Annual report on observational results of the Astronomical Observatory at Kolonica Saddle

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The general model for intermediate polars is a red dwarf filling its Roche lobe, and a white dwarf, the magnetic field of which is strong enough to disrupt accretion disk completely or at least in its internal parts. The white dwarf rotates much more faster than the orbital motion.
Long term observing campaigns

Intermediate polars campaign

The goal of the campaign is the monitoring of selected intermediate polars for spin period changes. More detailed data analysis is done by prof. Andronov team including data from Hlohovec, Baja, Korea, Crimea and USA. The campaign is a part of Inter- longitude Astronomy project, Andronov et al. 2003.
Note the peculiar behavior of FO Aqr and V 1323 Her during their faint states. Change in mass transfer rate → change between disc-fed and stream-fed accretion.
MU Cam - Orbital sidebands in the periodic signal produced by intermediate polar
Active galactic nuclei

Participation in the radio - optical search for short term variability, i.e.
Intro Day Variability and Inter day Variability (IDV)

Ventspils International Radio Astronomy Centre, Latvia
Astronomical Observatory, Odessa National University, Ukraine
Odessa observatory URAN-4 Radio-astronomical Institutes NAS Ukraine

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<th>Designation</th>
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<td>VRI 120s</td>
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<td>BLLAC</td>
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<td>B180 V180 R60s l30s</td>
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<td>Mrk 501 (Her)</td>
<td>BLLAC</td>
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Active galactic nuclei - Light curves observed at AO
Kolonica
Superhumps in cataclysmic variables

VSNET campaign conducted by T. Kato. Evolution of accretion discs investigated by photometric observations of superhump period variations ($\dot{P}$). Most fruitful program. Serie of “Pdot“ papers.

Kato et al. (2009) introduced superhump stages: initial growing stage (A) with a long period, fully developed stage with a systematically varying period (B) and later stage C with a shorter period.
Mass ratio from A stage of superhumps

The mass ratio $q$ can be determined from the superhumps excess $\epsilon^*$ - Kato, Osaki (2013)

$$q = -0.0016 + 2.60\epsilon^* + 3.33(\epsilon^*)^2 + 79(\epsilon^*)^3$$

This is because stage A superhumps reflect the dynamical precession rate at the 3:1 resonance radius.

Observing superhumps during stage A is very important although the amplitude is low and the noise in the data is annoying.

Thanks to the vsnet-alert system many superoutbursts were indeed caught in the initial phase.
Anomalous event in 2021 in the dwarf nova SS Cygni

One of the most intensively observed variable stars. Prototype of long orbital period dwarf novae. And there is still space for surprise. The anomalous behavior started already in 2019. The outbursts became irregular, quiescence brighter. The optical irregularities are accompanied by increased flux in X rays. This was the reason for international observing campaign leaded by Dr. Mariko Kimura (RIKEN, Japan).
Anomalous event in 2021 in the dwarf nova SS Cygni

Kimura et al. 2021 suggested that anomalous phenomenon was caused by an enhancement of accretion disk viscosity in the cool state.
6 novae well observable from the northern hemisphere

All events were studied intensively both photometrically and spectroscopically. First results already presented on the Bezovec conference.
Special case - V1674 Her, fastest nova and intermediate polar

Spin period found in ZTF data
Surprisingly we have detected the $P_{\text{spin}} = 0.00580 \text{d}$ just 23 days after the nova explosion.

Figure: Fast photometry of V1674 Her. Left: multi sinusoidal fit of the data from July 5, 2021 in V band with periodogram (small panel) showing the peak at the spin frequency. Right: data from August 7, 2021. Sideband frequencies $\omega - \Omega$ and $\omega - 2\Omega$. 
Low resolution spectroscopy of novae

V606 Vul example

Spectra obtained during the Variable astrocamp held at AO on Kolonica Saddle showing transition from He/N type to Fell type nova.
V1405 Cas - slow nova with oscillations

Photometric and spectroscopic coverage
Times of minima of selected eclipsing binaries

Long term campaign conducted by Pribulla, Vaňko and Parimucha. Regular publication after sufficient data is accumulated

Times of minima in 2020 and 2021
56 times of minima were collected of 24 different objects

Totals from 2006 to 2019
1521 times of minima of 108 different objects
Visual estimates of variable stars

Only one observer - Pavol A. Dubovský (DPV)
Total 5216 estimates made with dobson Meade Starlight 405/1830, dobson Chermelin 300/1500, double binocular 25×100 + 12×60 and Dobson 200/1400 in 2020 and 2021. Total 73402 visual estimates by DPV made in the period 1998 - 2021.

Monitoring of cataclysmic variables

Long period variables
Symbiotic and Semiregular variables. Long term light curve is step by step constructed for 73 targets.
Projects

Interacting binaries - Key for the Understanding of the Universe, APVV grant 15-0458

From Interacting Binaries to Exoplanets, APVV grant 20-0148
Publications

Papers published with Vihorlat Observatory co-authors in 2020

Žák, J.; et al. (2019)
Photometric and spectroscopic investigation of nine Cepheids in the Cassiopeia constellation
*CoSka* 49, 503.

