ILWS and associated activities in Slovakia: 2013-2014.

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ILWS Meeting, COSPAR, Moscow, August 2014

Based on individual activities of the Institutes of Slovak Academy of Sciences, and of the Universities

Institute of Experimental Physics, SAS, Košice

(Department of Space Physics)

- Energetic particles in space (solar, interplanetary, magnetospheric processes)
- Cosmic Rays (ground based observations) and space weather, atmospheric effects

More at ***http://space.saske.sk***

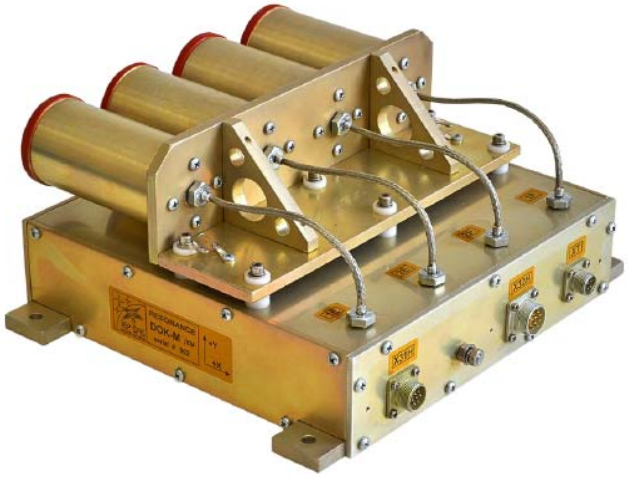
Institute of Experimental Physics, SAS, Košice (IEP SAS)

Mission presently in orbit: <u>Spectrum- Radioastron</u>

MEP-2 (Monitor of Energetic Particles), data processing, analysis – since August 2011, ***energetic electrons*** (*joint with IKI RAS Moscow (IKI RAN), and DUT Xanthi, Greece (DUTH)*)

Missions under preparation: <u>RESONANCE</u>

DOK-M (Detector of Energetic Particles)
Study of wave-particle interactions in magnetosphere (*joint with IIKI RAN and DUTH*



Particle spectrometer DOK-M /EM (Engineering Model)

Institute of Experimental Physics, SAS, Košice

Missions under preparation:

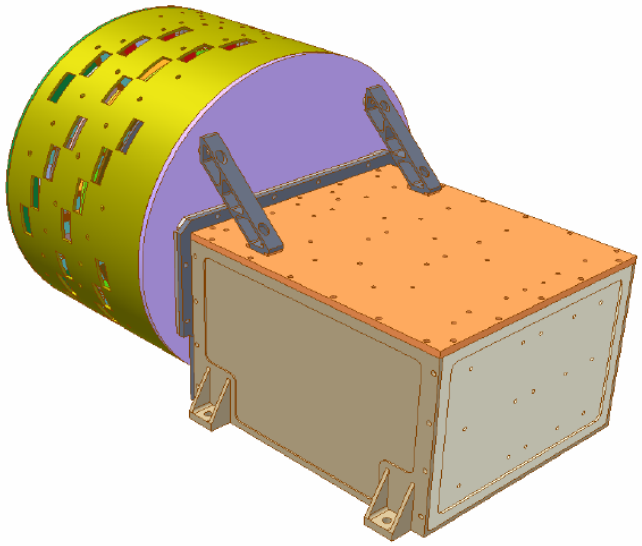
participation in PICAM (Planetary Ion CAMera), part of SERENA, **for mission ESA-BepiColombo,** *collaboration with Space Technology, Ireland (STIL) and Space Res. Austrian Acad.Sci. (IWF OAW)*

The electronic box of the PICAM / FM (flight model).

