**Biannual report**

**Astronomical Institute of the Slovak Academy of Sciences 2012 – 2013**

***Institute***

**Mission Statement of the Institute**

[1] Astronomical Institute of the Slovak Academy of Sciences (AISAS) is focused on observations and basic research in the group of sciences “Natural sciences” sub-group “Physical sciences”, branches “Astronomy”, “Astrophysics”, “Plasma physics” and “Environmental Physics”, with emphasis on research of the Sun, interplanetary matter, stars and stellar systems.

[2] AISAS provides consulting and other expertise services relating to its main specialization.

[3] AISAS organizes the postgraduate (PhD) study in astronomy and astrophysics and ensures the participation of the staff of the Institute in teaching at universities.

[4] AISAS publishes the results of its scientific activity in journals as well as in non-periodical prints and popularizes the results in media.

***Basic information on the Institute:***

**Legal name and address**

Astronomical Institute of the Slovak Academy of Sciences

05960 Tatranská Lomnica, Slovakia

**URL of the institute web site**

https://www.astro.sk/

**Executive body of the institute and its composition**

Director: RNDr. Aleš Kučera, CSc.

Deputy director: Doc. RNDr. Ján Svoreň, DrSc.

Scientific secretary: Mgr. Martin Vaňko, PhD. RNDr. and Drahomir Chochol, DrSc.

Astronomical Institute of the Slovak Academy of Sciences (AISAS) consists of three scientific departments: **Stellar Department, Solar Physics Department, Department of interplanetary matter**

**Stellar department – research areas:**

1. study and search of exoplanets, determination of basic parameters of exoplanets and development of theoretical tools for analysis, search for young exoplanets in open galactic clusters, search for circumbinary exoplanets,
2. study of binaries and multiple systems of stars, determination of the absolute parameters of the components of eclipsing binaries using ground-based and satellite photometric, spectroscopic, and interferometric data, study of close binaries focusing on the mass transfer and mass loss, study of cycles of stellar activity and spots,
3. study of pre-main-sequence (T Tauri) multiple and single stars to constrain models of stellar evolution,
4. study of the structure of active components in symbiotic stars, ionization, scattering and mass outflow by the stellar wind and jets, multifrequency observations of classical novae, determination of their orbital periods, study of the structure of their expanding envelopes

**Solar department – research areas:**

1. study of the solar photosphere and chromosphere and active events in them, using modern spectro-polarimetric, spectroscopic and photometric observations acquired with top level solar telescopes base at the Canary Islands (GREGOR, VTT, SST, THEMIS), and with space-borne satellites under own joint observing proposals,
2. study of the solar corona and structures in it (prominences, coronal holes, coronal condensations) and Sun-Earth relations using data acquired with modern infrastructure at our Lomnicky Peak Observatory, with space-borne satellites and from VSO – Virtual Solar Observatory (unique access to data from space- and ground-based observations of the Sun) and using data from solar total eclipses observations,
3. study of evolution of fast and very powerful events in the solar atmosphere (flares, coronal mass ejections, active prominences, jets) using multiple observations from ground based and space-borne instruments,

**Department of interplanetary matter – research areas:**

1. investigation of populations of small bodies in the Solar System, study of transfer orbits, interrelations and evolution among different populations regarding near-Earth objects, study of the structure of the outer part of the Oort cloud and the Edgeworth-Kuiper belt;
2. investigation of the activity of selected cometary nuclei and its influence on physical and dynamical evolution of these bodies, photometry of asteroids and comets;
3. study of structure and dynamics of meteoroid streams and evolution of their parent bodies, description of the distribution of meteoroid particles in the inner Solar System, search for meteoroid streams of asteroidal origin, search for hyperbolic and interstellar meteoroids, operation of the all-sky photographic cameras within the European Fireball Network; study of meteorite properties.
4. study of the physical and chemical properties of surfaces of small bodies in the Solar System and their relevant terrestrial analogs, simulation of effects of space weathering in laboratory conditions, formation of molecules due to ion irradiation of ices relevant to Solar System bodies.

