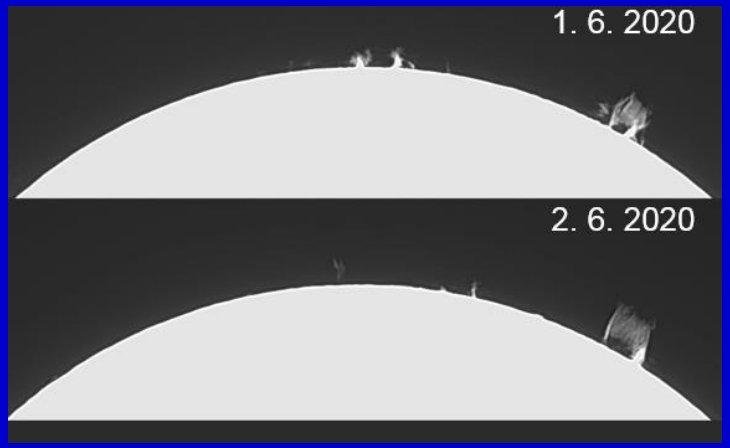
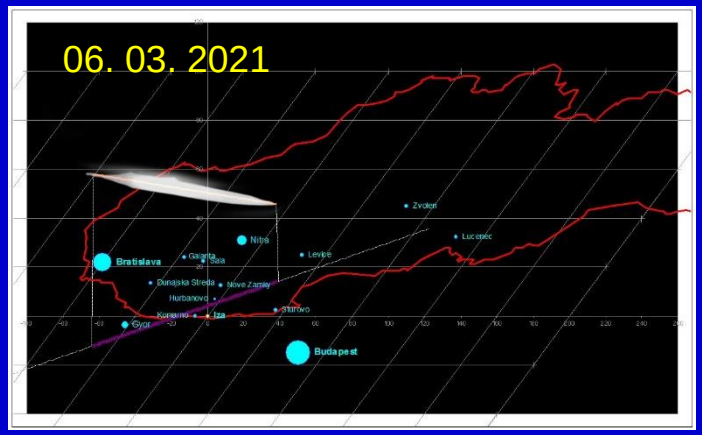
Scientific and observational activities in the SCO in Hurbanovo

Ivan Dorotovič

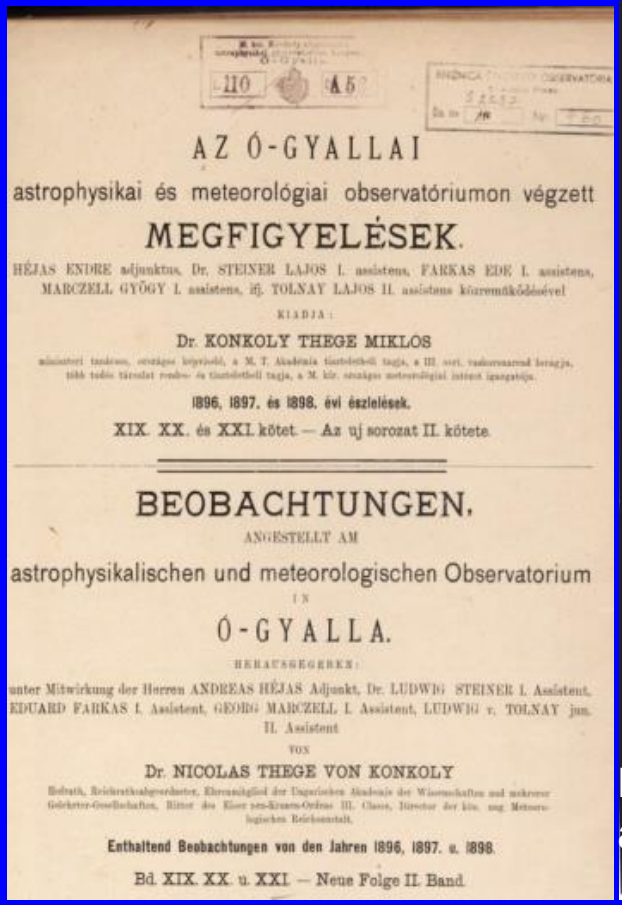


Slovak Central Observatory, Komárňanská 137, 947 01 Hurbanovo



The regular solar observational program began in Ó-Gyalla (Hurbanovo) in 1872. M. Thege Konkoly performed the first drawing of sunspots on May 16, 1872.

M. Thege Konkoly was one of the first scientists who perfor-med micrometric measurements of sunspots positions.



AZ Ó-GYALLAI

astrophysikai és meteorológiai observatóriumon végzett

MEGFIGYELÉSEK.

HÉJAS ENDRE adjunktus, Dr. STEINER LAJOS I. assistens, FARKAS EDE I. assistens, MARCZELL GYÖGY I. assistens, ifj. TOLNAY LAJOS II. assistens közreműködésével

KIADJA:

Dr. KONKOLY THEGE MIKLOS

1896, 1897. és 1898. évi észlelések.

XIX. XX. és XXI. kötet. — Az uj sorozat II. kötete.

BEOBACHTUNGEN,

ANGESTELLT AM

astrophysikalischen und meteorologischen Observatorium

IN

Ó-GYALLA.

HERAUSGEGEBEN:

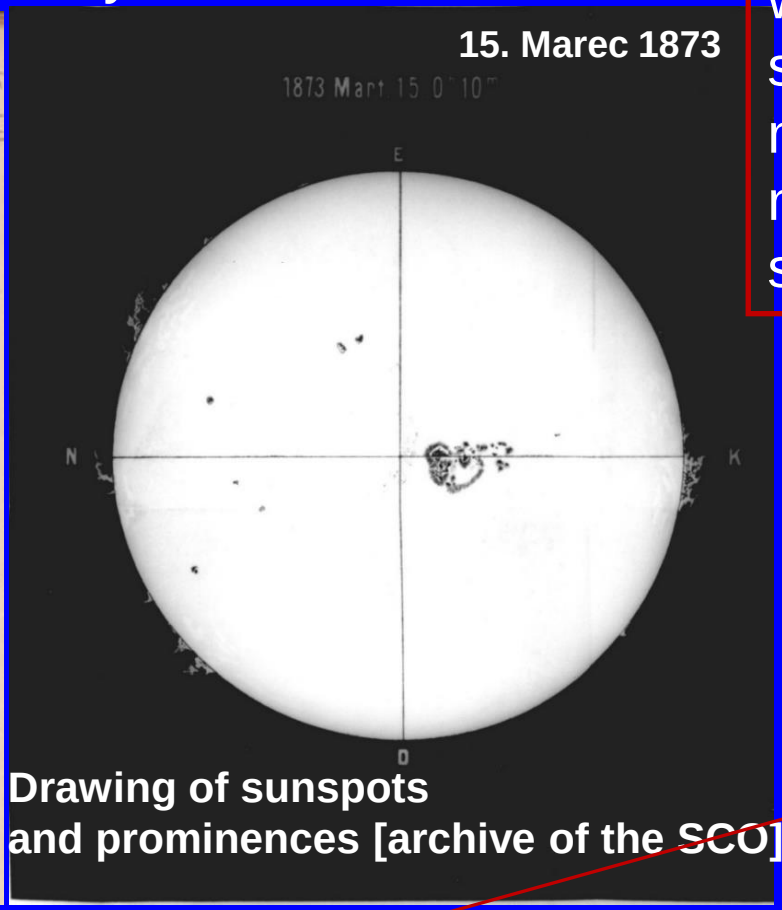
unter Mitwirkung der Herren ANDREAS HÉJAS Adjunkt, Dr. LUDWIG STEINER I. Assistent, EDUARD FARKAS I. Assistent, GEORG MARCZELL I. Assistent, LUDWIG v. TOLNAY jun. II. Assistent

VON

Dr. NICOLAS THEGE VON KONKOLY

Enthaltend Beobachtungen von den Jahren 1896, 1897. u. 1898.

Bd. XIX. XX. u. XXI. — Neue Folge II. Band.



Drawing of sunspots and prominences [archive of the SCO]

Meteoroscope

In addition: prominence spectroscope for observing of solar prominences; spectrograph for photographing the solar spectrum; meteoroscope for visual observation of meteors: M. Thege Konkoly discovered the meteor showers of α-Capricornids (1871) and κ-Cygnids (1874).

Since **1885**, Wolf's sunspot number was determined daily in Ó-Gyalla. All older observations were processed by Wolf's method and relative numbers were sent to Zurich. Wolf used these observations to supplement the missing observations.

1930 - B. Šternberk, the first astrophotometric observation of the planet Pluto in Europe shortly after the discovery was made in Stará Ďala.

1936 - expedition Dr. Nováková to Russia (Orenburg, USSR, June 13, 1936) to observe a total solar eclipse.

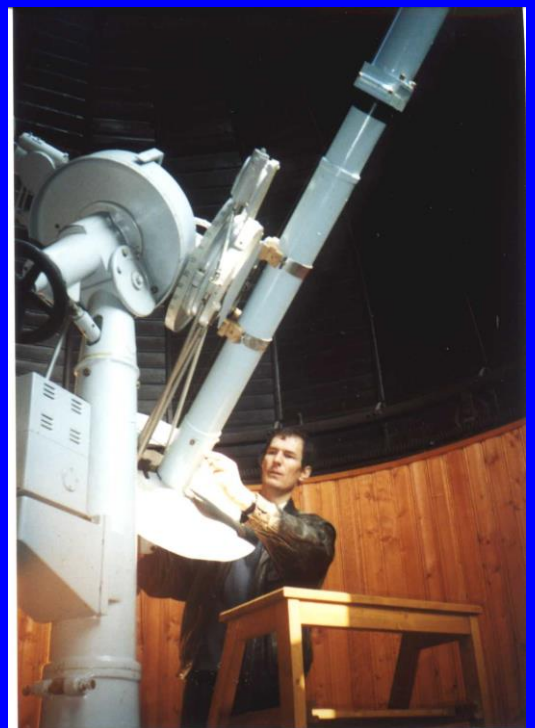
1936-38 – construction of The Hale type spectrohelio-scope according to device pattern of the observatory at Mt. Wilson.The device has been installed and operational in Hurbanovo from **1967**.

After World War II, there were renewed observations of the Sun only in 1966. Regular drawings of sunspots were perfor-med first using a refractor 120/1800 mm, later from 1974 using the Coudé refractor 150/2250 mm (drawings of sunspots and photographing the photosphere of the Sun using a solar-lunar chamber).

Solar corona during the total solar eclipse in Tihany, (Hungary, August 11, 1999)

Employees of the observatory in Hurba-novo have continued since 1990 in the another 13 expeditions behind a total solar eclipse.

In **1983** was installed the horizontal solar telescope with spectrograph (HSTS). Regular observations of prominences have started since 2007 using a Lyott type coronagraph.



In **2014** began the program of registration of radiometers on the frequency of **49.74 MHz** (TV transmitter in Lviv, Ukraine), selected meteor showers were observed also visually; the second reg. system was added later at a freq. of **143.05 MHz** (GRAVES, France)

In the years **2017 – 2019**: program of photometric observations of variable stars and transiting objects (exoplanets) using the Celestron 14“ telescope on EQ8 mounting.

RESEARCH TASKS IN the SCO IN HURBANOVO

Astronomical observations and research are mainly focused on:

- solar physics (sunspots, solar flares, prominences, total solar eclipses, solar spectrum) and space weather (CME, cosmic radiation),

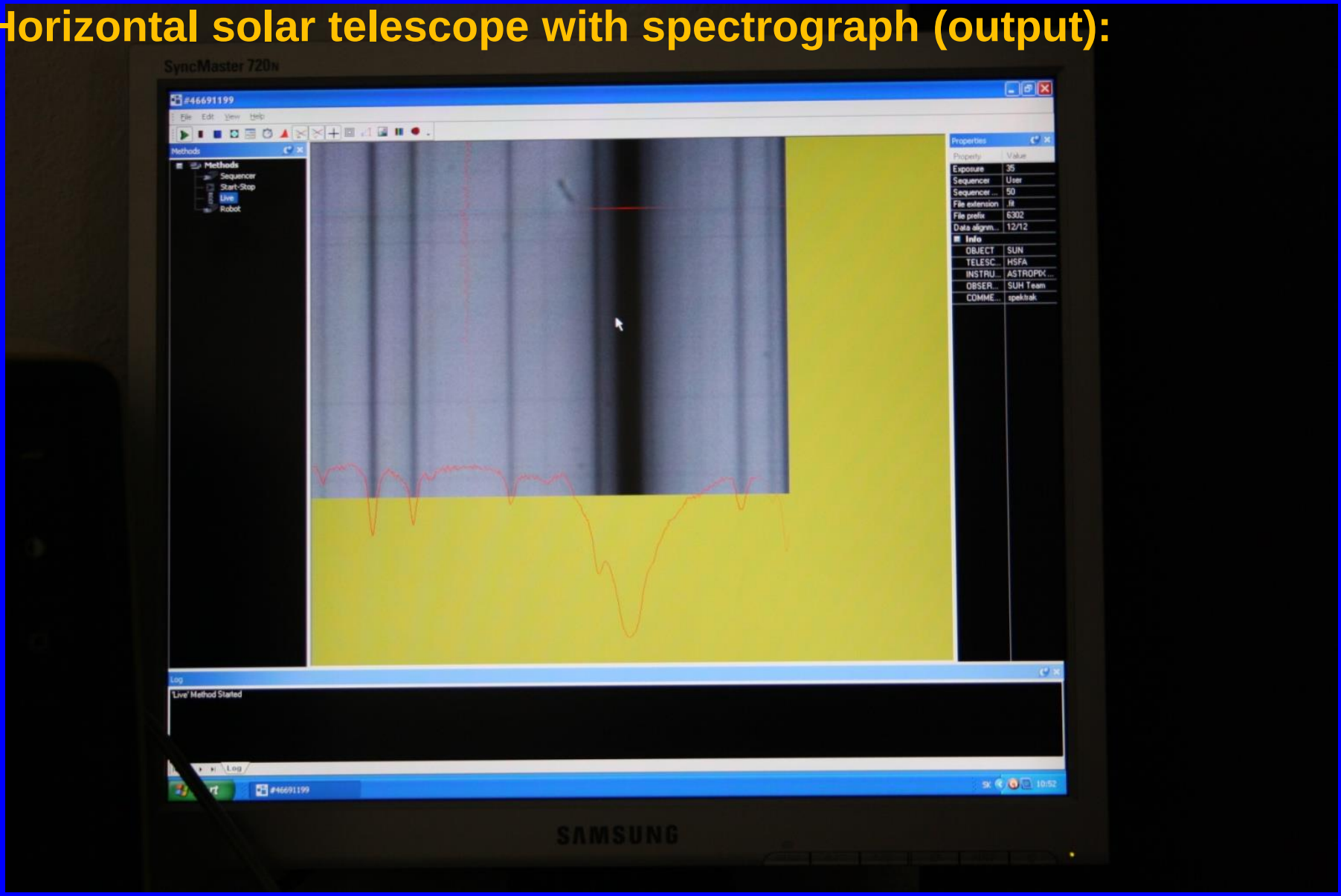
- meteoric astronomy (visual observation,
radio meteorometer registration, meteor video video registration),