Institute of Experimental Physics, SAS, Košice

Missions under preparation:

participation in NAIS for Chinese mission MIT (Magnetosphere-Ionospher-Thermosphere). *Cooperation with NSSC Beijing; STIL Ireland; IRF, Kiruna;*



Virtual model of neutral atom imager NAIS-H

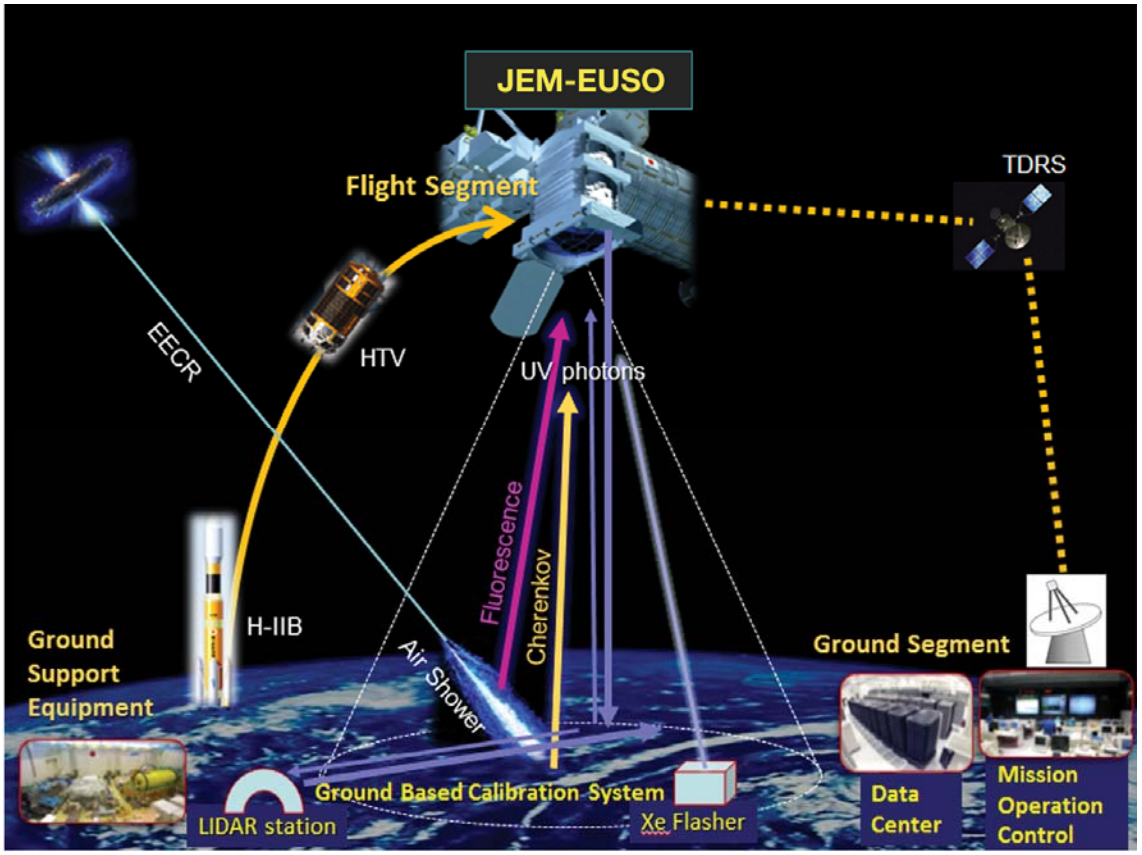
The high-energy (>30keV) sensor of the experiment, NAIS-H, uses the heritage of neutral atom imager NUADU developed at IEP-SAS for Double Star project, however, with improved angular resolution

The experiment ASPECT-L is presently under development at IEP-SAS in cooperation with IKI-RAN and DUTH for Moon exploration mission Luna Glob.

Institute of Experimental Physics, SAS, Košice

Participation (end-to end-simulations) in ***JEM-EUSO project*** the ***Extreme Universe Space Observatory (EUSO)*** onboard the***Japanese Experiment Module (JEM) on the International Space Station.*** (http://jemeuso.riken.jp/en/). ***Wide international collaboration.***

Possibilities of atmospheric/magnetospheric research (as by-product)



Institute of Experimental Physics, SAS, Košice

Measurements of secondary cosmic rays at Lomnický Štít.