***Results 2012- 2013***

Scientific achievements and results gained at (AISAS) have been published mostly in top high ranked international scientific journals, presented at prestigious international conferences and significantly cited by the scientific community

**Study of peculiar exoplanetary system**

A peculiar exoplanetary system KIC 12557548b showing a long comet-like tail was studied using the SHELLSPEC code. The light curve has a prominent pre-transit brightening and a less prominent post-transit brightening. Both are caused by the forward scattering and are a strong function of the particle size. This feature enabled us to estimate a typical particle size (radius) in the dust tail of about 0.1-1 micron. However, there is an indication that the particle size decreases along the tail. The dust density in the tail is a steep decreasing function of the distance from the planet, which indicates a significant tail destruction caused by the star-planet interaction. Several possible combinations of other dust properties are tabulated. We reveal interesting periodic long-term evolution of the tail on a time scale of about 1.3 years and also argue that the "planet" does not show a uniform behaviour, but may have at least two constituents.

BUDAJ, Ján. Light-curve analysis of KIC 12557548b: an extrasolar planet with a comet-like tail. In Astronomy and Astrophysics, 2013, vol. 557, article no. A72, p. 1-10. (**5.084 - IF2012**).(2013 - Current Contents, SCOPUS, NASA ADS). ISSN 0004-6361.

**Determination of ionization structure of hot components in symbiotic binaries during active phases**

During active phases of symbiotic binaries, an optically thick medium in the form of a flared disk develops around their hot stars. During quiescent phases, this structure is not evident. In this paper we aimed to explain how such a formation can be created during active phases. Our concept is based on the fact that during active phases the mass loss rate from the hot star (i.e. the white dwarf – WD) increases by a factor of ~10 and the assumption that the WD can rotate fast. The fast rotation of the source of the stellar wind causes its compression to the equatorial plane, where it can form a neutral disk-like region flared from its centre. The remainder of the sphere above/below the disk is ionized. Basic parameters of the model (the mass-loss rate, emission measure of the ionized zone and the hydrogen column density of the neutral zone) are in a good agreement with those derived independently from observations. During quiescent phases, the neutral disk-like structure cannot be created, because the mass-loss rate and thus the compression are insufficient. This mechanism probably represents a common origin of warm pseudophotospheres, indicated in the spectrum of active symbiotic binaries.

[4] CARIKOVÁ, Zuzana - SKOPAL, Augustín. Ionization structure of hot components in symbiotic binaries during active phases. In Astronomy and Astrophysics, 2012, vol. 548, article no. A21, p. 1-10. (**4.587 - IF2011**). (2012 - Current Contents, SCOPUS, NASA ADS). ISSN 0004-6361.

**Evidence of coupling of emerging small-scale magnetic flux in photosphere with chromospheric activity**

We investigated the temporal evolution of magnetic flux emergence in the quiet-Sun atmosphere close to disk centre. We combined high-resolution satellite SoHO/MDI magnetograms with satellite TRACE observations taken in the 1216 Å channel to analyze the temporal evolution of an emerging small-scale magnetic loop and its traces in the chromosphere. We find signatures of flux emergence very close to the edge of a supergranular network boundary located at disk center. The new emerging flux appeared first in the MDI magnetograms in form of an asymmetric bipolar element. The patch with negative polarity was roughly twice as weak as the corresponding patch with opposite polarity. The average values of magnetic flux and magnetic flux densities reached 1.6 × 1018 Mx - 8.5 × 1017 Mx, and 55 Mx cm-2 -30 Mx cm-2, respectively. The spatial distance between the opposite polarity patches of the emerged feature increased from about 2.5 to 5.0 arcseconds during the lifetime of the loop, which was 36 min. The chromospheric response to the emerged magnetic dipole occurred ~9 min later than in the photospheric magnetograms. It consisted of a quasi-periodic sequence of time-localized brightenings visible in the 1216 Å TRACE channel for ~14 min that were co-spatial with the axis connecting the two patches of opposite magnetic polarity. Thus, we identify the observed event as a small-scale magnetic loop emerging at photospheric layers that subsequently rose to the chromosphere. The fluctuations detected in the chromospheric emission probably reflect magnetic-field oscillations which propagate to the chromosphere in the form of waves.

GÖMÖRY, Peter - BALTHASAR, Horst - PUSCHMANN, Klaus Gerhard. Evidence of quiet-Sun chromospheric activity related to an emerging small-scale magnetic loop. In *Astronomy and Astrophysics*, 2013, vol. 556, article no. A7, p. 1-6. (**5.084 - IF2012**). (2013 - Current Contents, WOS, SCOPUS, NASA ADS). ISSN 0004-6361.