- exoplanets and variable stars (photometric observations, filters U-B-V-I).star eclipses (especially asteroids)

Scientific-Research and Observation Department:

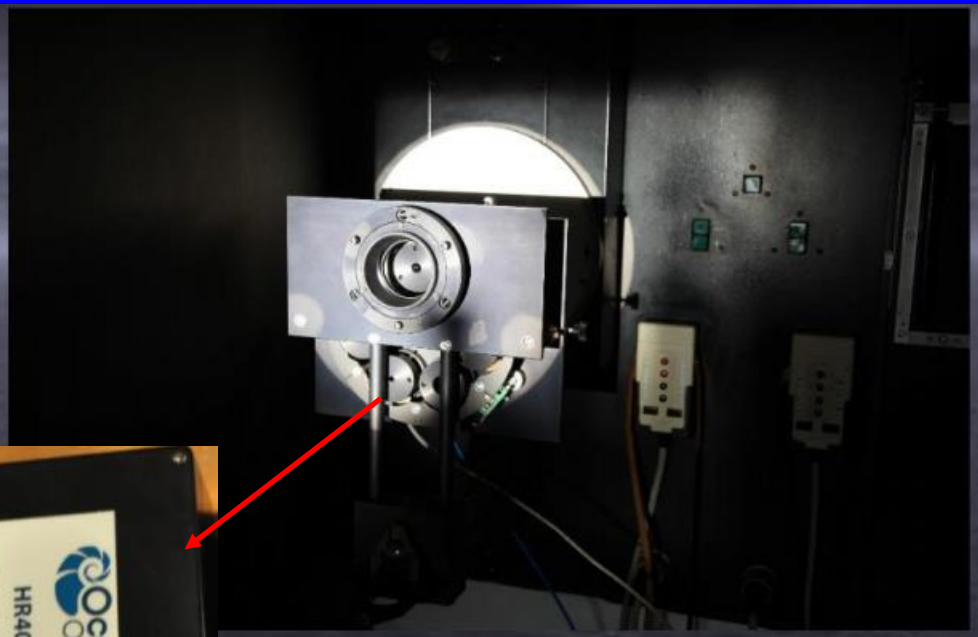
Building of the horizontal solar telescope with spectrograph (HSTS).

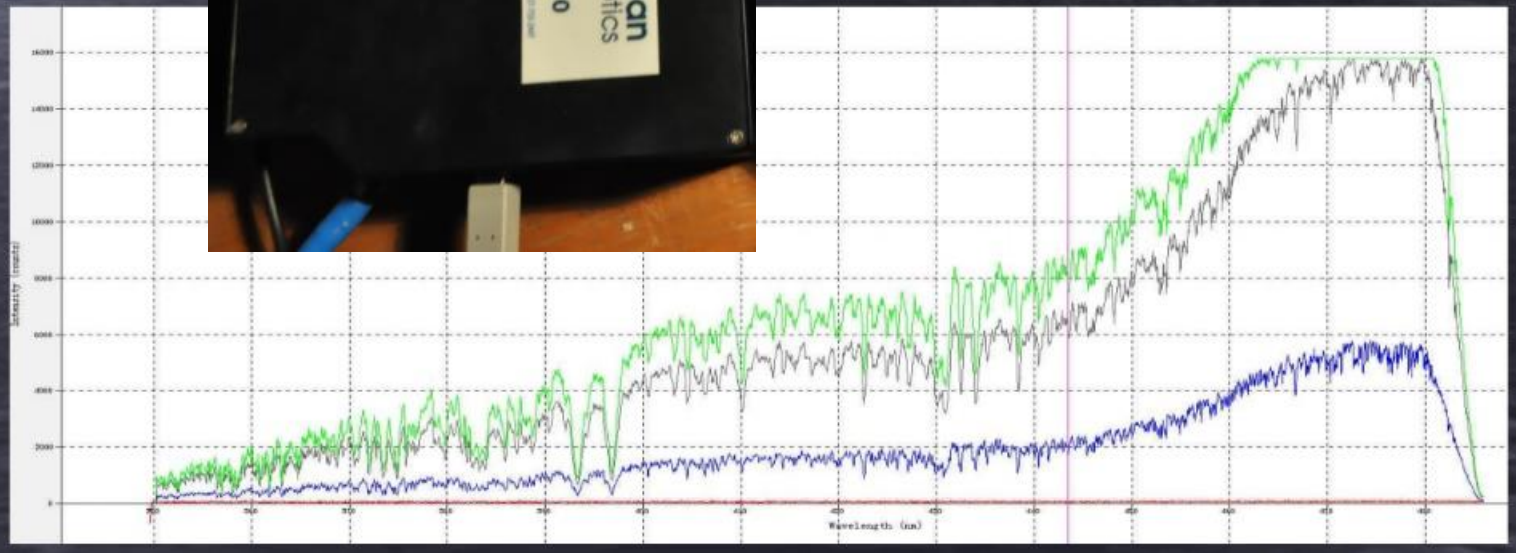
Horizontal solar telescope with spectrograph (output):



Part of the solar spectrum around the sodium spectral lineon a computer screen.

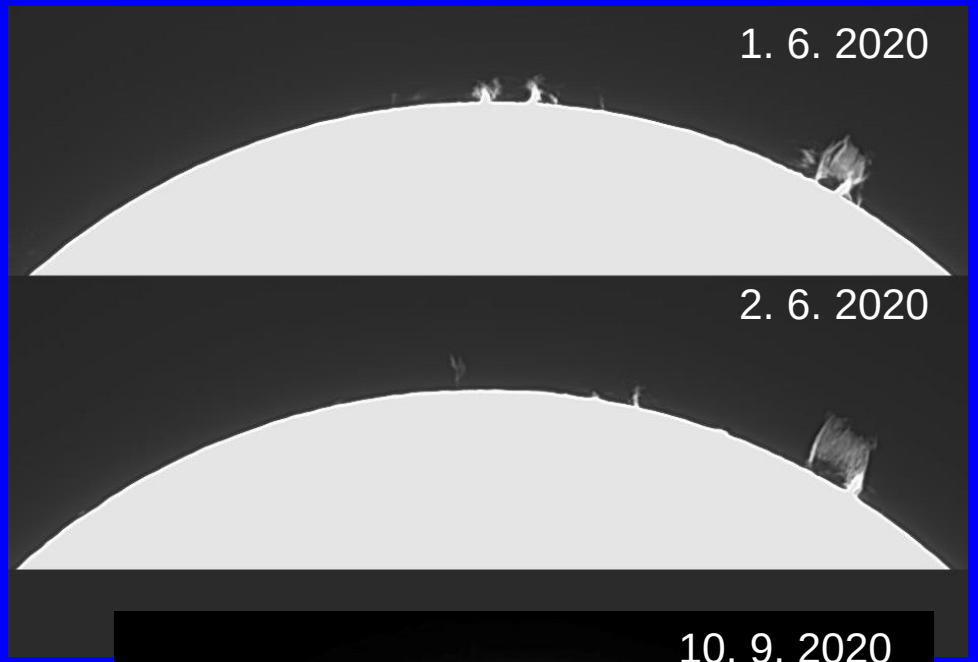
Spectral flux measurement in the optical continuum:
in cooperation with AsÚ AV ČR in Ondřejov

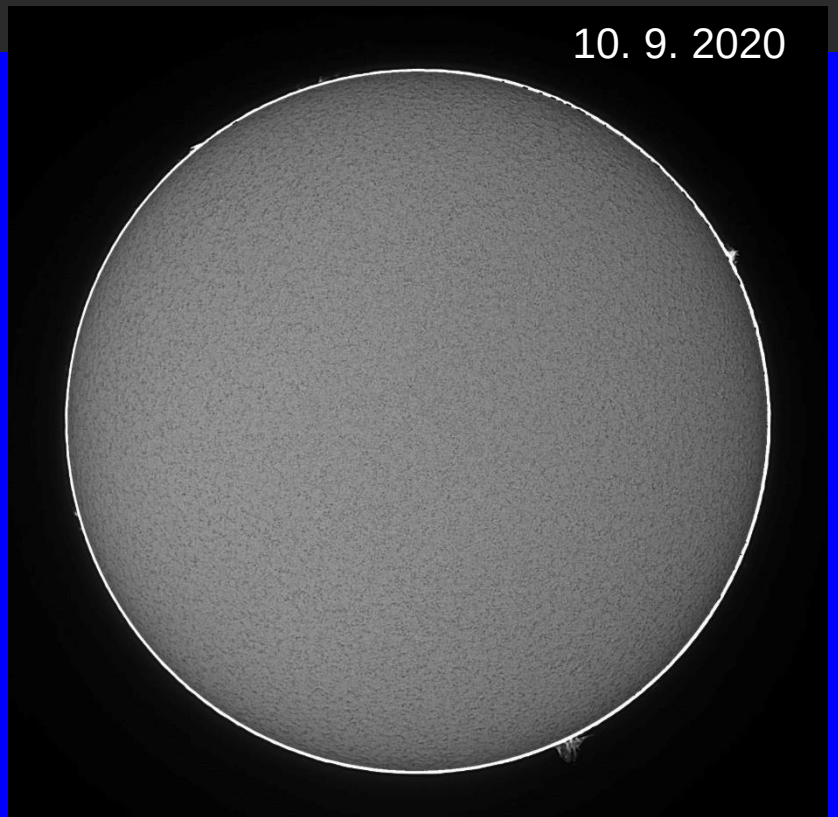




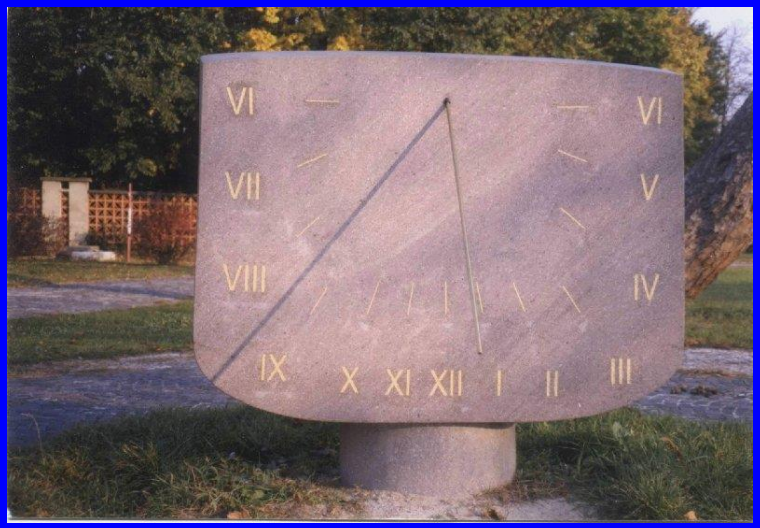
Refractor Coudé, D / f - 15/225 cm, drawing of sunspots.

