

International meeting on variable stars research

# KOLOS 2013

Astronomical Observatory and Planetarium on Kolonica Saddle

Hotel Armales, Stakčín, Slovakia

## Book of abstracts

### Oral presentation:

**Session I. Astronomical complex on Kolonica Saddle, results of observations in 2013. Papers based on data collected at AO Kolonica Saddle**

**Kudzej, I.**

Vihorlat Observatory, Humenné, Slovakia

**From Kolos to Kolos**

**Dubovský, P. A.**

Vihorlat Observatory, Humenné, Slovakia

**Annual Report on Observational results of AO at Kolonica Saddle**

Introductory presentation about observing program at Astronomical Observatory at Kolonica Saddle. Short overview of main observing campaigns during last year, most important results, interesting light curves, new publications based on observations at AO Kolonica Saddle.

**Dubovský, P. A.**

Vihorlat Observatory, Humenné, Slovakia

**Long period variables visual light curves compared with CCD data from All Sky Automated Survey and other CCD data**

After ten years of visual monitoring of selected semiregular variable stars we presents comparison of collected data with CCD observations. Discussion about the reliability of visual data is presented and some recommendation for future visual monitoring as well.

**Hric, L. (1), Breus, V. V. (2), Dubovský, P. A. (3)**

(1) Astronomical Institute od Slovak Academy of Science, Tatranská Lomnica, Slovakia

(2) Department "High and Applied Mathematics", Odessa National Maritime University, Odessa, Ukraine

(3) Vihorlat Observatory, Humenné, Slovakia

**The new period in V709 Cas**

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We present the results of 10 years photometric CCD observations of the intermediate polar V709 Cas obtained by using of the different instruments in 2003 - 2013. We detected the new variability with a period of  $P_{\text{new}} = 0.016449979(5)$  day which seems to be real. The spin variability is not clearly seen in all our data, so we are unable to study the evolution of the white dwarf rotation. From the best night (2010) we obtained the value of the spin period  $P_{\text{spin}} = 311.8(5)$  sec. We analyzed the orbital variability using (O - C) analysis. We found no variations of the orbital period on the timescale of 10 years, but the linear fit to the (O - C) diagram shows that the value of the orbital period is  $P_{\text{orb}} = 0,2222123(6)$  day, which is close to the published earlier values.

## **Session II. Variable stars research**

### **Zverko, J.**

Slovak Astronomical Society, Slovakia

**Astrophysics with 60-cm telescope**

### **Zola, S.**

Astronomical Obs. Jagiellonian Univ. & Mt. Suhora Observatory , Poland

**Observations of extragalactic objects with small telescopes**

### **Vaňko, M.**

Astronomical Institute od Slovak Academy of Science, Tatranská Lomnica, Slovakia

**The eclipsing binary TY CrA revisited: what near-IR light curves tell us**

New photometric observations of the hierarchical eclipsing TY CrA system were taken in the optical with Variable Young Stellar Object Survey 6 (VYSOS6) and in the near-infrared (IR) with Son of ISAAC (SOFI) and Rapid Eye Mount Infra Red (REMIR). They are the first observations showing the deep eclipse minimum of the pre-main-sequence secondary in the near-IR. For the first time, the secondary minimum can be reliably used in the calculation of the O-C diagram of TY CrA. By now, the O-C diagram can be studied on a time basis of about two decades. We confirm, that the O-C diagram cannot be explained by the spectroscopic tertiary. For the first time, the light curve of the inner eclipsing binary is analysed in both optical and near-IR bands simultaneously. In combination with already published spectroscopic elements, precise absolute dimensions and masses of the primary and the secondary component are obtained using the ROCHE code.

### **Ogloza, W.**

Mt. Suhora Observatory , Poland

**Photometric observations at Mt. Suhora**

I would like to present the Mt. Suhora Observatory of Cracow Pedagogical University and our works about variable stars.

### **Čokina, M. (1), Parimucha, Š. (1), Vaňko, M. (2)**

(1) Institute of Physics, Faculty of Science, P. J. Šafárik University in Košice , Slovakia

(2) Astronomical Institute od Slovak Academy of Science, Tatranská Lomnica, Slovakia

**autoObserver - automatic generation of observing schedules**

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We present new web-based application autoObserver for an automatic generation of observing schedules and control scripts, mainly of variable stars. autoObserver will generate list of objects to observe based on catalog of objects, database of early observations and other options characterizing used instrumentation and observing place.