**Investigation of the outer parts of the Solar System**

Investigation of the outer parts of the Solar System is essential for a better understanding of the processes which formed of our planetary system. Modern simulations using a large number of theoretical bodies – points are performed at AISAS.

Modelling the formation of the ice giants Uranus and Neptune has been a challenging problem in planetary science for along time. Owing to gas-drag, collisional damping, and resonant shepherding, the planetary embryos repel the planetesimals from their reach and that is why they stop growing. This problem persists independently of whether the accretion took place at the current locations of the ice giants or closer to the Sun. Instead of trying to push the runaway/oligarchic growth of planetary embryos up to 10−15 Earth masses, we envision the possibility that the planetesimal disk could generate a system of planetary embryos of only 1−3 Earth masses. Then we investigate whether these embryos could have collided with each other and grown enough to reach the masses of current Uranus and Neptune. We performed several series of numerical simulations. The dynamics of a considered set of embryos is influenced by the presence of Jupiter and Saturn, assumed to be fully formed on non-migrating orbits in 2:3 resonance, and also by gravitational interactions with the gas disk. Our results point to two major problems. First, there is typically a large difference in mass between the first- and the second-most massive core formed and retained beyond Saturn. Second, in many simulations the final planetary system has more than two objects beyond Saturn. The growth of a major planet from a system of embryos requires strong damping of eccentricities and inclinations from the gas disk. But strong damping also enables embryos and cores to find a stable resonant configuration, so that systems with more than two surviving objects are found. In addition to these problems, it is necessary to assume that the surface density of the gas was several times higher than that of the minimum-mass solar nebula to achieve substantial accretion among embryos. However, this contradicts the common idea that Uranus and Neptune formed in a gas-starving disk, which is suggested by the relatively small amount of hydrogen and helium contained in the atmospheres of these planets. Only one of our simulations serendipitously reproduced the structure of the outer Solar System successfully. However, we point out that models of formation of Uranus and Neptune have non-trivial problems, which cannot be ignored and have to be addressed in future work

JAKUBÍK, Marián - MORBIDELLI, Alessandro - NESLUŠAN, Luboš - BRASSER, Ramon. The accretion of Uranus and Neptune by collisions among planetary embryos in the vicinity of Jupiter and Saturn. In *Astronomy and Astrophysics*, 2012, vol. 540, article no. A71, p. 1-16. (**4.587 - IF2011**). (2012 - Current Contents, WOS, SCOPUS, NASA ADS). ISSN 0004-6361.

**Structure of the complex of meteoroid particles released from comet 96P/Machholz**

The structure of the complex of meteoroid particles released from comet 96P/Machholz is studied to reveal a relationship among the meteor showers observed in the Earth’s atmosphere that belong to this complex. For eight perihelion passages of the parent comet in the past, we model theoretical streams associated with comet 96P and follow their dynamical evolution until the present. Subsequently, we analyze the orbital characteristics of the streams, especially of their parts approaching the Earth’s orbit. The dynamics of the stream is controlled by Jupiter, which changes the initial orbits of the particles into the orbits situated within several specific corridors. It thus creates a filamentary structure of the complex. Six filaments approach the orbit of the Earth producing four well-known meteor showers and two showers, whose identification with κ-Velids and α-Cetids is not certain. The known showers, in order of the predicted abundance of meteors, are daytime Arietids, Southern δ-Aquarids, Quadrantids, and Northern δ-Aquarids. The filaments corresponding to the Arietids, δ-Aquarids S and N, and possibly α-Cetids constitute the ecliptical lcomponent and those corresponding to the Quadrantids and possibly κ-Velids constitute the toroidal component of the complex

NESLUŠAN, Luboš - KAŇUCHOVÁ, Zuzana - TOMKO, Dušan. The meteor-shower complex of 96P/Machholz revisited. In *Astronomy and Astrophysics*, 2013, vol. 551, article no. A87, p. 1-14. (**5.084 - IF2012**). (2013 - Current Contents, WOS, SCOPUS, NASA ADS). ISSN 0004-6361.