Breus, V.; et al. (2020)
On the spin and orbital variability of the intermediate polars
*AANv* 1, 191B.

Kato, T.; et al. (2020)
Survey of period variations of superhumps in SU UMa-type dwarf novae. X. The tenth year (2017)
*PASJ* 72, 14.
Papers published with Vihorlat Observatory co-authors in 2020

Sukharev, A., et al. (2020)
Study of Rapid Variability of the Blazar OJ 287 in the Radio and Optical Ranges
*Ap* 63, 32S.

Parimucha, Š.; et al. (2020)
About the dependency of the spin maxima on orbital phase in the intermediate polar MU Cam
*CoSka* 50, 618P.

Evitts, J. J.; et al. (2020)
A survey for variable young stars with small telescopes: II - mapping a protoplanetary disc with stable structures at 0.15 au
*MNRAS* 493, 184E.
Papers published with Vihorlat Observatory co-authors in 2020

Skopal, A., et al. (2020)
The path to Z And-type outbursts: The case of V426 Sagittae (HBHA 1704-05)
*A&A* 636A, 77S.

Tampo, Y.; et al. (2020)
First detection of two superoutbursts during the rebrightening phase of a WZ Sge-type dwarf nova: TCP J21040470+4631129
*PASJ* 72, 49T.

Sukharev, A.; et al. (2020)
Program and Results of Investigations Rapid Variability of the BL Lac Object 3C 371 in Radio and Optical Ranges
*Galax* 8, 69S.
Publications

Papers published with Vihorlat Observatory co-authors in 2021

Breus, V., et al. (2020)
On the spin period variability in intermediate polars
*OEJV* 208, 11B.

Dubovsky, P. A.; et al. (2021)
Spectroscopic Confirmation of the Active Dwarf Nature of 2MASS J07363415+6538548
*RNAAS* 5, 11D.

Kimura, M.; et al. (2021)
Multi-wavelength photometry during the 2018 superoutburst of the WZ Sge-type dwarf nova EG Cancri
*PASJ* 73, 1K.
Papers published with Vihorlat Observatory co-authors in 2021

Wakamatsu, Y., et al. (2021)
ASASSN-18aan: An eclipsing SU UMa-type cataclysmic variable with a 3.6-hr orbital period and a late G-type secondary star
_PASJ tmp, 11W._

Chochol, D.; et al. (2021)
Classical Nova Persei 2018 outburst from the dwarf nova V392 Per
_gacv.workE 29C._

Shore, S. N.; et al. (2021)
V1405 Cas (≡ PNV J23244760+6111140) now displaying Fe II emission
_ATel14577 1S._
Papers published with Vihorlat Observatory co-authors in 2021

Pavlenko, E., et al. (2021)
MASTER OT J172758.09+380021.5: a peculiar ER UMa-type dwarf nova, probably a missed nova in the recent past

*CoSka* 51, 138P.

Tampo, Y.; et al. (2021)
Spectroscopic and photometric observations of dwarf nova superoutbursts by the 3.8 m telescope Seimei and the Variable Star Network

*PASJ* 73, 753T.

Kato, T.; et al. (2021)
BO Ceti: Dwarf nova showing both IW And-type and SU UMa-Type features

*PASJ* tmp, 84K.
Papers published with Vihorlat Observatory co-authors in 2021

Kimura, M., et al. (2021)
On the nature of the anomalous event in 2021 in the dwarf nova SS Cygni and its multi-wavelength transition
*PASJ* tmp, 85K.

Shore, S. N.; et al. (2021)
ARAS Group spectroscopic monitoring of the latest outburst of RS Oph
*ATel14868 1S*.

Froebrich, D.; et al. (2021)
A survey for variable young stars with small telescopes - IV. Rotation periods of YSOs in IC 5070
*MNRAS* 506, 5989F.
Observing statistics in recent years

Atmospheric conditions, activity and efficiency of the observatory
Observers and instruments

Pavol A. Dubovský and Tomáš Medulka as staff observers
VNT 1000/9000 + FLI1001E + B V Rc Ic Clear filters
C14 356/3910 + MII G2-1600 + B V Rc Ic Clear filters
C11 280/2800 + LISA spectrograph ATIK 460ex camera
Pupava 280/1500 + MII G2-1600 + B V Rc Ic Clear filters
M20 200/2000 + QHY9 without filters (private instrument)

Doc. Parimucha and his students from Šafárik University in Košice
ZIGA Planewave CDK20 508/3454 + MII G4-16000 + B V Rc Ic filters

Visual estimates of variable stars brightness
Pavol A. Dubovský with dobson Meade Starlight 405/1830 and double binocular 25x100 + 12x60
Thank you for your attention