High temporal resolution, high statistical acurracy at 2634 m – continuous data in real time, used by scientific and application communities monitoring and forecasting space weather effects. From March 2013 SEVAN in operation at LS. Real time data at (http://neutronmonitor.ta3.sk and http://crd.yerphi.am/Lomnicky_stit_SEVAN_Data). Cooperation with other institutes in the framework of SEVAN (*CRD Phys. Inst. Yerevan)*

Relations of cosmic rays to atmospheric effects (cloudiness, lightning…)

Astronomical Institute of SAS, Tatranská Lomnica (AI SAS)

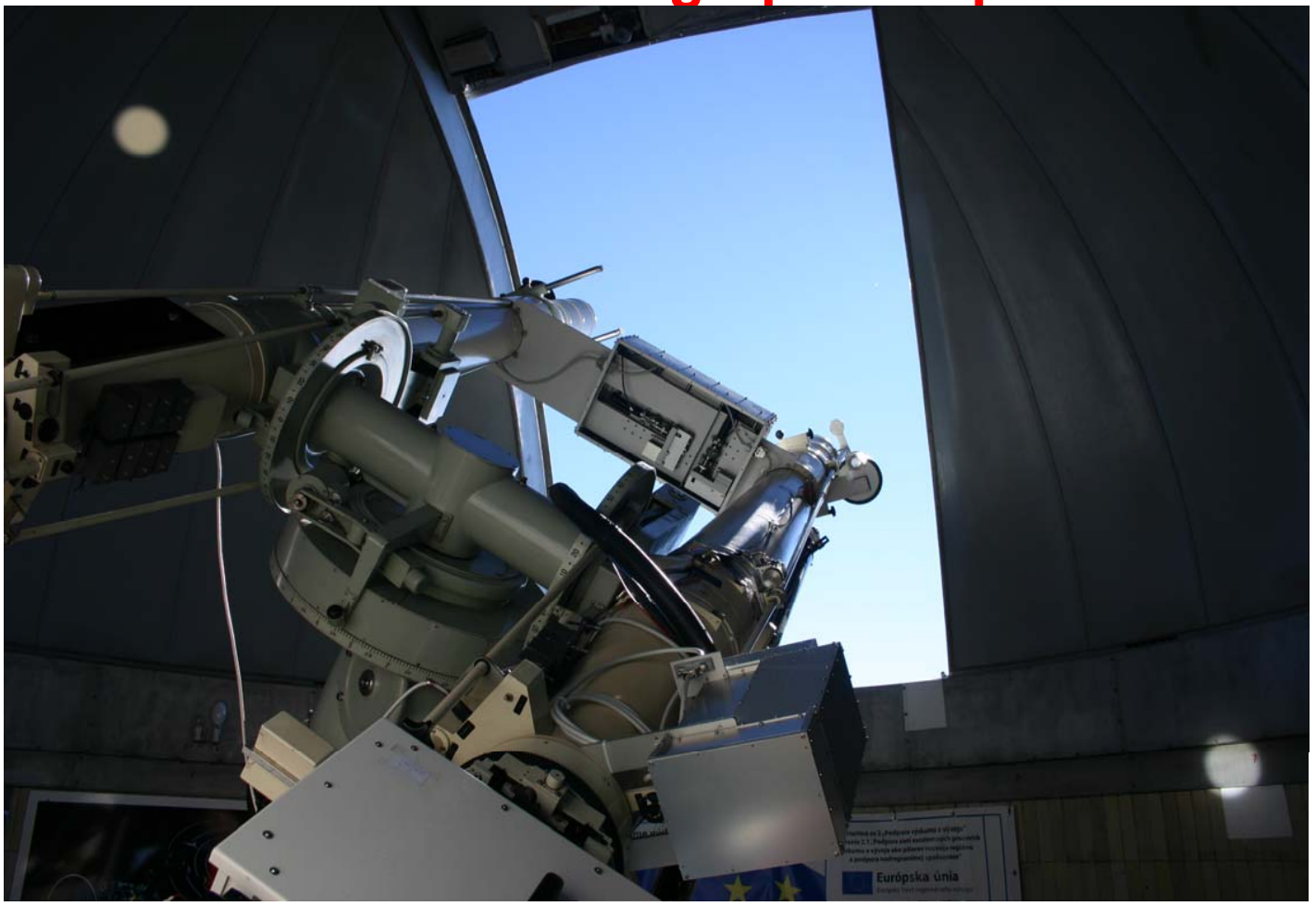
- Solar outer atmosphere using combined data of the space-born satellite instruments (SoHO, STEREO, Hinode, SDO) and the ground-based telescopes (DOT/LaPalma, SST/LaPalma, VTT/Tenerife, THEMIS/Tenerife)
- Ground-based coronographic measurements at the Observatory Lomnicky Peak (2633 m a.s.l.) using two 20/300 ZEISS Lyot coronagraphs and their post-focus spectral instruments
- More at ***http://www.astro.sk/***