**Binary asteroid population in main-belt of Solar System**

Our photometric observations of 18 main-belt binary systems in more than one apparition revealed a strikingly high number of 15 having positively re-observed mutual events in the return apparitions. Our simulations of the survey showed that it cannot be due to an observational selection effect and that the data strongly suggest that poles of mutual orbits between components of binary asteroids in the primary size range 3–8 km are not distributed randomly: The null hypothesis of anisotropic distribution of the orbit poles is rejected at a confidence level greater than 99.99%. Binary orbit poles concentrate at high ecliptic latitudes, within 30° of the poles of the ecliptic. We propose that the binary orbit poles oriented preferentially up/down-right are due to either of the two processes: (i) the YORP tilt of spin axes of their parent bodies toward the asymptotic states near obliquities 0 and 180°(pre-formation mechanism), or (ii) the YORP tilt of spin axes of the primary components of already formed binary systems toward the asymptotic states near obliquities 0 and 180°(post-formation mechanism). The alternative process of elimination of binaries with poles closer to the ecliptic by the Kozai dynamics of gravitational perturbations from the sun does not explain the observed orbit pole concentration as in the close asteroid binary systems the J2 perturbation due to the primary dominates the solar-tide effect

PRAVEC, Petr - SCHEIRICH, Petr - VOKROUHLICKÝ, David - HARRIS, Alan W. - KUŠNIRÁK, Peter - HORNOCH, Kamil - PRAY, Donald P. - HIGGINS, David - GALÁD, Adrián - VILÁGI, Jozef - GAJDOŠ, Štefan - KORNOŠ, Leoš - OEY, Julian - HUSÁRIK, Marek - COONEY, Walter R. Jr. - GROSS, John - TERRELL, Dirk - DURKEE, Russ - POLLOCK, Joseph - REICHART, Daniel - IVARSEN, Kevin - HAISLIP, Josh - LA CLUYZE, Aaron - KRUGLY, Yurij N. - GAFTONYUK, Ninel - STEPHENS, Robert D. - DYVIG, Ron - REDDY, Vishnu - CHIORNY, Vasilij - VADUVESCU, Ovidiu - LONGA-PEÑA, Penélope - TUDORICA, Alexandru - WARNER, Brian D. - MASI, Gianluca - BRINSFIELD, James - GONCALVES, Rui - KRZEMINSKI, Zbigniew - GERASHCHENKO, Oleg - SHEVCHENKO, Valeri - MOLOTOV, Igor - MARCHIS, Franck. Binary asteroid population. 2. Anisotropic distribution of orbit poles of small, inner main-belt binaries. In *Icarus*, 2012, vol. 218, p. 125-143. (**3.385 - IF2011**). (2012 - Current Contents, WOS, SCOPUS, NASA ADS). ISSN 0019-1035.

**First time determination of metalicity of 90 binaries (W UMa type)**

About 4500 spectra collected at the David Dunlap Observatory were analysed to determine metallicity of 90 W UMa type binaries for the first time. The logarithmic relative metallicities, [M/H], for the F-type sub-sample indicate metal abundances roughly similar to the solar metallicity, but with a large scatter which is partly due to combined random and systematic errors. A parallel study of kinematic data, utilizing the most reliable and recently obtained proper motion and radial velocity data for 78 binaries of the full sample, shows that the F-type sub-sample binaries (44 stars with both velocities and metallicity determinations) have similar kinematic properties to solar-neighbourhood, thin-disk dwarfs. FU Dra with a large spatial velocity, V = 197 km/s and [M/H] = -0.6 ± 0.2, appears to be the only thick-disk object in the F-type sub-sample. The kinematic data indicate that the F-type EW binaries are typical, thin-disk population stars with ages about 3-5.5 Gyr.

RUCINSKI, Slavek M. - PRIBULLA, Theodor - BUDAJ, Ján. Spectroscopic metallicity determinations for W UMa-type binary stars. In The Astronomical Journal, 2013, vol. 146, article no. 70, p. 1-20. (**4.965 - IF2012**). (2013 - Current Contents, SCOPUS, NASA ADS). ISSN 0004-6256.