LUNT solar telescope
LS80TC Hα / B1200 80mm
chromosphere observation
and prominences (since 2020)

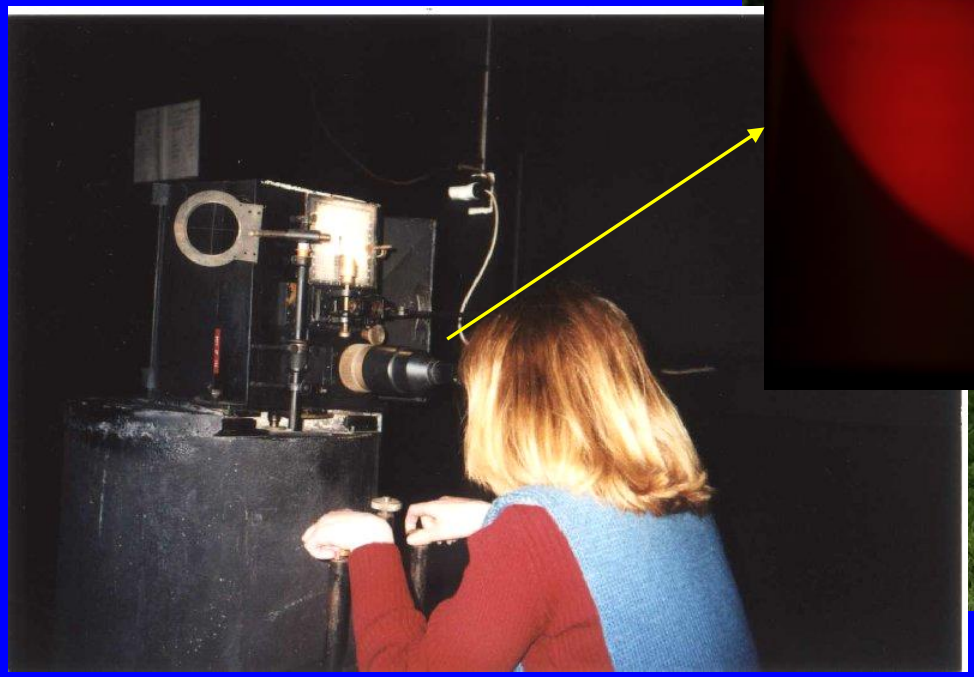




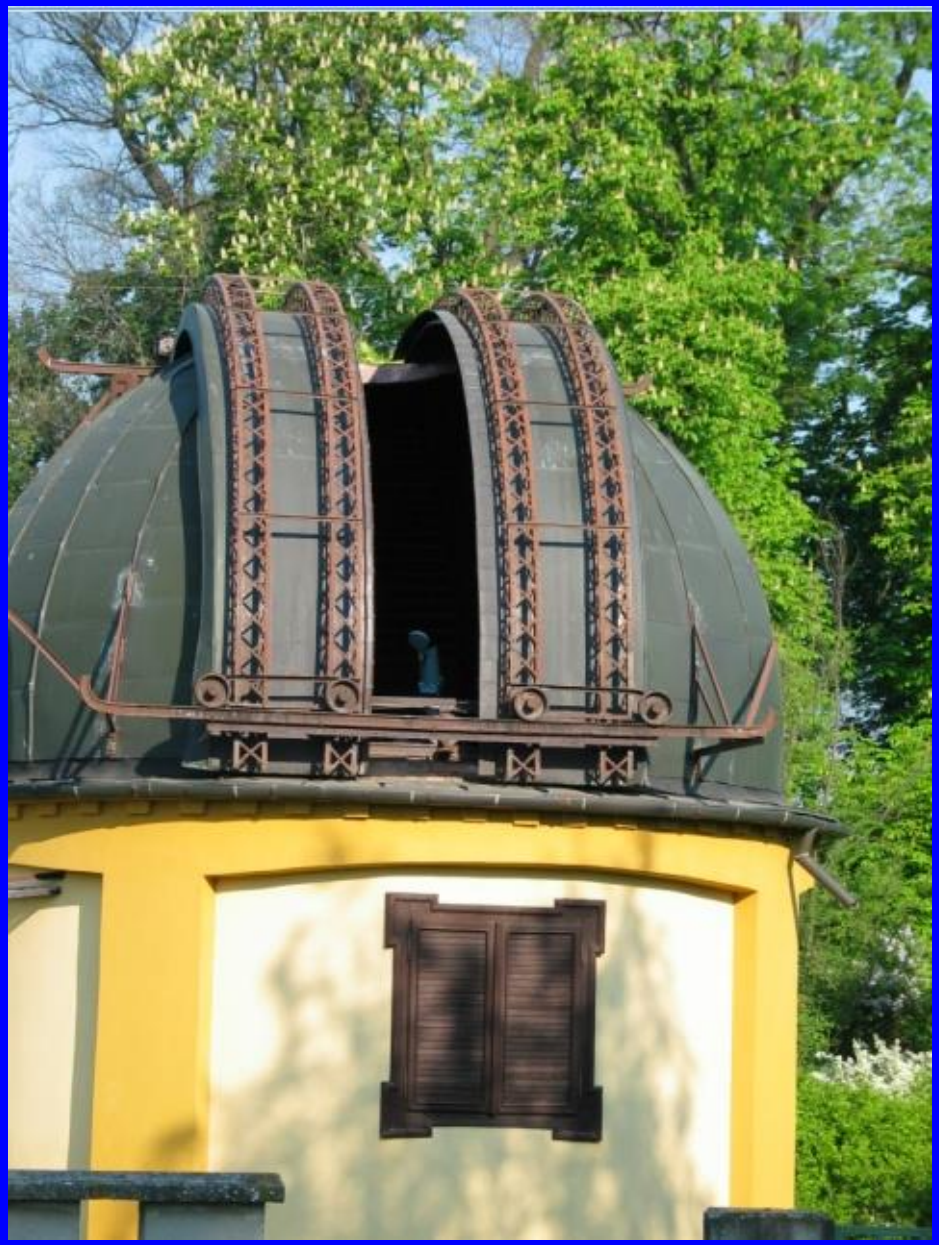
Reflector HDN400 400/1800 mm and refractor 105/1200 mm
- star occultations



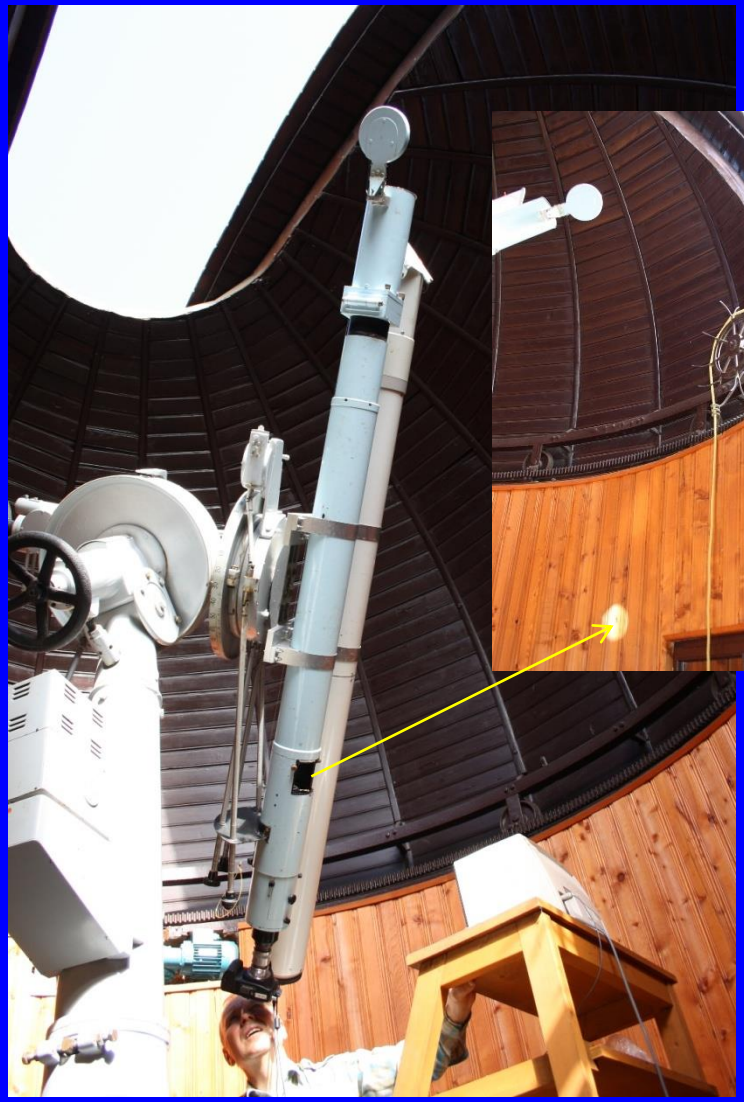
Sundails in the park of the SCO



Spectrohelioscope, visual flare observations



Heyde dome



Coronagraph, observation of prominences , D/primary focus/ effective focuse
- 9/125/375 cm

APRÍL 2021

H-alfa ďalekohľad Lunt 80, SÚH Hurbanovo
H-alfa filter - položírka priepustnosti 0,7 A

Coudé refraktor, Historická budova SÚH
D/f : 150/2250 mm

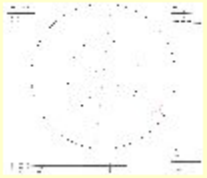
H- alfa ďalekohľad Lunt 80 - chromosféra disk

10-04-2021, 07:51 UT

H- alfa ďalekohľad Lunt 80 - chromosféra - protub.