Astronomical Institute of SAS, Tatranská Lomnica

- An upgrade of the CoMP-S instrument for spectropolarimetry of the solar corona and prominences at the Lomnicky Peak Observatory in progress:
  - adding the near IR spectral range (900-1100nm)
  - allowing almost simultaneous observations of the emission lines in VIS and near IR regions
  - web page: ***www.astro.sk//LSO/COMP-S/***
- Implementation of the CorMar instrument (spectropolarimetry of the coronal green line) to the Lomnicky Peak Observatory coronagraph (cooperation with the INAF/OAT, Torino, Italy)
- On-line co-pointing system for 2 coronagraphs installed

Astronomical Institute of SAS, Tatranská Lomnica

- Two ZEISS 20/300 coronagraphs co-pointed on-line



Astronomical Institute of SAS, Tatranská Lomnica

Coronal Multi-channel Polarimeter for Slovakia (CoMP-S)

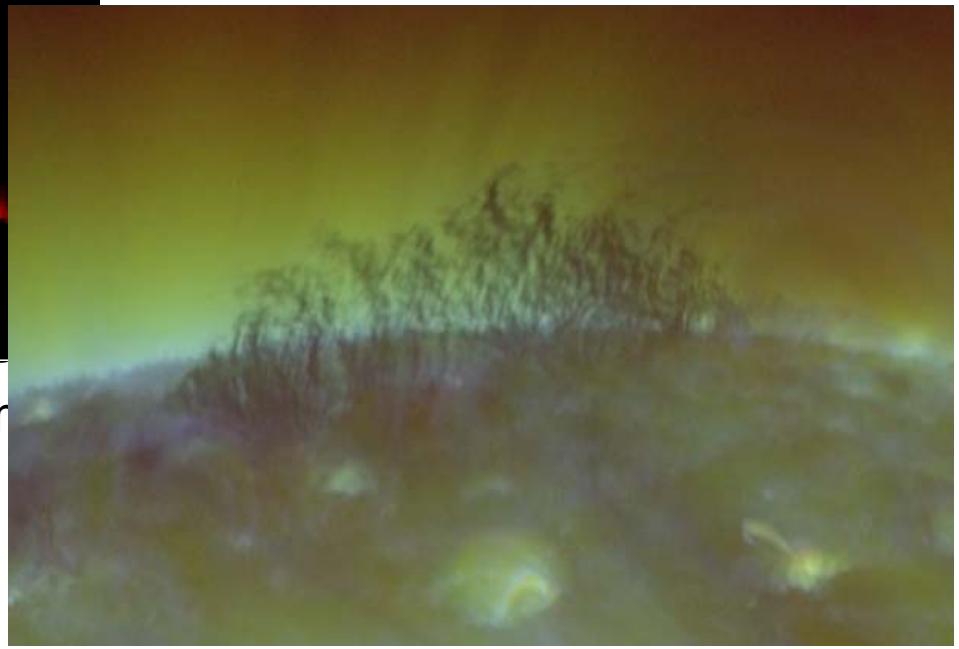
Hα quiescent prominence – Oct 20, 2012:

R

CoMP-S: 07:09 UT, H I 656.3 nm

-
-

21.1+19.3+17.1nm



Activities of IEP SAS and of AI SAS supported by the realisation of the project ITMS No. 26220120029, based on the supporting operational Research and development program financed from the European Regional Development Fund, European Union.