**A quiescent prominence observed in the H-alpha line by the COMP-S instrument at the Lomnicky Peak Observatory**

A prominence above the NEE limb was observed by the COMP-S instrument attached to the ZEISS coronagraph located at the Lomnicky Peak Observatory. The filter of the instrument was tuned during measurements sequentially in five wavelengths within the profile of the Hα line: 0, ±1, ±2 Å around 6563 Å. FWHM of the transmission function of the filter was ≈0.4Å at these wavelengths. Data were fitted using a simple cloud model (1D geometry, a complete frequency redistribution, a source function independent of the optical depth) to diagnose the prominence plasma. Five positions at the prominence were chosen for simulation using the cloud model and groups of different models were found for each position. Simulating observations using three different finer wavelength scales it was found that the wavelength scale with a step of 0.3 Å and even more finer in the line core (step of 0.1 Å) is already suitable for more precise and unambiguous plasma diagnostics. We also show that for correct plasma diagnostics it is crucial to take into account an effect of a finite width of the transmission function of the filter. If observed data were fitted irrespectively of this important effect, an error in estimated model parameters could exceed even 100 %, except for the Doppler velocities, for which the error would be much smaller, e.g. for velocities up to 20 km s-1 the error is below 1 %.

SCHWARTZ, Pavol - RYBÁK, Ján - KUČERA, Aleš - KOZÁK, Matúš - AMBRÓZ, Jaroslav - GÖMÖRY, Peter. A quiescent prominence observed in the H-alpha line by the COMP-S instrument at the Lomnicky Peak Observatory. In Contributions of the Astronomical Observatory Skalnaté Pleso, 2012, vol. 42, p. 135-146. (**0.152 - IF2011**). (2012 - WOS, SCOPUS, NASA ADS). ISSN 1335-1842.

**Strong constraints on the third light (reflection nebula + stellar components) in eclipsing TY CrA system**

 Hierarchical eclipsing system TY CrA system is observed photometrically in the visual range (VYSOS6) and in the near-infrared (SOFI, REMIR) in Chile. The infrared observations show the secondary minimum and enable reliable parameter determination and set strong constraints on the third light (reflection nebula + stellar components). The absolute parameters of the inner eclipsing binary agree very well with previous work except of the primary radius (1.46±0.15 R⊙) and luminosity (40±10 L⊙) which are clearly smaller. While the parameters of the secondary are well understood when assuming an age of about 3-5 Myr, the primary seems considerably undersized. Low metallicity cannot explain the parameters of the primary

VAŇKO, Martin - AMMLER-VON EIFF, Matthias - PRIBULLA, Theodor - CHINI, Rolf - COVINO, Elvira - NEUHÄUSER, Ralph. The eclipsing binary TY CrA revisited: what near-IR light curves tell us.In Monthly Notices of the Royal Astronomical Society, 2013, vol. 431, p. 2230-2239.(**5.521 - IF2012**). (2013 - Current Contents, SCOPUS, NASA ADS). ISSN 0035-8711.

**Inter-discipline fundamental research result**

Employing the structure of the split Cayley hexagon of order two, a distinguished subgeometry of the symplectic polar space W(5, 2) of the three-qubit Pauli group, we got an intriguing finite-geometric insight into the nature of a couple of `magic' three-qubit configurations proposed recently by Waegell and Aravind *[1]*. Mermin's pentagram, a specific set of ten three-qubit observables used to provide a very simple proof of the Kochen-Specker theorem, was also shown to be isomorphic to an ovoid (elliptic quadric) of the three-dimensional projective space of order two *[2]*. The geometry of the real four-qubit Pauli group, being embodied in the structure of the symplectic polar space W(7,2), was analyzed in terms of ovoids of a hyperbolic quadric of the seven-dimensional projective space of order two. The quadric was selected in such a way that it contains all 135 symmetric elements of the group. Under such circumstances, the third element on the line defined by any two points of an ovoid is skew-symmetric, as is the nucleus of the conic defined by any three points of an ovoid. The strategy we employed was completely novel and unique in its nature, as were the results obtained *[3]*. We further invoked some ideas from finite geometry to map bijectively 135 heptads of mutually commuting three-qubit observables into 135 symmetric four-qubit ones. After labeling the elements of the former set in terms of a seven-dimensional Clifford algebra, we presented the bijective map and most pronounced actions of the associated symplectic group on both sets in explicit forms. This formalism was then employed to shed novel light on recently-discovered structural and cardinality properties of an aggregate of three-qubit Mermin's 'magic' pentagrams. Moreover, some intriguing connections with the so-called black-hole--qubit correspondence were also pointed out *[4]*.