### **Hegedus, T., Szing, A., Vinko**

Baja Astronomical Observatory , Hungary

#### **SDSS griz photometry - first experiences at Baja Observatory**

Due to several reasons, the SDSS photometric system is not so widely used in our region, and thus, also not so well known... By certain ideas, we at Baja Astronomical Observatory decided to instal g, r, i, z filter system on the 1-degree fielded BART-1 robotic telescope. Our aim is to show the latest efforts and some preliminary results and experiences of the griz photometry at Baja Astronomical Observatory.

### **Gális, R. (1), Hric, L. (2), Kundra, E. (2)**

(1) Institute of Physics, Faculty of Science, P. J. Šafárik University in Košice , Slovakia

(2) Astronomical Institute od Slovak Academy of Science, Tatranská Lomnica, Slovakia

#### **Pulsation of IU Per from the ground based and INTEGRAL photometry**

IU Per is an eclipsing semi-detached binary with a pulsating component. Using our own ground-based, as well as INTEGRAL satellite photometric observations in the B and V passbands, we derived geometrical and physical parameters of this system. We detected the short-term variations of IU Per in the residuals of brightness after the subtraction of synthetic light curves. Analysis of these residuals enabled us to characterize and localize the source of short-term variations as the pulsations of the primary component typical to delta Scuti-type stars.

## **Session III. Other astrophysical areas, cosmology, nuclear physics, geophysics**

### **Vojsovič, M.,**

Faculty of Science, P. J. Šafárik University in Košice , Slovakia

#### **Cosmic rays detector SKALTA**

Príspevok v skratke predstavuje detektor sekundárneho kozmického žiarenia SKALTA (ďalej len SKZ SKALTA) a čiastočne analyzuje aj problematiku detekcie sekundárnej zložky kozmického žiarenia. Zaoberá sa praktickým využitím SKZ SKALTA vo vzdelávacom procese stredných a vysokých škôl. V príspevku je prezentovaná ako príklad využitia aj práca SOČ s názvom: Vplyv slnečného žiarenia na intenzitu spŕšok sekundárneho kozmického žiarenia prostredníctvom detektora SKZ SKALTA.

### **Vojsovič, M.,**

Slovak Organization for Space Activities , Slovakia

#### **Cross border project "Spoločne do stratosféry"**

Project „Spoločne do stratosféry“ (in article: SDS) is a cross-border projekt of Slovak organization for space activities and Observatory in Valašské Meziříčí. Main goal of SDS is allowed to participate students of Slovak and Czech secondary grammar school and universities in experimental research of Earth's stratosphere. In the presentation we will present possibilities, which a SDS offers not only to students in research area, but also teachers in the field of popularization physics and cosmic sciences. We will also introduce the partners of SDS and their actual projects.

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## **Gorbanev, Y.,**

Odessa Astronomical Observatory , Ukraine

### **Television meteor observations in Odessa**

## **Session IV. Astrotourism and astronomical education in Carpathian region**

## **Sęk, G.,**

MOA Niepołomice, Poland

### **Pupil`s observations of the sun in MOA**

## **Paugsch, P. (1), Balaschová, O. (2), Kimák, I. (3)**

(1) Informal group MOVE, Košice, Slovakia

(2) KCÚBaR - Observatory based in Medzev, Hlavná 52, Moldava nad Bodvou, Slovakia

(3) Regional youth center, Strojárska 3, Košice, Slovakia

### **Every Under One Sky One or a small contribution to the development of astro-tourism**

The paper discusses youth projects “Every one under one sky”. The project is in partnership with members of an informal group MOveo and workers Observatories Medzev. Project work was carried out by making 27 young people from Belgium, Finland , Slovenia and Slovakia. The aim of the project was to restore Observatories Medzev active participation in public life to the city and its surroundings. The program was a combination of practical and theoretical activities in which young people are familiar with the history of the observatory and the city , explored astronomy through practical observation of the night sky. Reconstructed it and put into operation planetarium and astropark. The first feedback from the operation of the planetarium and astropark indicate, that implement youth project was a step in the right direction towards getting new visitors Observatories in Medzev . The project was carried out with financial support from the Youth in Action Programme.

## **Hegedus, T.,**

Baja Astronomical Observatory , Hungary

### **New Dark Sky Park plan in Hungary: Illancs**

There are two officially registered Dark Sky Parks in Hungary: Zselic and Hortobágy. If anyone checks the satellite-produced light pollution maps of Hungary - it can be revealed for him, that there is a third dark area near Baja Observatory: Illancs. In this short presentation we overview our concept of a new Hungarian Dark Sky Park. We show the first SQM measurement monitoring experiences at the site, the astronomical and other kinds of values of this area, and the vision of the future at this park...

