is thoroughly described in our previous publication, (Usatov and Nosulchik, 2008). We will not repeat describing methods employed rather than we will indicate that all the objects considered in the current work have AOV ratio less or equal 1.6 – exactly the cutoff used in the previous research which did a great job filtering out artifacts and objects with highly questionable light curves. The criteria of the current selection from the NSVS database is outlined in Table 1, where σ is the RMS of magnitude scatter and E is the median of error estimate of all “good” magnitude measurements without problem flags and N is the number of measurements after all quality filters.

Table 1 – SR+L Candidate Criteria

Parameter	Range of Values
J-H (2MASS)	0.6 to 6
H-K _s (2MASS)	0.2 to 3
Period	>20 days
Amplitude (m_{ROTSE})	<1.3
AOV Ratio	≤ 1.6
σ	>0.1
σ/E	>3
N	>100

There were 1511 stars found with corresponding 2MASS objects out of which further candidates were manually selected. The criteria for the selection from the reduced database is primarily visual: the light curve shall show obvious variability pattern with none or negligible artifacts. None of the stars in the selection can be classified as Mira-type, thus most of the stars presented are irregular or semiregular AGB branch variables except special case stars discussed below. Also none of the stars presented appear as known variables in SIMBAD, VSX and GCVS catalogues. All of the SR+L stars presented have AOV ratios that are rather close to the 1.6 cutoff criteria and rather high period significance indices.

RS CVn Type Variables

Objects with ID 3500405 and 1225362 are most probably long-periodic RS CVn type systems with spectral type K components as there are X-ray sources identified in the 1RXS catalogue within 14.4” distance to the stars and the amplitude of variation of both stars is unusually regular. It is a disputable question of to what 2MASS object NSVS 3500405 really belongs to since there are two stars very close in the field. This object is a blend in the “eyes” of ROTSE-I. In order to clarify what star exactly is a variable, we have blinked POSS-I (DSS1) and POSS-II (DSS2) plates shot in the R optical band and determined that the closest 2MASS object 22253107+6245273 is the one responsible for the light curve amplitude. We have thus remained this 2MASS object as the source of cross-identification and coordinates.

Object NSVS 1225362 is confirmed to be correlated with star GSC4458.00557 with 6” separation according to the 1RXS Correlation to HST_GSC catalogue (Voges et al, 1999). The GSC object indicated in the catalogue corresponds to the 2MASS cross-identifier for the NSVS object used in this work and that is the closest 2MASS hit against the NSVS coordinates. The QORG catalog of radio/X-ray sources (Flesch et al, 2004) lists the 1RXS object as the Star and an X-Ray source. There were no other objects having 1RXS cross-identifiers within the current selection.

Orion T Tauri Type Variable

An object was found in the molecular cloud of “Orion A” star forming region with ID NSVS 15013959 that has a SIMBAD cross-ID [LCZ2005]8 and spectral type K5. 2MASS IDs of the object found automatically by our procedure and indicated in the publication of (Lee et al, 2005) are identical. At the same time, according to the criterias of (Lee et al, 2005) based on 2MASS colors, this star is a classical T Tau type candidate. T Tau stars are newly formed low-mass stars that started to shine in the optical spectrum range. GCVS classification scheme of 2004 provides a special case for designating Orion T Tau variables as “INT”. Since such a classification is purely based on spectroscopic features unavailable to us, we remain this object as doubtful “INT:” in the results. It is also worth to mention that a known T Tau type star CSI+19-02533 1 in Orion field with detected AOV ratio of 0.97 has got into the current selection criteria.

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Light Curves