- **Geophysical Institute of SAS, Bratislava (GI SAS)**

  - Magnetospheric physics

- **Faculty of Mathematics, Physics and Informatics, Comenius University Bratislava (FMPH CU)**

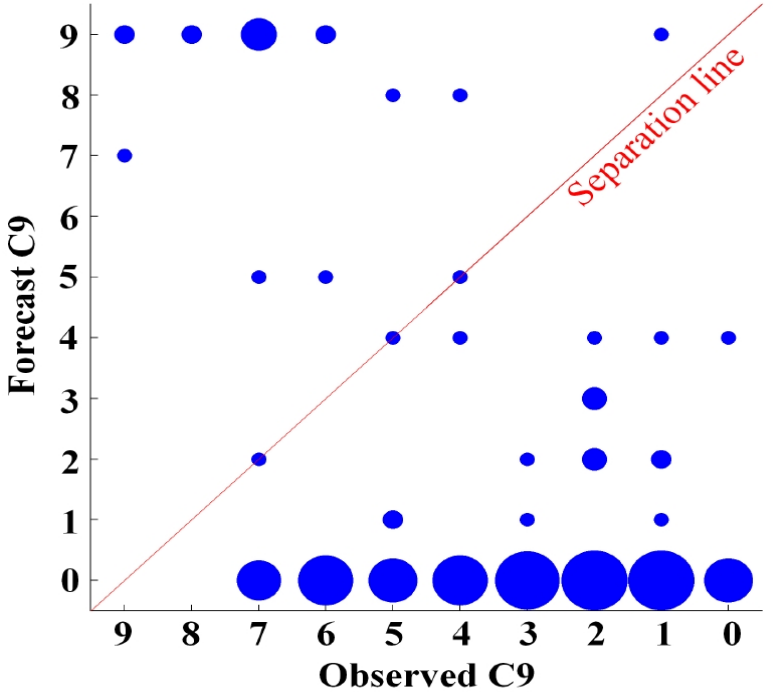
  - cosmogenic nuclides, links of cosmic rays to environmental studies

  - reconstruction of measurements of Schumann resonances

Geophysical Institute of SAS, Bratislava (GI SAS)

INTERPLANETARY MAGNETIC FIELD (IMF) ORIENTATION AND GEOMAGNETIC ACTIVITY DAILY GEOMAGNETIC ACTIVITY FORECAST

Orientation of the IMF plays a crucial role in development of geomagnetic activity. **Daily geomagnetic indices C9** and **one-hour means of north-south component of the IMF** were studied. The method of ANN was employed to forecast geomagnetic activity. The model was proved to be able to classify two categories (yes/no) for occurrence of strong geomagnetic activity (with limiting value of C9 to be 7).

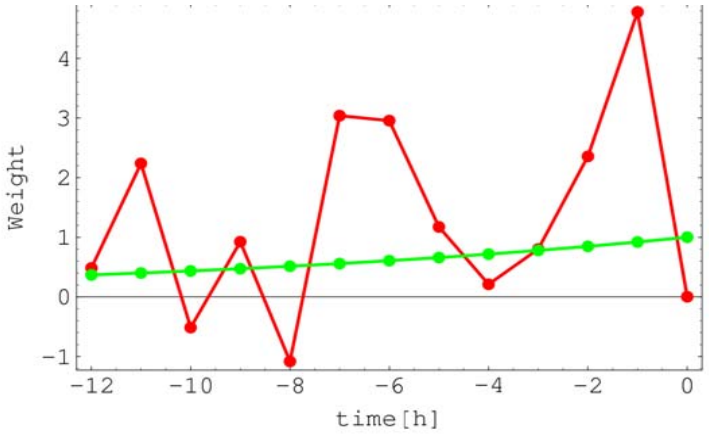


Diagrammatized contingention table describing the successfulness of forecasting the daily level of geomagnetic activity (in terms of index C9). The size of circles is proportional to the number of days.