## **Bury, R.,**

ASTRODOM, Poland

### **New polish-slovak crossborder astronomical projects**

In 2012 project “Carpathian Sky” ended. But polish-slovak astronomical cooperation still exist, an develop. At 2013 started two new common astronomical project with Vihorlat Observatory as a partner. First project – “Bieszczady, Sky and Stars” in Lutowska supports activities new Starry Sky Park in Bieszczady mountains. Conducts promotion and educational activities about astronomy, light pollution,

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and astro-tourism. Prepare small astronomical infrastructures- sundials, observation places, informational tables. Create Information Centre for Starry Sky Park "Bieszczady".

Second project- "Rhythms of nature" in Bolestraszyce Arboretum prepare new natural tourist products. Promote astronomy and biology, showing relation between them. Informs about light pollution problem and promote good solutions for lighting green places. Prepare small astronomical infrastructures- sundials, observation place, informational tables, and tyfloplanetarium for blinds people.

## **P o s t e r   s e s s i o n :**

### **Hric, L. (1), Kundra, E. (1), Gális, R. (2)**

(1) Astronomical Institute of Slovak Academy of Science, Tatranská Lomnica, Slovakia

(2) Institute of Physics, Faculty of Science, P. J. Šafárik University in Košice, Slovakia

#### **RS Oph - Flickering activity and accretion disc formation**

Supernovae, novae and dwarf novae (DN) are one of the dominant part in astronomical research suitable for observation by small telescopes. In the world, the small telescopes are widely used for studying of sudden brightening of such objects. The observations are also important during the decrease of brightness after the outbursts, what helps with the classification of the objects.

We present our experience with observation of the RS Ophiuchi (RS Oph) and analyses of the light curves. RS Oph is a binary system with 6 recorded outbursts classified as recurrent nova (RN). We used the telescopes of Astronomical Institute of Slovak Academy of Sciences to measure the brightness of the RS Oph after its last outburst occurred on February 12, 2006. We have continued the observation to monitor the activity of this system since the destruction of the accretion disc via its formation in August 2006. The new observations indicate the ongoing mass transfer and the estimation of the mass transfer rate allow to make a prediction of the next outburst of this RN.

### **Hric, L. (1), Gális, R. (2), Kundra, E. (1)**

(1) Astronomical Institute of Slovak Academy of Science, Tatranská Lomnica, Slovakia

(2) Institute of Physics, Faculty of Science, P. J. Šafárik University in Košice, Slovakia

#### **Excursion to the Universe in frame of Slovak Astronomical Society**

### **Kudzej, I., Dubovský, P. A.**

Vihorlat Observatory, Humenné, Slovakia

#### **1 meter telescope in Kolonica saddle - technical parameters and observing programs**

The actual technical status of 1 meter Vihorlat National Telescope (VNT) at Astronomical Observatory at Kolonica Saddle is presented. Cassegrain and Nasmyth focus, autoguiding system, computer controlled focusing and fine movements and other improvements achieved recently. For two channel photoelectric photometer the system of channels calibration based on artificial light source is described. For CCD camera FLI PL1001E actually installed in Cassegrain focus we present transformation coefficients from our instrumental to international photometric BVRI system.

In the second part of the paper we present results of variable stars observations with 1 meter telescope in recent years. The first experimental electronic measurements were done in 2006. Both with CCD cameras and with two channel photoelectric photometer. Starting in 2007 the regular observing program is in operation. There are only few stars suitable for two channel photoelectric photometer observation. Generally the photometer is better when fast brightness changes (time scale of seconds) must be recorded. Thus the majority of observations is done with CCD detector. We present a brief overview of most im-

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portant observing programs: long term monitoring of selected intermediate polars, Project Dwarf. Occasional observing campaigns were performed on several interesting objects: OT J071126.0+440405, V603 Aql, Z And in outburst.

