

# SEARCH FOR VARIABLE STARS IN THE NORTHERN SKY AND ANALYSIS OF PHOTOMETRIC TIME SERIES

Rūta Urbonavičiūtė<sup>1</sup>, Erika Pakštienė<sup>2</sup>

<sup>1</sup>Faculty of Physics, Vilnius University, Lithuania

<sup>2</sup>Institute of Theoretical Physics and Astronomy, Vilnius University, Lithuania  
[ruta.urbonaviciute@ff.stud.vu.lt](mailto:ruta.urbonaviciute@ff.stud.vu.lt)

As more space telescopes enter space, TESS (Transit Exoplanet Survey Satellite) launched in April 2018, and more to be launched, as JWST (James Webb Space Telescope) in 2021 and PLATO (PLANetary Star Transit and Oscillation) in 2026. Their main purpose is to search and study exoplanets, but observing exoplanets with such cosmic telescopes, we also can observe brightness fluctuations of the stars, since the methodology for observing these objects is very similar. Variable stars have been recognized to offer crucial insights into stellar structure and evolution. With ground based observations, we search for most suitable variables - candidates stars, to study them further with space telescopes. The aim of this work was to find variable stars in five fields, which all of them are in northern sky. Observations of northern sky stars are vital, because vast majority of observatories are located in the southern hemisphere or closer to the equator, so stars near the north pole are inaccessible to them and therefore, the stars seen in this part of the sky are less studied. To attain this intent, chosen fields were near the north pole. We studied five fields, of which the central stars are NSV26138, NSV0255, NSV13673, NSV15053, NSV25919. To achieve this we used *Muniwin* [1] computer program to perform photometric reduction for these five fields. To determine variability of the stars we used Lomb-Scargle periodograms and *Period04* [2] statistical analysis program to determine variability parameters of the stars. We found twenty previously unknown candidates of variable stars. For them we determined amplitudes, periods, phases of their brightness variations and possible variability types.

Among twenty previously unknown variable stars is a late type W Ursae Majoris binary which orbital period is 6 hours 27 minutes and two Algol type binary stars - candidates. We also observed one  $\delta$  Scuti candidate with period - 20 hours 53 minutes. Together with them we found seven slowly variable stars and nine periodic variable stars.

Also we present recommendations for further investigations. We will use new data sets from cosmic telescope TESS (Transiting Exoplanet Survey Satellite) to study more profoundly Algol type stars. For all long period variables need more photometric observations for longer periods of time to prove their variability, to determine more precisely variability parameters and to conclude their type of variability. For three of them additional spectroscopic observations or multicolour photometric observations are needed in order to determine luminosity. We recommend spectroscopic or multicolour photometric observations for T-Tauri or BY Draconis candidates in order to determine their real type. For two unknown type short period variables we recommend also spectroscopic observations in order to determine their temperatures and luminosity.

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[1] Hroch, F. 2014, *Munipack: General Astronomical Image Processing Software*, *Astrophysics Source Code Library*, 140.006

[2] Lenz, P., Breger, M., 2005, *Communications in Asteroseismology*, 146, 53