[1] SANIGA, Metod - PLANAT, Michel - PRACNA, Petr - LÉVAY, Péter. 'Magic' configurations of three-qubit observables and geometric hyperplanes of the smallest Split Cayley Hexagon. In Symmetry, Integrability and Geometry: Methods and Applications, 2012, vol. 8, article no. 083, p. 1-9. (**1.071 - IF2011**). (2012 - Current Contents, SCOPUS). ISSN 1815-0659.

[2] SANIGA, Metod - LÉVAY, Péter. Mermin's pentagram as an ovoid of PG(3,2). In EPL - Europhysics Letters, 2012, vol. 97, article no. 50006, p. 1-3. (**2.171 - IF2011**). (2012 - Current Contents, SCOPUS). ISSN 0295-5075.

[3] SANIGA, Metod - LÉVAY, Péter - PRACNA, Petr. Charting the real four-qubit Pauli group via ovoids of a hyperbolic quadric of PG(7,2). In Journal of Physics A: Mathematical and Theoretical, 2012, vol. 45, article no. 295304, p. 1-16. (**1.564 - IF2011**). (2012 - Current Contents, WOS, SCOPUS). ISSN 1751-8113.

[4]LÉVAY, Péter - PLANAT, Michel - SANIGA, Metod. Grassmannian connection between three- and four-qubit observables, Mermin's contextuality and black holes. In Journal of High Energy Physics, 2013, no. 09, article no. 037, p. 1-34. (**5.618 - IF2012**). (2013 - Current Contents, WOS, SCOPUS). ISSN 1126-6708.

***International projects - grants: 2012- 2013***

***Project title:*** Polarization as a tool to study the Solar System and beyond

***Type/ Project number:*** MPNS COST Action MP1104

***Duration:*** 11/2012-11/2015

***Responsible person:*** Partner- Coordinator for Slovakia/ A. Kučera - scientist in charge

***Project title:*** SOLARNET- High-Resolution Solar Physics Network

***Type/ Project number:*** 7 RP/FP7-INFRA-312495

***Duration:*** 04/2013-03/2017

***Responsible person:*** Partner/ A. Kučera - scientist in charge

***Project title:*** Impulsively generated waves in radio and X-ray ranges of the electromagnetic spectrum detected in the solar corona

***Type/ Project number:*** MAD SK-CZ

***Duration:*** 01/2012-12/2014

***Responsible person:*** Coordinator / J. Rybák

***Project title:*** Plasma diagnostics of EIT waves and flares on the Sun

***Type/ Project number:*** MVD APVV SK-AT-0003-12 SK 16/2013

***Duration:*** 01/2013-12/2014

***Responsible person:*** Coordinator / P. Gömöry

***Project title:*** Dynamics and magnetic field topology of small-scale loops

***Type/ Project number:*** 7 RP SOLARNET Trans-nat. access programme:

VTT - Ref. nr.: 13-05

***Duration:*** 10/2013-10/2013

***Responsible person:*** Coordinator / P. Gömöry

***Project title:*** Finite Geometries Behind the Black–Hole–Qubit Correspondence

***Type/ Project number:*** MFO-RiP-2013-LPS

***Duration:*** 02/2013-03/2013

***Responsible person:*** Coordinator / M. Saniga

***Project title:*** Total Solar Eclipse in Gabon at Sunspot-Cycle maximum

***Type/ Project number:*** National Geographic Society NGS-9312-13

***Duration:*** 10/2013-12/2013

***Responsible person:*** Coordinator / V. Rušin

***Project title:*** Studying the nature of outbursts of symbiotic stars

***Type/ Project number:*** MAD SK-BG-0015-10

***Duration:*** 01/2012-12/2013

***Responsible person:*** Coordinator / A. Skopal

***Project title:*** Investigation of emerging magnetic flux in the quiet photosphere of the Sun

***Type/ Project number:*** DFG - Germany BA 1875/7-1

***Duration:*** 07/2011-06/2012

***Responsible person:*** Partner/ P. Gömöry - scientist in charge

***Project title:*** Understanding the evolution of the very young stars -- multiple data sets solution of the young eclipsing binary TY CrA