## **Andronov, I. L., Breus, V. V.**

Department "High and Applied Mathematics", Odessa National Maritime University, Odessa, Ukraine

### **Variability of the Spin Period of the White Dwarf in the Magnetic Cataclysmic Binary System EX Hya**

The observations of the two-periodic magnetic cataclysmic system EX Hya have been carried out, using the telescopes RC16 and TOA-150 of the Tzec Maun observatory. 6 nights of observations were obtained in 2010-2011 (alternatively changing filters VR). Also the databases of WASP, ASAS and AAVSO have been analyzed. Processing time series was carried out using the program MCV. We analyzed changes in the rotation period of the white dwarf, and based on our own and previously published moments of maximum. The ephemeris was determined for the maxima of the radiation flux associated with the rotation of the magnetic white dwarf:  $T_{\max} = 2437699.89079(59) + 0.0465464808(69) \cdot E - 6.3(2) \cdot 10^{-13} E^2$ , which corresponds to the characteristic timescale of the rotation spin-up of 4.67(14) · 10<sup>6</sup> years. This contradicts the estimated value of the mass of the white dwarf of 0.42 M<sub>⊙</sub>, based on X-ray observations made by Yuasa et al (2010), however, is consistent with estimates of the masses of 0.79 M<sub>⊙</sub> (white dwarf) and 0.108 M<sub>⊙</sub> (red dwarf) previously published Beuermann and Reinsch (2008), and the assumption that the capture of accreted plasma by magnetic field of the white dwarf is near the border of the Roche lobe. Analyzed moments do not support the assumption of Mauche et al (2009) for a statistically significant cubic term in the ephemeris. Despite the presence of outbursts in EX Hya, there are significant differences from the DO Dra, which supports the introduction to a detailed classification of the intermediate polars the groups of "outbursting intermediate polars" and "magnetic dwarf novae." A complete paper is published at [2013arXiv1308.1805A](https://arxiv.org/abs/2013arXiv1308.1805A).

## **Andronov, I. L. (1), Chinarova, L. L. (2)**

(1) Department "High and Applied Mathematics", Odessa National Maritime University, Odessa, Ukraine

(2) Odessa Astronomical Observatory, Ukraine

### **Method of Running Sines: Modeling Variability in Long-Period Variables**

We review one of complementary methods for time series analysis - the method of "Running Sines". "Crash tests" of the method include signals with a large period variation and with a large trend. The method is most effective for "nearly periodic" signals, which exhibit "wavy shape" with a "cycle length" varying within few dozen per cent (i.e. oscillations of low coherence). This is a typical case for brightness variations of long-period pulsating variables and resembles QPO (Quasi-Periodic Oscillations) and TPO (Transient Periodic Oscillations) in interacting binary stars - cataclysmic variables, symbiotic variables, low-mass X-Ray binaries etc. General theory of "running approximations" was described by Andronov (1997A &AS..125..207A), one of realizations of which is the method of "running sines". The method is related to Morlet-type wavelet analysis improved for irregularly spaced data (Andronov, 1998KFNT...14..490A, 1999sss..conf...57A), as well as to a classical "running mean" ("moving average"). The method is illustrated by an application to a model signal with strongly variable period, as well as to a semi-regular variable AF Cyg. Some other stars studied with this method are discussed, e.g. RU And (switching between "Mira-type" large amplitude oscillations and time intervals of "constancy"), intermediate polars MU Cam (1RXS J062518.2+733433) and BG CMi, magnetic dwarf nova DO Dra, symbiotic stars UV Aur and V1329 Cyg. A complete paper is published at [2013arXiv1308.1129A](https://arxiv.org/abs/2013arXiv1308.1129A).

## **Andronov, I. L., Naumova, A. V.**

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### **Program WWZ: Wavelet Analysis of Astronomical Signals With Irregularly Spaced Arguments**

A program WWZ is introduced, which realizes the wavelet analysis using an improved modification of the algorithm of the Morlet wavelet for a general case of irregularly spaced data, which is typical for the data-bases available in virtual observatories. Contrary to the well-known analogs, working with regularly spaced (equidistant in time) arguments, we have implemented an improved algorithm presented by Andronov, (1998KFNT...14..490A, 1999sss..conf...57A), which significantly increases the signal-to-noise ratio. The program has been used to study semi-regular pulsating variable stars (U Del et al.), but can be used for the analysis of signals of any nature. A complete paper is published at [2013arXiv1310.5031A](#).

**Andronov, I. L., Tkachenko, M. G.**

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**Comparative Analysis of Numerical Methods for Parameter Determination**

We made a comparative analysis of numerical methods for multidimensional optimization. The main parameter is a number of computations of the test function to reach necessary accuracy, as it is computationally "slow". For complex functions, analytic differentiation by many parameters can cause problems associated with a significant complication of the program and thus slowing its operation. For comparison, we used the methods: "brute force" (or minimization on a regular grid), Monte Carlo, steepest descent, conjugate gradients, Brent's method (golden section search), parabolic interpolation etc. The Monte-Carlo method was applied to the eclipsing binary system AM Leo. A complete paper is published at [2013arXiv1310.1967A](#).

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