10-04-2021, 07:52 UT

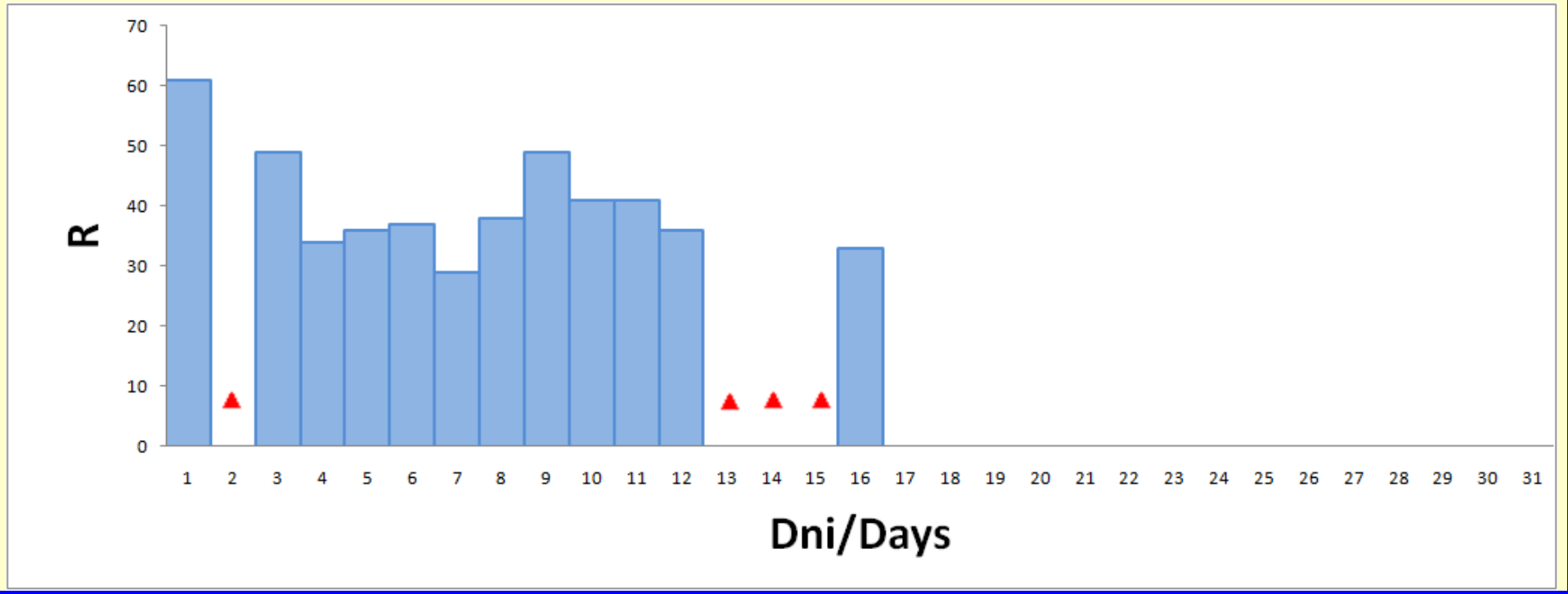
Archív kresieb fotosféry



Deň	1	2	3	4	5	6
R	0	0	0	14	11	11
O	5	4	4	5	4	3
MPZ	np	np	np	np	np	np

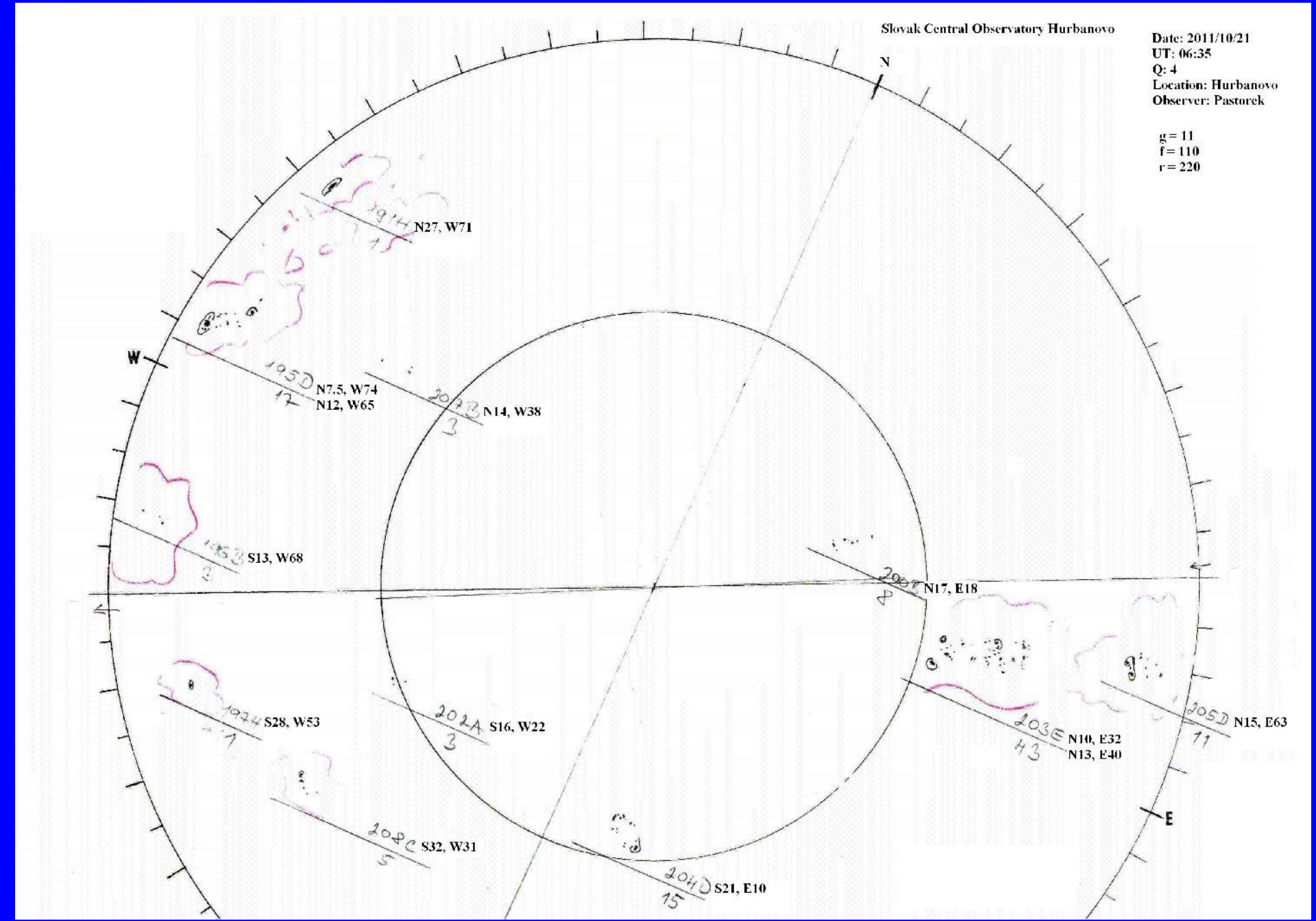
http://www.suh.sk/obs/aktivita/aktivita.htm

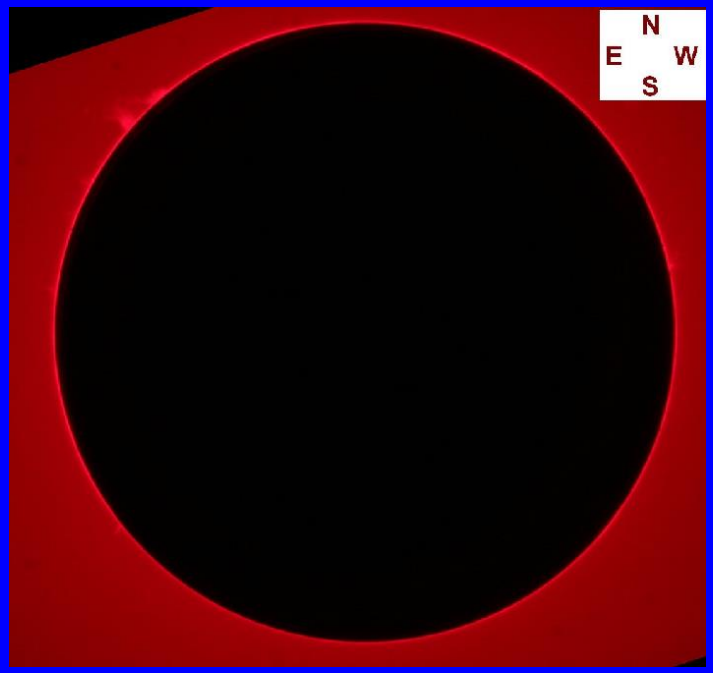
Graphical course of the **Wolf's number** of sunspots
November 2021



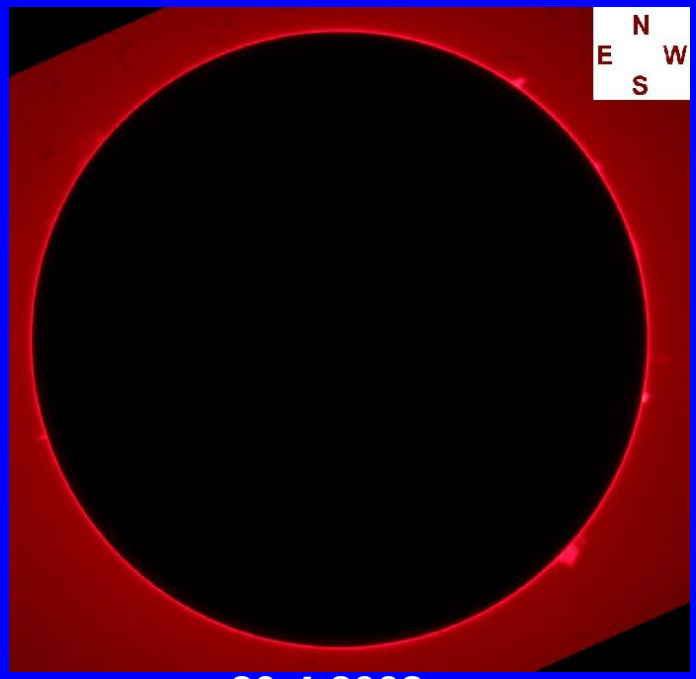
Wolf's number monthly forms:
http://www.suh.sk/online-data/protokoly-pozorovani-sln-fotosfery

Slnečná fotosféra:

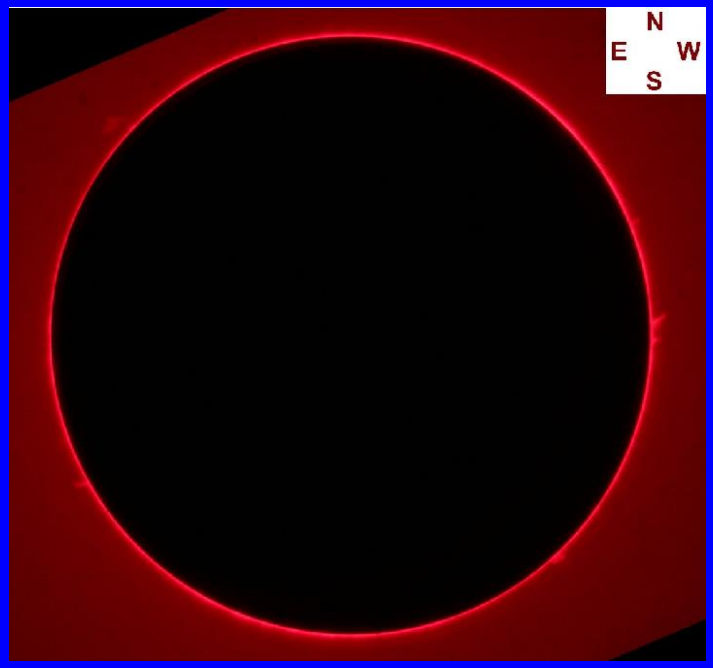




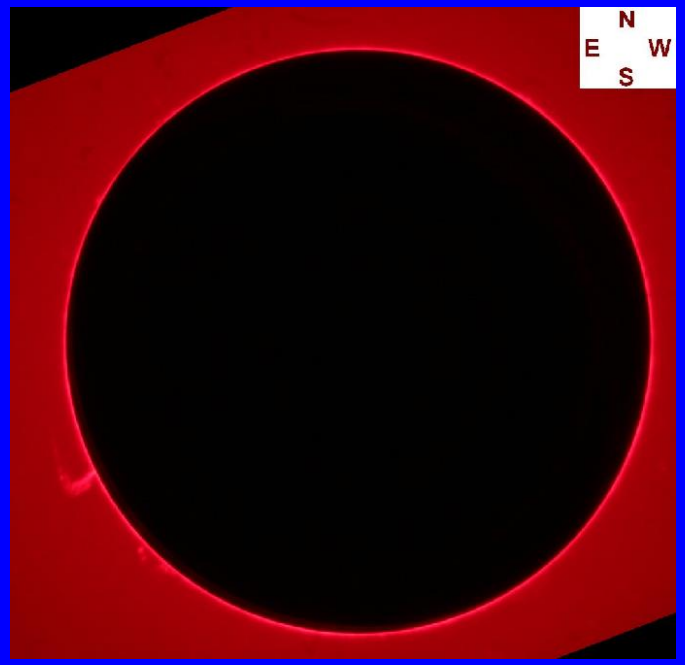
19-2-2008



30-4-2008



9-3-2008



15-5-2008

Zatmenie Mesiaca
21. 1. 2019

Slnečná
chromosféra v čiare
H-alfa. 16. 5. 2015

Porovnanie vzhľadu
Venuše v rôznych fázach
a vzdialenostiach od Zeme

Slnečná škvrna „medvedia
laba“ fotografovaná
dňa 20. 11. 2014.

Kométa
46P Wirtanen
4. 12. 2018

Jeden z meteorov
roja Perzeidy

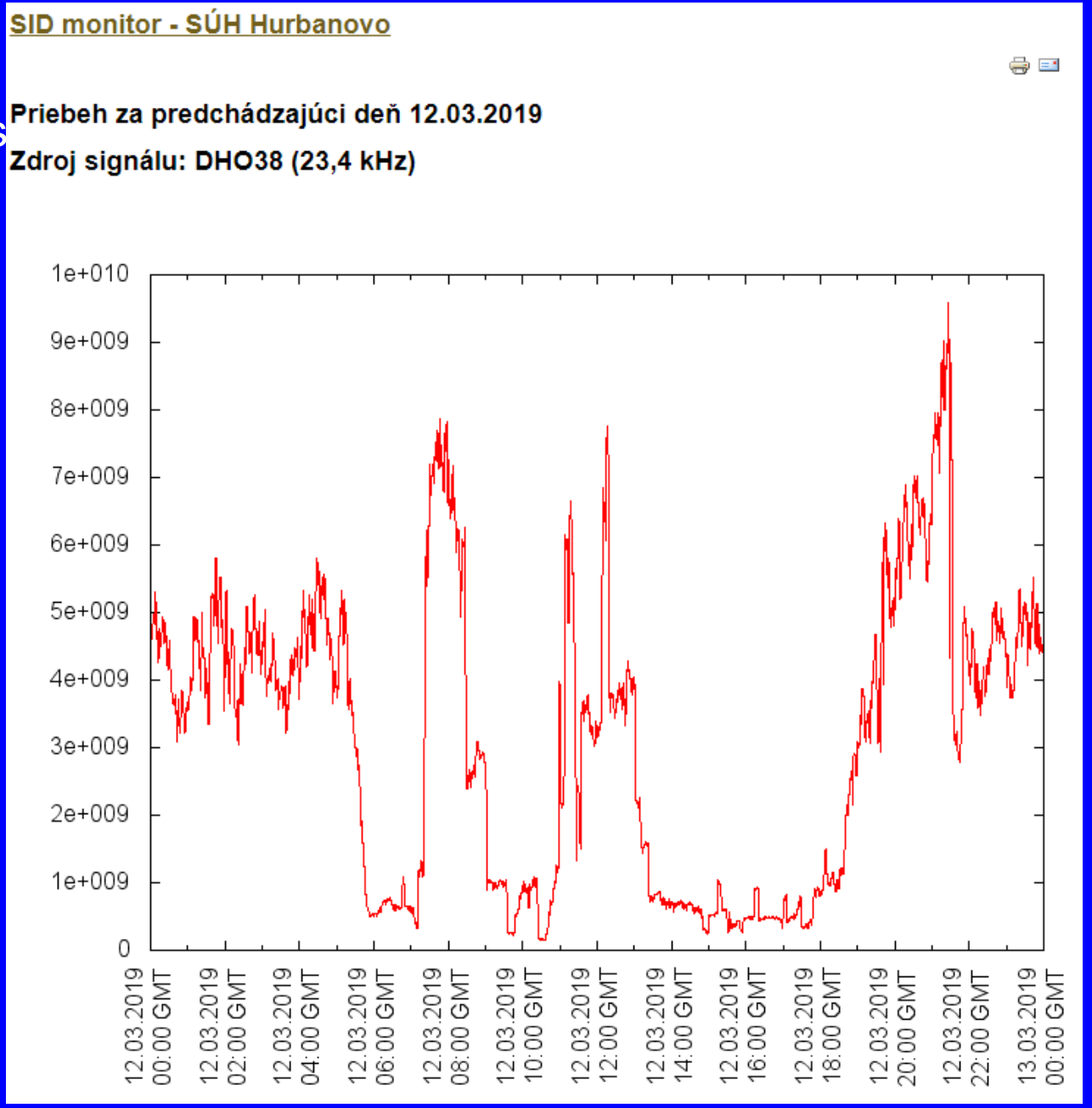
Kométa
Lovejoy.
2. 3. 2015

Prvé svetlo
z Celestronu 14 na montáži
EQ8, M 57, 24.10.2017

Galérie pozorovaní:
http://www.suh.sk/online-data/galerie

SID (Sudden Ionospheric Disturbances) monitor in Hurbanovo:

- detection of sudden ionospheric disturbances



CALLISTO – solar radio spectrometer (since 2011)

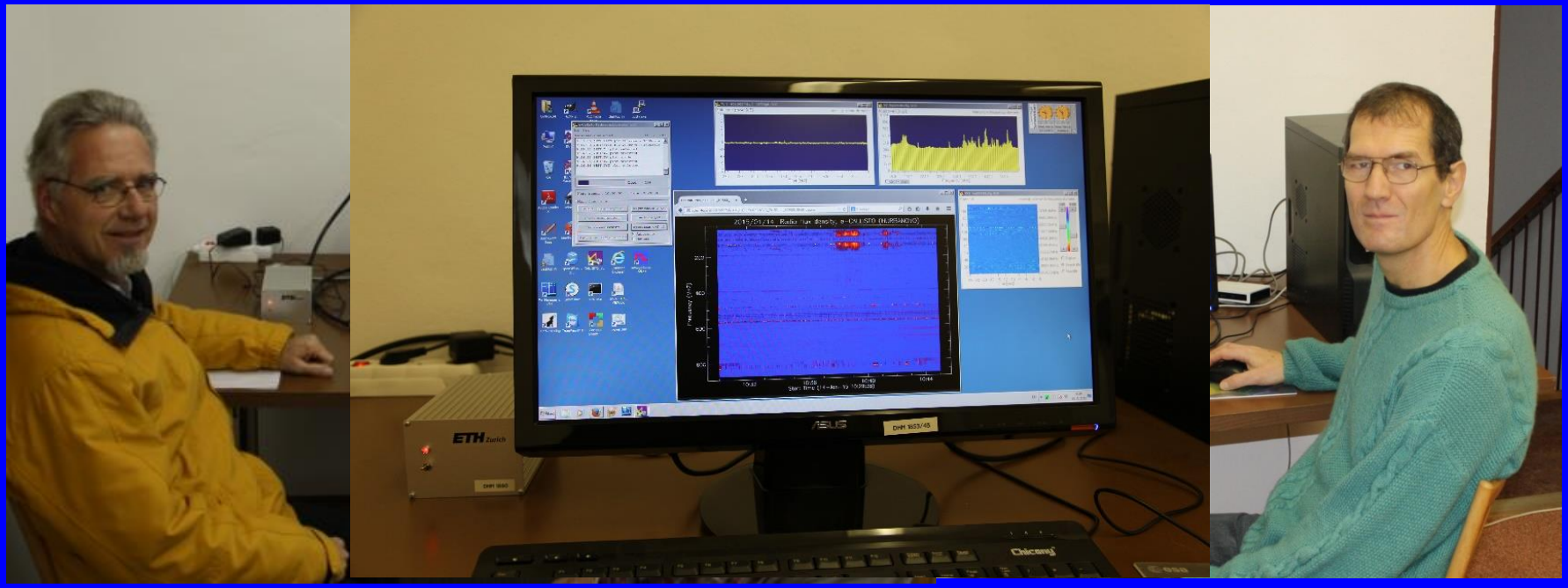
(Compound Astronomical Low-cost Low-frequency Instrument for Spectroscopy and Transportable Observatory)

< Benz, Monstein, Meyer (2005) >

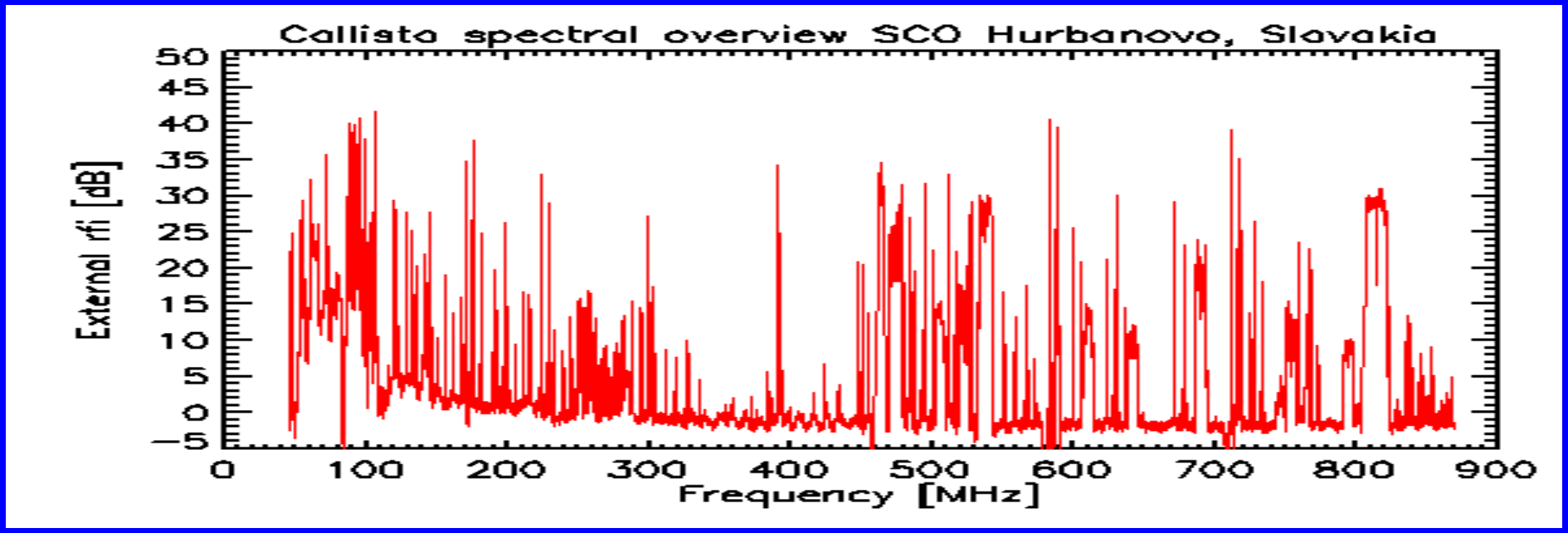
International network of CALLISTO devices
In the frame of the program ISWI
(International Space Weather Initiative):
www.e-callisto.org

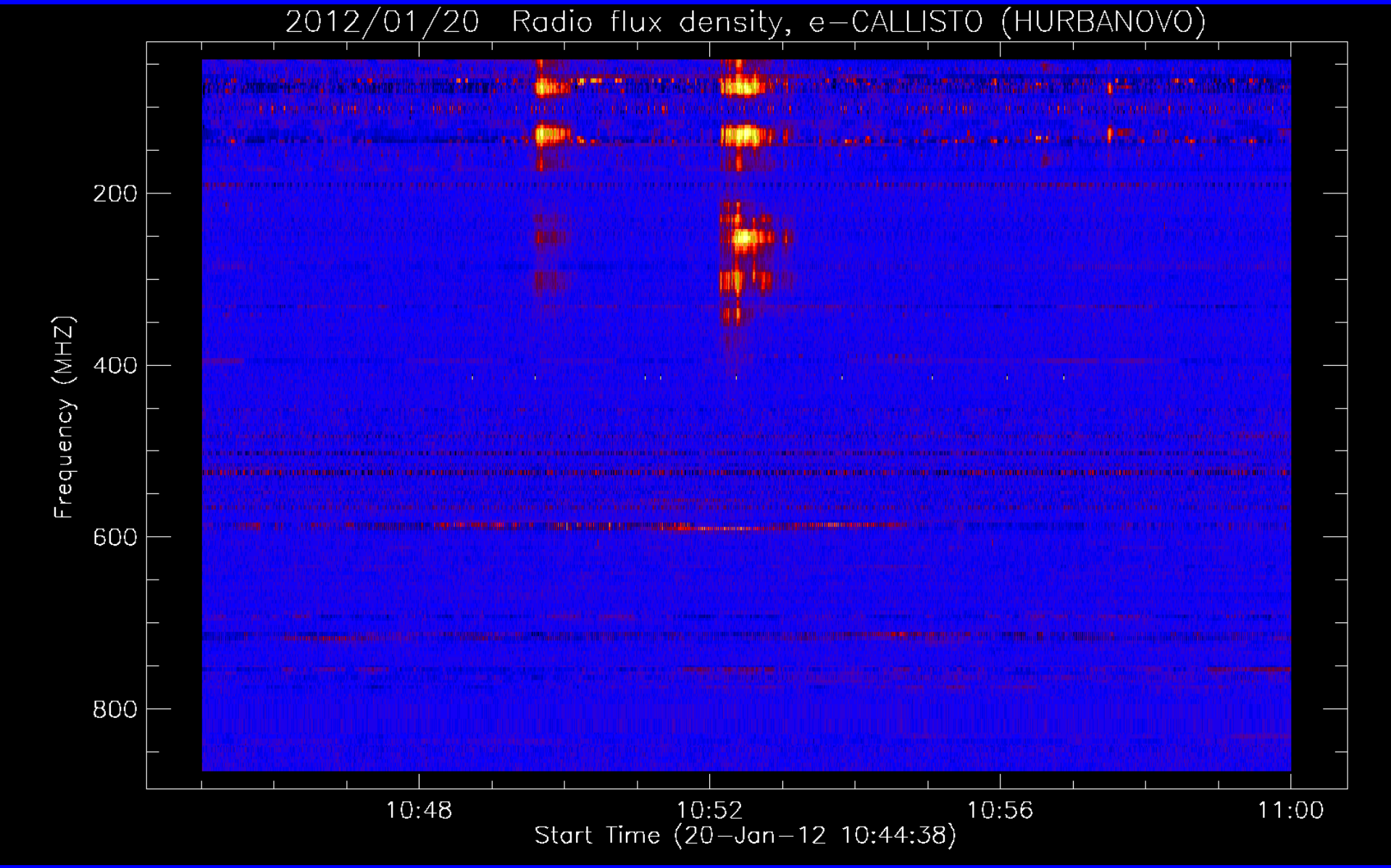
Log-periodic antenna CLP-5130-2N

**CALLISTO eC50 (left)
and amplifier
Frequency range:
45 – 870 MHz,
Frequency resolution: 62,5 kHz**



Christian Monstein (ETH, Zürich, Switzerland)





Radio burst type III (electrons) 20 January 2012 between 10:49 and 10:53 UT.

[http://soleil.i4ds.ch/solarradio/callistoQuicklooks/]

Hurbanovské expedície za úplnými zatmeniami Slnka

Mapa sveta s lokalitami hurbanovských expedícií za úplnými zatmeniami Slnka:
1 – 19. 6. 1936, Krasnyj Borek, Orenburg, Rusko; **2** – 20. 7. 1990, **a** – Čukotka, Rusko, **b** – Ilomantsi, Fínsko; **3** – 11. 7. 1991, La Paz, Mexiko; **4** – 3. 11. 1994, Criciúma, Brazília; **5** – Nakhon Sawan, Thajsko; **6** – 9. 3. 1997, Čita –Pervomajskij, Rusko; **7** – 26. 2. 1998, Guadeloupe, Francúzsko; **8** – 11. 8. 1999, Velém – Tihany – Kiskunmajsa; **9** – 21. 6. 2001, Sumbe, Angola; **10** – 4. 12. 2002, Messina, Juhoafrická republika; **11** – 29. 3. 2006, Side, Turecko; **12** – 1. 8. 2008, Novosibirsk, Rusko; **13** – Tianhuangping, Anji, Čína; **14** – 21. 8. 2017, **a** – Columbia, Missouri, USA, **b** – Nashville, Tennessee, USA.

Polarisation of the white-light corona

22. July 2009,
Tianhuangping, Anji, China

Baily's beads

I. Dorotovič

White/light corona

I. Dorotovič

L. Pastorek

21. August 2017, Columbia, MO, USA

Fotografie z roku 2017 upravené pomocou programu CANON Digital Photo Professional (**P. Dolinský**)

SOLAR PHYSICS MEETING

The goal of these meetings is to educate professional staff of observatories and planetariums - to get acquainted with the latest knowledge in physics of the Sun (solar activity and its impact on the Earth), in geophysics, in meteorology and climatology.