***Type/ Project number:*** DFG - Germany AM 158/3-1

***Duration:*** 01/2012-12/2012

***Responsible person:*** Partner/ M. Vaňko- scientist in charge

***Project title:*** Multiwavelength modeling the spectral energy distribution of the supersoft X-ray sources

***Type/ Project number:*** Alexander von Humboldt Foundation SLA/1039115

***Duration:*** 0/2012-04/2012

***Responsible person:*** Coordinator/ A. Skopal

***Project title:*** Multifaceted observations of the solar corona during the 13 November 2012 total eclipse in Australia

***Type/ Project number:*** National Geographic Society NGS-3139-12

***Duration:*** 11/2012-11/2012

***Responsible person:*** Coordinator/ V. Rušin

***International visits of the institute***

**YEAR-2013**

|  |  |
| --- | --- |
| **Country** | **Type of visits** |
|  | **Projects** | **Bilateral** | **Other** |
|  | **Name** | **Days** | **Name** | **Days** | **Name** | **Days** |
| Czech republic | Meszárosová Hana | 15 |  |  | Jelínek Peter | 5 |
|  |  |  |  |  | Krejčová Tereza | 6 |
|  |  |  |  |  | Krejčová Tereza | 12 |
|  |  |  |  |  | Krejčová Tereza | 6 |
|  |  |  |  |  | Krejčová Tereza | 6 |
|  |  |  |  |  | Mikulášek Zdeněk | 15 |
| Egypt | Awadalla Nabil | 7 |  |  |  |  |
|  | Hanna Magdy | 7 |  |  |  |  |
| Hungary |  |  |  |  | Levay Peter | 6 |
| Germany |  |  |  |  | Balthasar Horst | 8 |
| Austria | Su Yang | 5 |  |  |  |  |
|  | Temmer Manuela  | 5 |  |  |  |  |
|  | Utz Dominik | 5 |  |  |  |  |
|  | Vanninathan K. | 5 |  |  |  |  |
|  | Veronig Astrid | 5 |  |  |  |  |
| Russia | Romanjuk Josif | 21 |  |  | Golysheva Polina | 20 |
|  |  |  |  |  | Katysheva Natalia | 27 |
| Spain |  |  |  |  | Ariste Arturo Lopez | 5 |
| Italy |  |  |  |  | Munari Ulise  | 7 |
| Ukraine |  |  |  |  | Breus Vitalii  | 154 |
|  |  |  |  |  | Ivanova Alexandra | 7 |
|  |  |  |  |  | Tarasova T. | 13 |
|  **Total** | **9** | **75** |  |  | **15** | **297** |

**YEAR 2012**

|  |  |
| --- | --- |
| **Country** | **Type of visits** |
|  | **Projects** | **Bilateral** | **Other** |
|  | **Name** | **Days** | **Name** | **Days** | **Name** | **Days** |
| Bulgaria | Tomov Nikolai | 14 |  |  |  |  |
| Czech Republic | Meszárosová Hana | 11 |  |  | Heinzel Petr | 5 |
|  | Pracna Petr | 12 |  |  | Krejčová Tereza | 16 |
|  |  |  |  |  | Krejčová Tereza | 12 |
|  |  |  |  |  | Krejčová Tereza | 90 |
|  |  |  |  |  | Krejčová Tereza | 6 |
|  |  |  |  |  | Mikulášek Zdeněk | 10 |
|  |  |  |  |  | Pracna Petr | 62 |
|  |  |  |  |  | Štepán Jiří | 5 |
| Egypt | Awadalla Nabil | 14 |  |  |  |  |
|  | Hanna Magdy | 14 |  |  |  |  |
| Japan |  |  |  |  | Hachisu Izumi | 9 |
|  |  |  |  |  | Kato Mariko | 9 |
| Austria |  |  |  |  | Fleslich Heindrich | 5 |
|  |  |  |  |  | Poetzi Werner | 5 |
| Russia | Romanjuk Iosiph | 21 |  |  | Katysheva Natalia | 210 |
|  | Semenko Evgenij | 21 |  |  | Volkov Igor | 244 |
| Ukraine |  |  |  |  | Breus Vitalii | 3 |
|  |  |  |  |  | Pavlenko Olena | 91 |
|  **Total** | **7** | **107** |  |  | **16** | **782** |

***List of publications***

***YEAR 2013***

**ADCA Scientific papers in international scientific journals with impact factor**

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