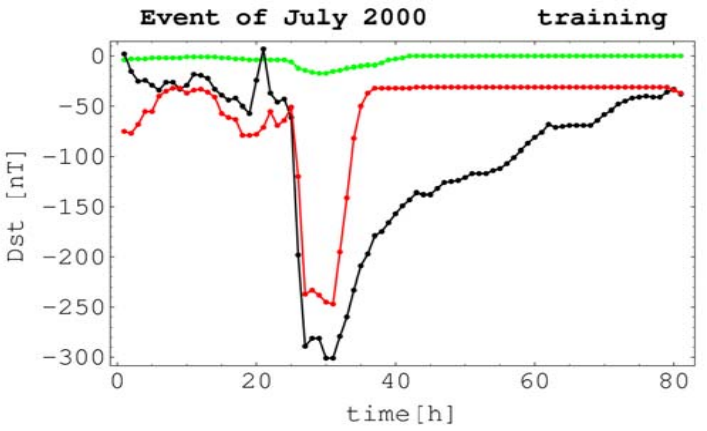
Geophysical Institute of SAS, Bratislava

INTERPLANETARY MAGNETIC FIELD (IMF) ORIENTATION AND GEOMAGNETIC ACTIVITY GEOMAGNETIC STORM MODELING USING SOLAR WIND DATA

Using the method of ANN, a new time prediction model of **geomagnetic storm** has been proposed based on **the solar wind data** (velocity, particle density, temperature, interplanetary magnetic field and its orientation). The model output in terms of **the Dst index** was compared with the output of an empirical model known from earlier studies.



The weighting function measuring the importance of the past hourly solar wind data entering the model; the empirical model (green) and the ANN model (red).



Model of geomagnetic storm of July 2000; observational data (black), the empirical model (green) and the ANN model (red).

Slovak Central Obseratory, Hurbanovo

- Ground-based observations of sunspots, prominences, flares, spectrographic observations
- Differential rotation of the solar corona using SOHO and SDO images (with UNINOVA, Lisbon, Portugal)
- North-south asymmetry of the solar activity (using calcium spectroheliograms from OAUC, Coimbra, Portugal)
- Modified coronal index of solar activity calculated from the EUV measurements by SOHO/CELIAS/SEM instrument
- Modified homogeneous data set of coronal inensities calculated from the SHO/EIT images
- Polar branch of prominences as an indicator of the magnetic polarity reversal
- Identification of MHD sausage waves in pores and sunspots (in collaboration with University of Sheffield, UK)
- Impact of solar activity on tree growth and wood density (in collaboration with IICT Lisbon and CITAB, UTAD, Vila Real, Portugal; and Astronomical Observatory, Hlohovec, Slovakia) . More at ***http://www.suh.sk/*** and ***http://stara.suh.sk/obs/aktivita/activity.htm***

Slovak Central Obseratory, Hurbanovo

- **SID monitoring in Slovakia**

http://stara.suh.sk/id/iswi/SIDmonitoring_Slovakia.pdf
SID monitor on-line: http://www.suh.sk

- **CALLISTO in Slovakia**

SCO Hurbanovo
http://newserver.stil.bas.bg/SUNGEO/00SGArhiv/SG_v9_No1_2014-pp-105-107.pdf

- CALLISTO registration at other 2 observatories in Slovakia (Hlohovec, Roztoky)

- **National Solar Physics Meetings** organized by SCO:
- 22nd NSPM in 2014

ISWI related activities

Participating institutions

Astronomical Institute of SAS, Tatranská Lomnica
Geophysical Institute of SAS, Bratislava
Institute of Experimental Physics, SAS Košice
Slovak Astronomical Society

Division of Physics of the Earth, FMPI, Comenius U., Bratislava

Astronomical Observatory, Rimavská Sobota

Slovak Union of Amateur Astronomers

ISWI Slovakia website

http://stara.suh.sk/id/iswi/iswi_SK-en.htm

Results 2012-2013 at
http://nccospar.saske.sk

http://nccospar.saske.sk/REPORT20122013/

Colleagues from IEP SAS, GI SAS, ASI SAS, FMPH CU are acknowledged for their inputs.