24th NSPM was held in 2018.

http://www.suh.sk/organizujeme/meetingy/24-celostatny-slnecny-seminar

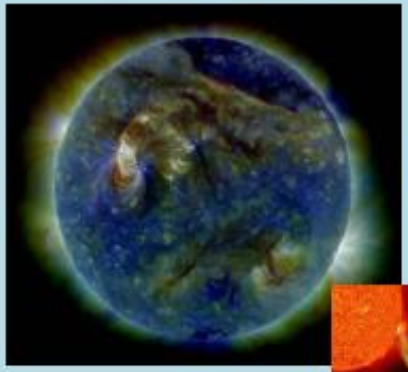
Proceedings on DVD:

Participants:

2011 ISWI Summer School in Space Science

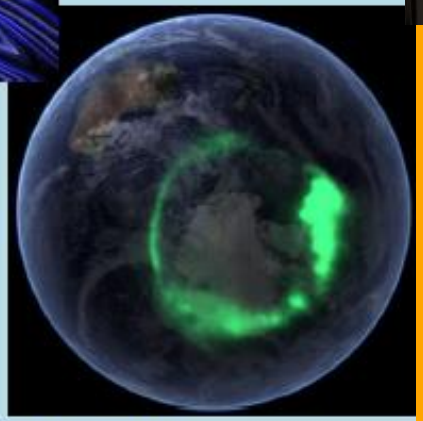
21 – 27 August 2011, Tatranská Lomnica, Slovakia

- **Organiser:** International Space Weather Initiative
- **Co-organisers:** Centre of Space Research: Space Weather Influences, Tatranská Lomnica
  Slovak Central Observatory, Hurbanovo



- **Course directors:** N. Gopalswamy (Nat.Gopalswamy@nasa.gov) and I. Dorotovič (ivan.dorotovic@suh.sk)
- **Local Organising Committee:**

I. Dorotovič (chair of the LOC), E. Hodálová, SCO, Hurbanovo · J. Koza, A. Kučera, AI of SAS, Tatranská Lomnica · K. Kudela, R. Langer, IEP of SAS, Košice · M. Lorenc, T. Pintér, SCO, Hurbanovo · F. Valach – GPI of SAS, Geomagnetic Obs., Hurbanovo



- **Invited lecturers:**

Ch. Amory-Mazaudier, M. Bárta, M. Danielides, J. M. Davila, I. Dorotovič, J. Dudík, W. Dziembowski, R. Erdélyi, N. Gopalswamy, A. Hanslmeier, P. Heinzel, R. Huth, F. Kamalabadi, J. Koza, A. Kučera, K. Kudela, J. Laštovička, E. Lopez, D. Maia, D. Odstrčil, D. Pérez-Suárez, R. A. Ribeiro, M. Sobotka, F. Valach

Website: http://stara.suh.sk/id/iswi/ISWI_School2011.htm

2011 ISWI-EUROPE SUMMER SCHOOL IN SPACE SCIENCE
August 21-27, 2011, Astronomical Institute of the SAS,
Tatranská Lomnica, Slovakia

http://stara.suh.sk/id/iswi/ISWI_School2011.htm

Ground-based Solar Observations in the Space Instrumentation Era

5-9 of October, 2015

Coimbra Solar Physics Meeting

University of Coimbra
Coimbra, PORTUGAL

LOC

T. Barata
S. Carvalho
I. Dorotovič
T. Esperança
J. Fernandes - Chair
A. Garcia
D. Maia
A. Morozova
D. Passos

SOC

J. Aboudarham (France)
F. Clette (Belgium)
I. Dorotovič (Slovakia) - chair
C. Fischer (Germany)
L. Fletcher (United Kingdom)
N. Gopalswamy (USA)
A. Kučera (Slovakia) - co-chair
D. Maia (Portugal)
M. Sobotka (Czech Republic)
Y. Suematsu (Japan)
M. Temmer (Austria)
J. Trujillo-Bueno (Spain)
G. Tsiropoula (Greece)
B. Vršnak (Croatia)

Organizers:

Geophysical and Astronomical Observatory of the University of Coimbra
Center of Geophysics of the University of Coimbra
Geo-Space Sciences Research Centre of the University of Porto
Slovak Central Observatory, Hurbanovo
Multidisciplinary Centre for Astrophysics of the Instituto Superior Técnico

http://www.mat.uc.pt/~cspm2015/

Sponsors

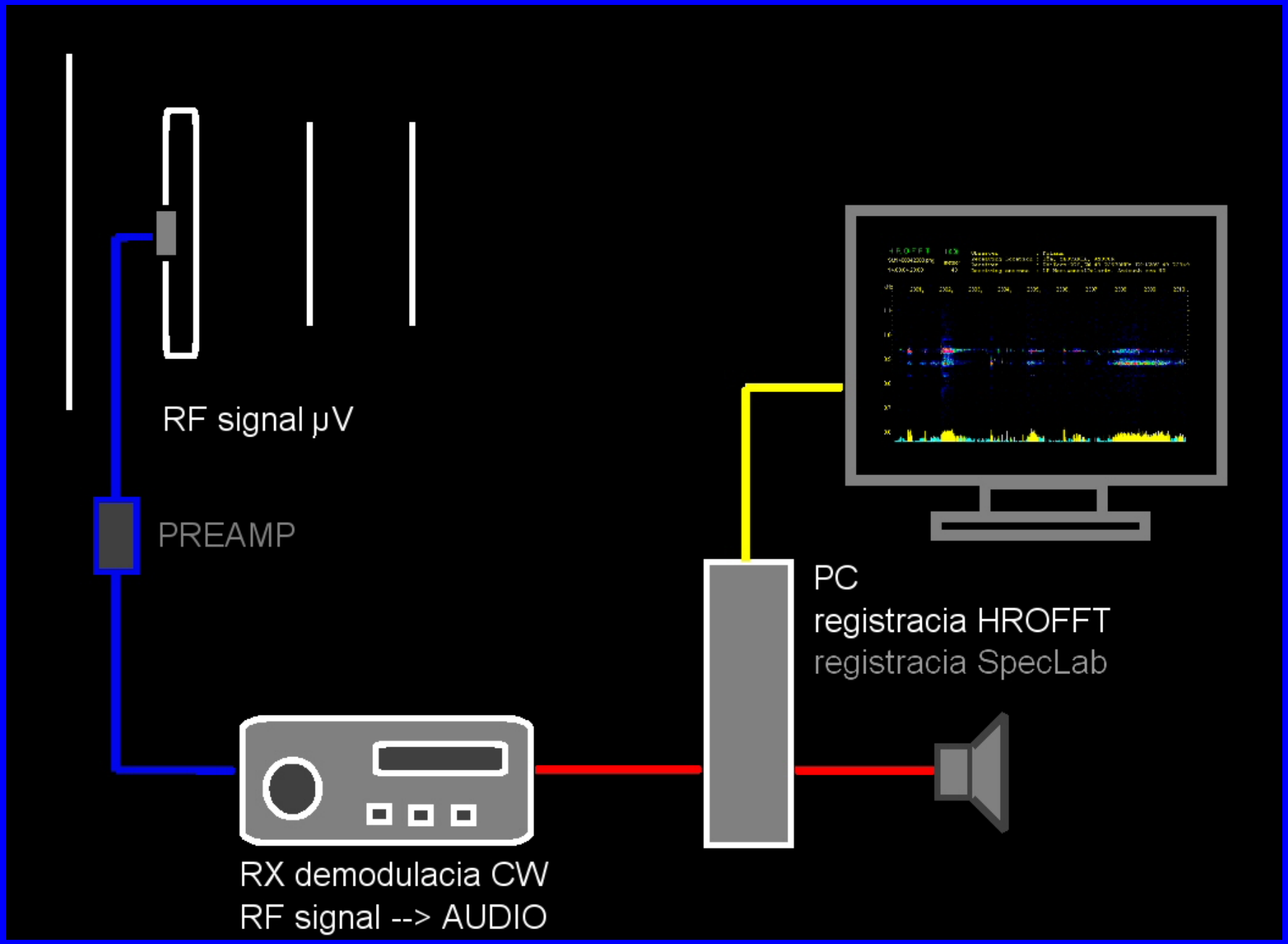
VarSITI · SCOSTEP Scientific Committee on Solar-Terrestrial Physics · esa · FCT Fundação para a Ciência e a Tecnologia · l'Observatoire de Paris · DEPARTAMENTO DE MATEMÁTICA FACULDADE DE CIÊNCIAS E TECNOLOGIA UNIVERSIDADE DE COIMBRA

REGISTRATION OF RADIOMETEORS:

First set: horizontally polarized log-periodic antenna (400-1300 MHz,6 dB), Yaesu VR-5000 radio,the signal from the ~~television transmitter Lviv~~ was received (Ukraine), **49.739 MHz**

Second set: vertically polarized log-periodicantenna, the signal from the GRAVES transmitter is received (France) for communication with Earth satellites, **143.05 MHz**.

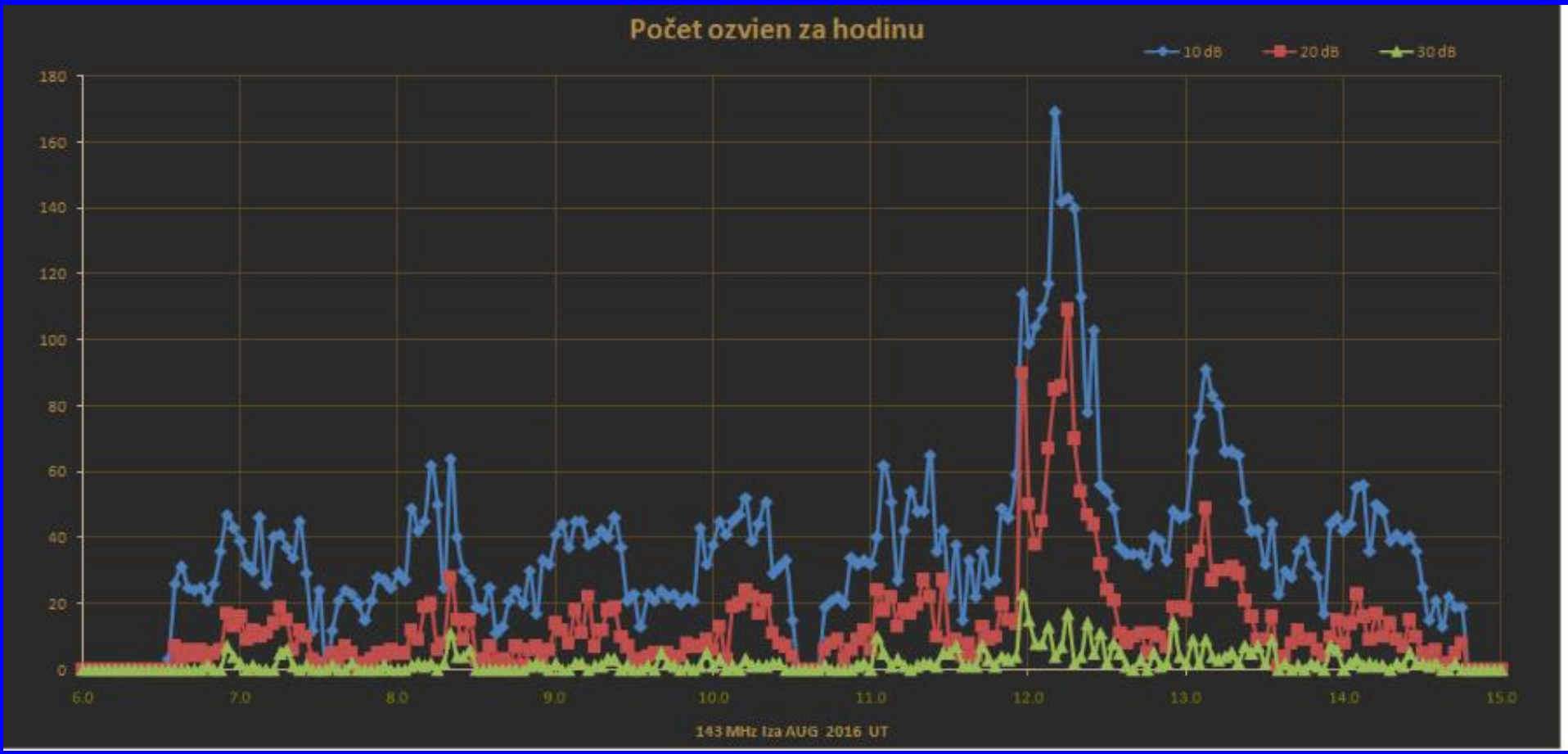
Diagram of the registration set:



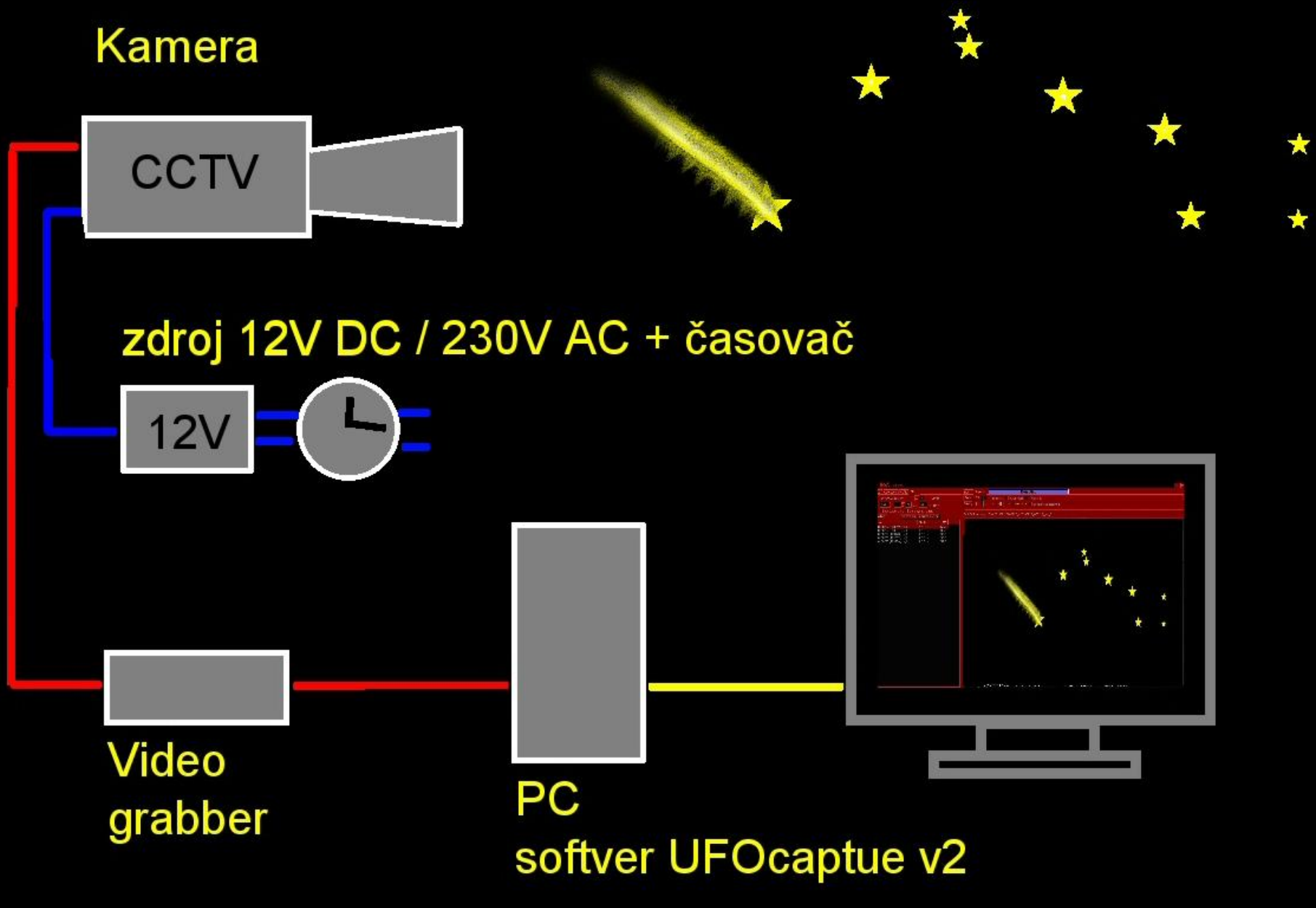
www.suh.sk ... Online dáta ... Rádiometeory ...

UKÁŽKY REGISTRÁCIE:

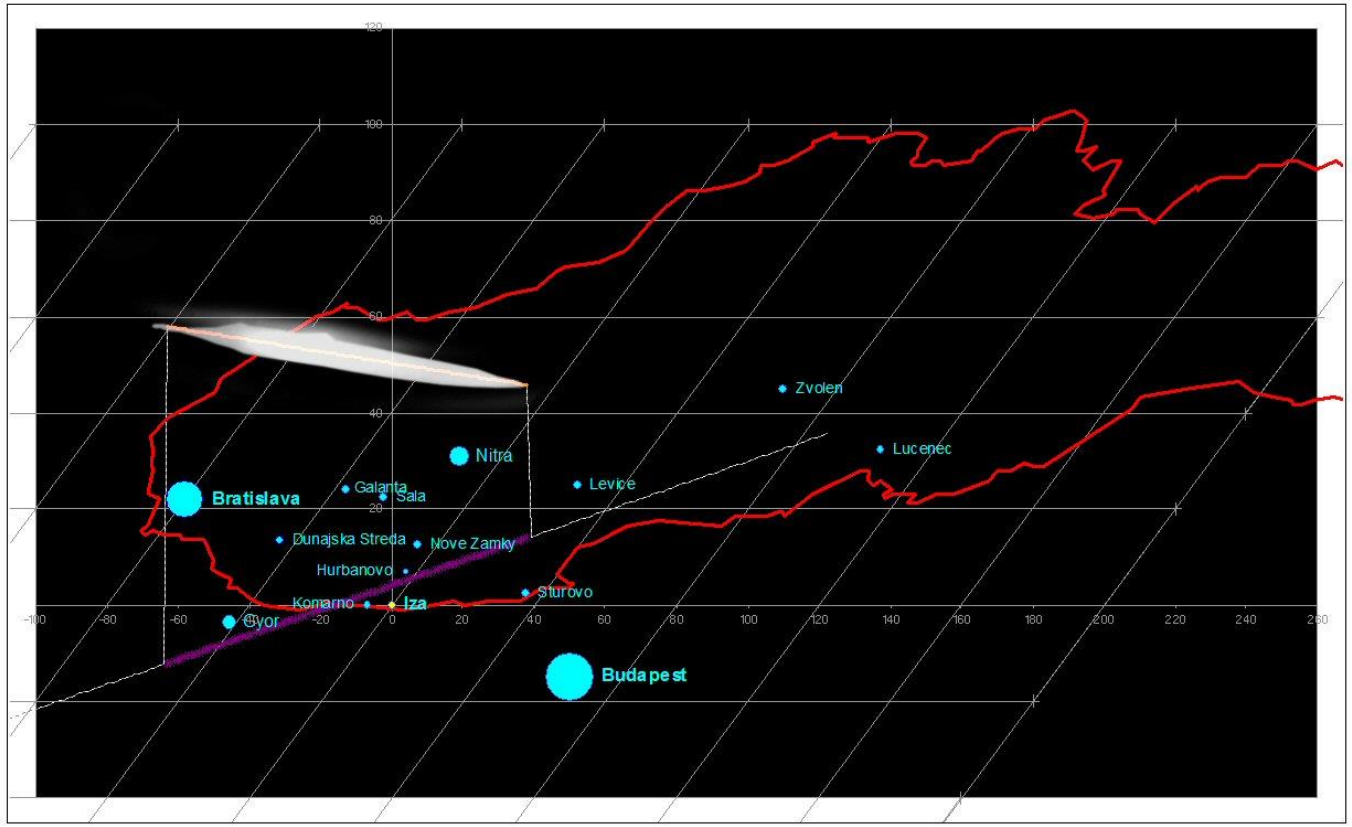
Perzeidy 2016

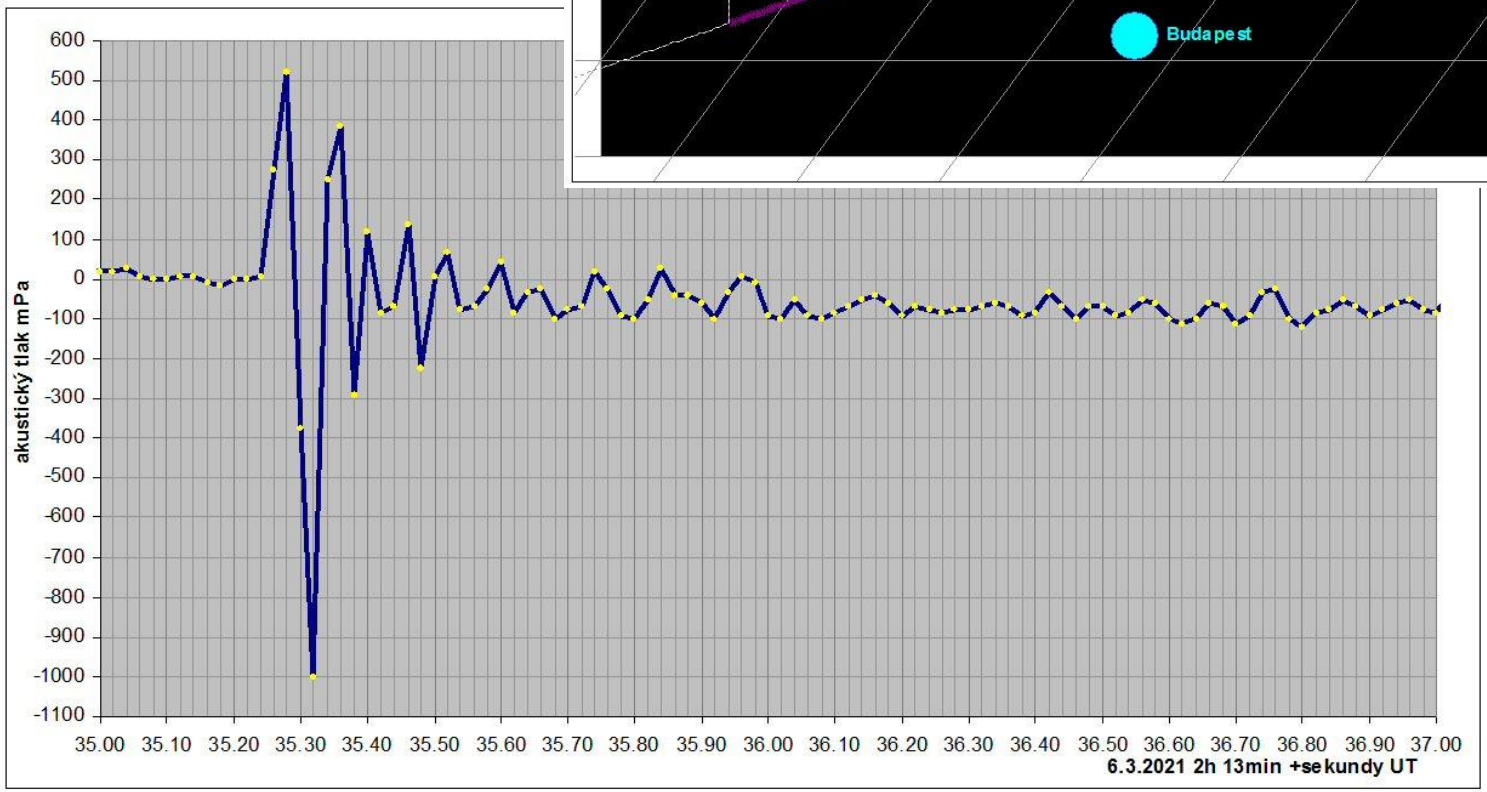


VIDEOREGISTRATION OF METEORS:



BOLID 06. marca





AUTOMATIC BOLID CAMERA

(AFO - *Automatic Fireball Observatory*):

September 16, 2020 - installation of AFO in Hurbanovo in cooperation with the Astronomical Institute of the ASCR, v. v. i., in Ondřejov (Czech Republic) European Bolide Network, headed by Dr. Pavel Spurný from ASÚ AV ČR.
In Slovakia - the main partner of the Astronomical Institute of the Slovak Academy of Sciences in Tatranská Lomnica (doc. Dr. Ján Svoreň). Additional cameras are located in Stará Lesná and in the observatories on Kolonický sedlo and in Rimavská Sobota.

HURBANOVO

This brught bolid was recorded in the network at many stations, then it is possible to calculate all important parameters of bolide, e.g. also the exact trajectory in the atmosphere of the Earth and its heliocentric orbit.

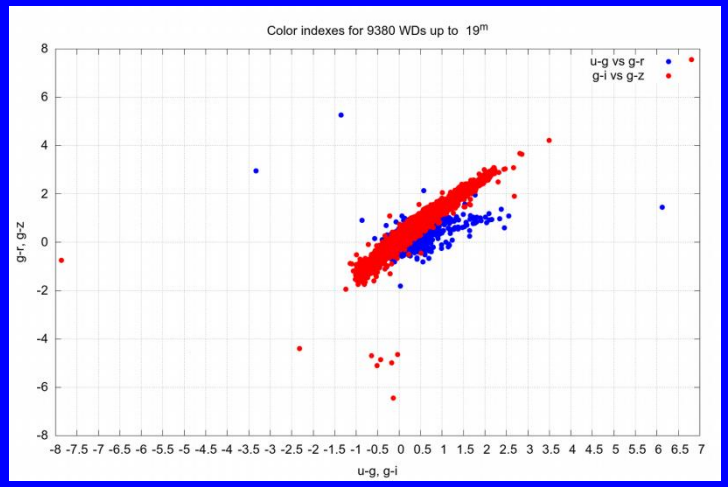
http://www.asu.cas.cz/~meteor/bolid/2021_03_06/index.html

http://www.asu.cas.cz/~meteor/bolid/2021_10_20/index.html

At 18:28:08 CEST, at about half a meter meteoroid penetrated into the Earth's atmosphere. Due to the contact with the atmosphere, it started to evaporate and shining at an altitude of **81 km** above the ground in Hungary, north of Lake Balaton. At that time, the body flew at a speed of nearly **17 km/s**, and flew on a steep orbit of 68 degrees above the Earth's surface for approx. to the southeast and brighte-ned very quickly. In the second half of the flight path, the bolid was signifi-cantly brightened 3 times due to the decomposition of the meteoroid. The first and highest luminosity was reached at an altitude of 44 km reached about fifty times the brightness of the full moon (viewed from a distance of 100 km). After the decay, only a small part of the meteoroid flew further ...

RESEARCH OF EXOPLANETS (2017 – 2019):

- **Search for exoplanets around white dwarfs:**
-bilateral project: Slovakia - Ukraine,
-goal: identification of exoplanets around
-white dwarfs, method: photometry, transit
-search, object selection: based on color index,
-analysis: observation processing, period
-analysis, modeling of light curves.




Observatory at peak Terskol, Northern Caucasus


Observatory in Hurbanovo, Slovakia

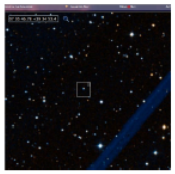

Observatory in Lisnyky, Ukraine


Stará Lesná Observatory, Slovakia


MAO NASU, Ukraine

Fig. 3. Available small telescopes


Skalnaté Pleso Observatory, Slovakia



Candidate №1 SDSS J070546.78+393453.4

|gmag |umag |rmag |imag |zmag |gmag_extinction
|16.51 |16.11 |16.67|24.37|17.25 | 0.292130
Constellation: Auriga
RA: 07h05m46.63s
Dec: +39◦35'00.0"
Apparent magnitude: 15.15

Candidate №2 SDSS J220823.66-011534.0

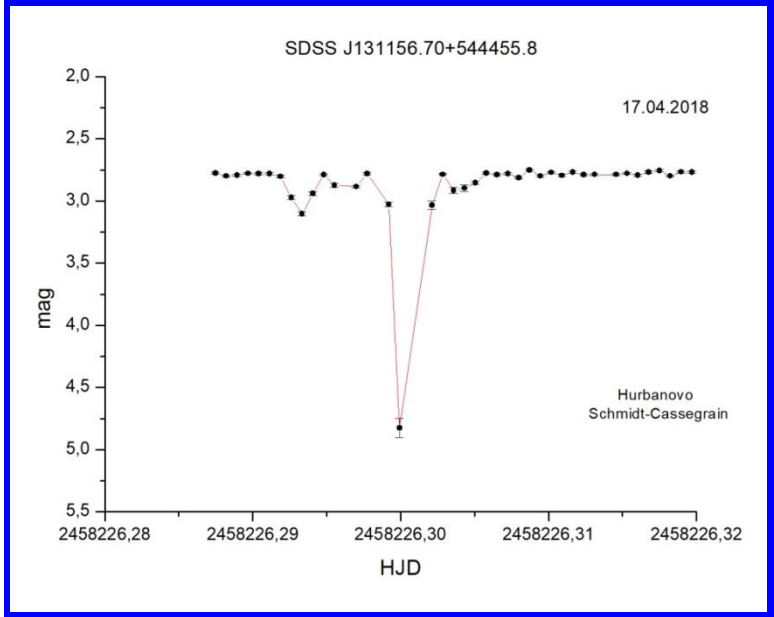
|gmag |umag |rmag |imag |zmag |gmag_extinction
|21.75 |18.42 |18.79|19.07|19.84 | 0.351438
Constellation: Aquarius
RA: 22h08m23.67s
Dec: -01◦15'33.2"
Apparent magnitude: 18.15

Candidate №3 SDSS J131156.70+544455.8

|gmag |umag |rmag |imag |zmag | gmag_extinction
|18.52 |24.65 |17.07|16.05|15.49 | 0.087918
Constellation: Ursa Major
RA: 13h11m56.95s
Dec: +54◦44'54.1"
Apparent magnitude: 16.5

Candidate №4 SDSS J085612.42+143756.9

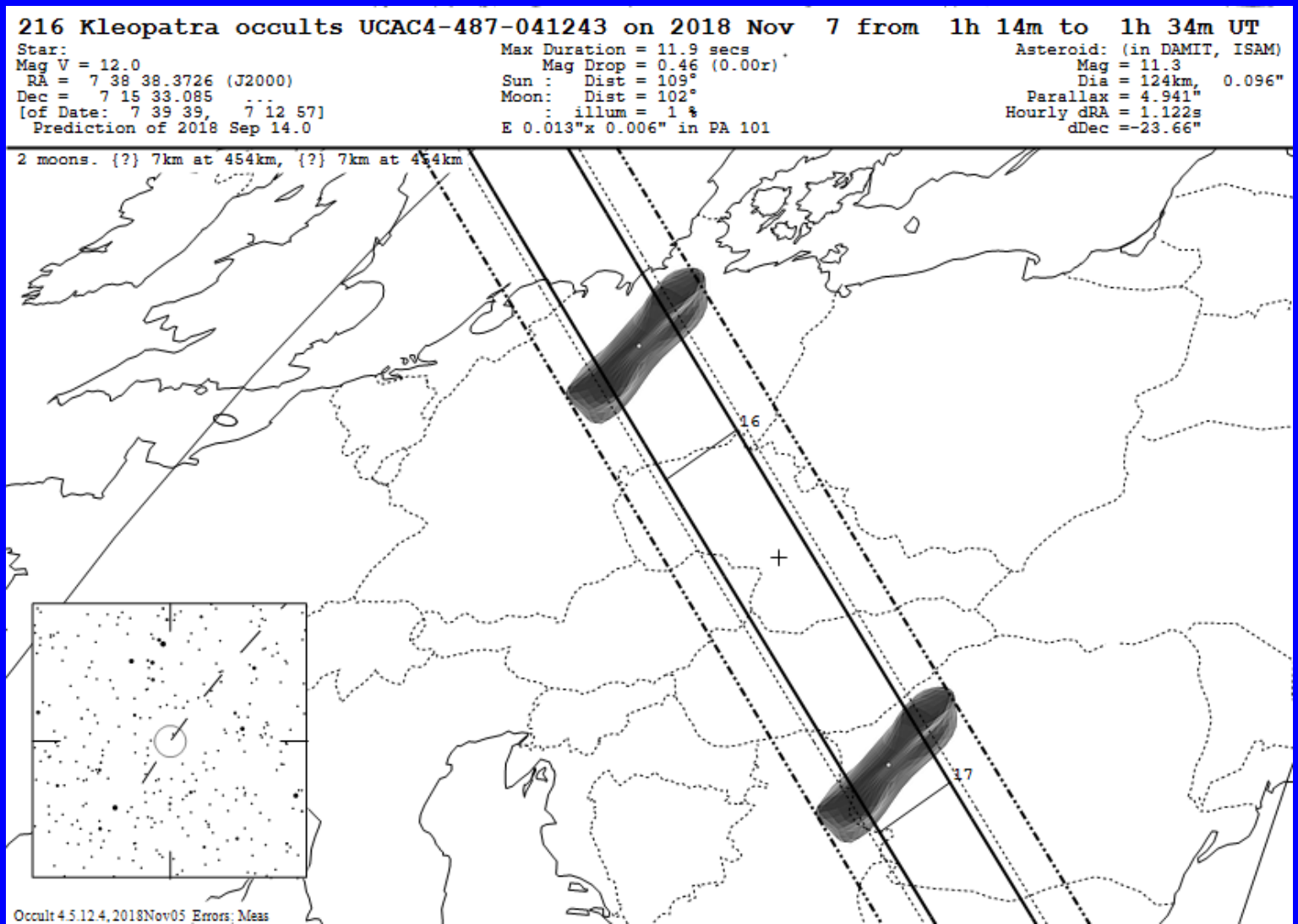
|gmag |umag |rmag |imag |zmag | gmag_extinction
|25.08 |23.73 |19.81|18.27|17.52 | 0.165427
Constellation: Cancer
RA: 08h56m12.42s
Dec: +14◦38'00.1"
Apparent magnitude: 18.2



Results: identification of the first possible transits, e.g. near the star SDSS J131156.70 + 544455.8.

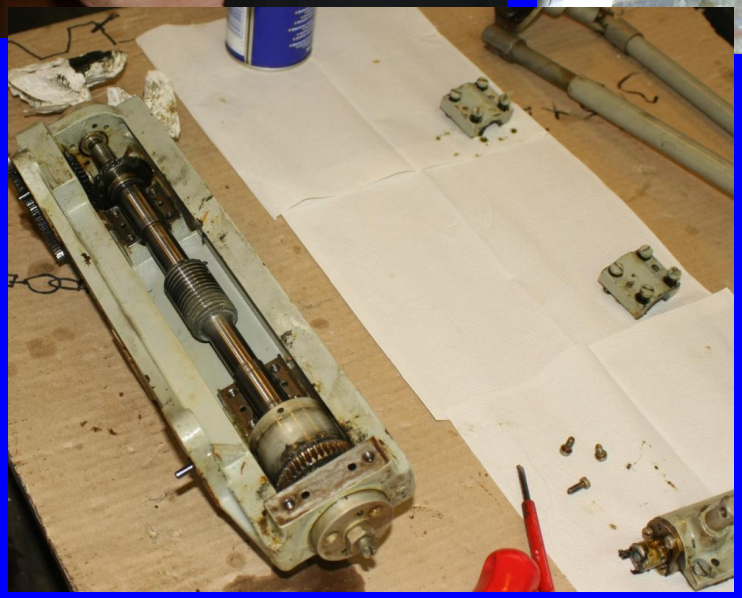
STAR OCCULTATIONS BY ASTEROIDS:

Star occultation UCAC4-487-041243 (12m) by the asteroid (216) Cleopatra
7 November 2018

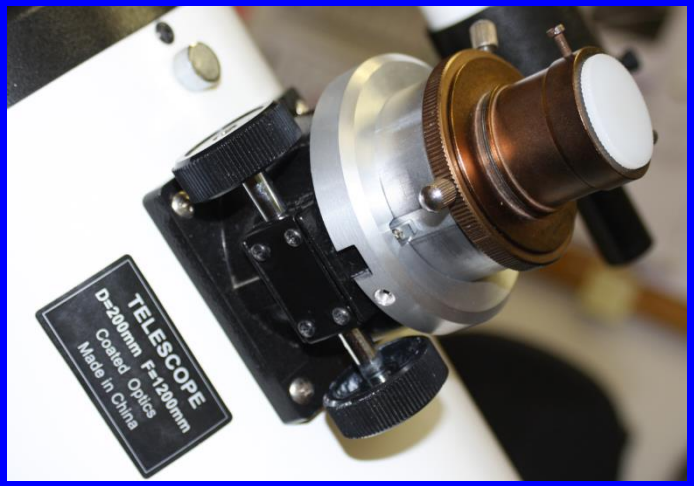


Mechanical-Optical Workshop:

- construction and service of astronomical instruments and accessories for scientific-research and observational activities of the SCO.



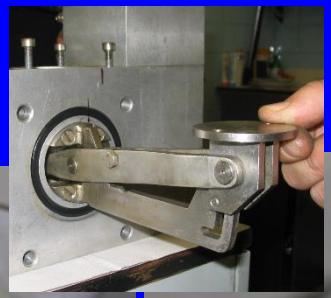
- **services to the public:** eyepiece parts, constructing replicas of telescopes, aluminising of mirrors (objectives and secondary mirrors as well), technical astronomical consultancy in the field of astronomical technique, ...

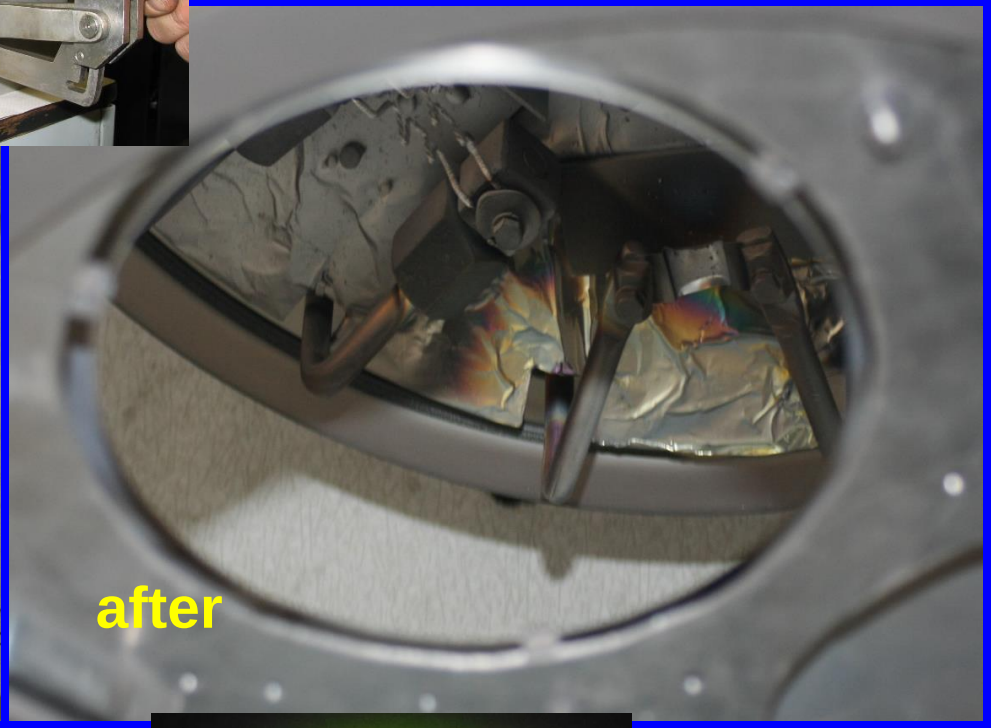


Original refractors
at the Technical Museum in Vienna.

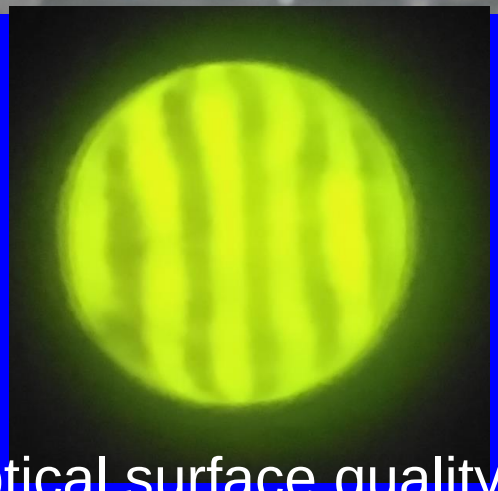
Replicas of refractor of M. Hell

ALUMINISING:





Aluminium at the meander



Optical surface quality check by Ronchi grating


Thank you for your attention!
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