

Opportunities for Young Astronomers

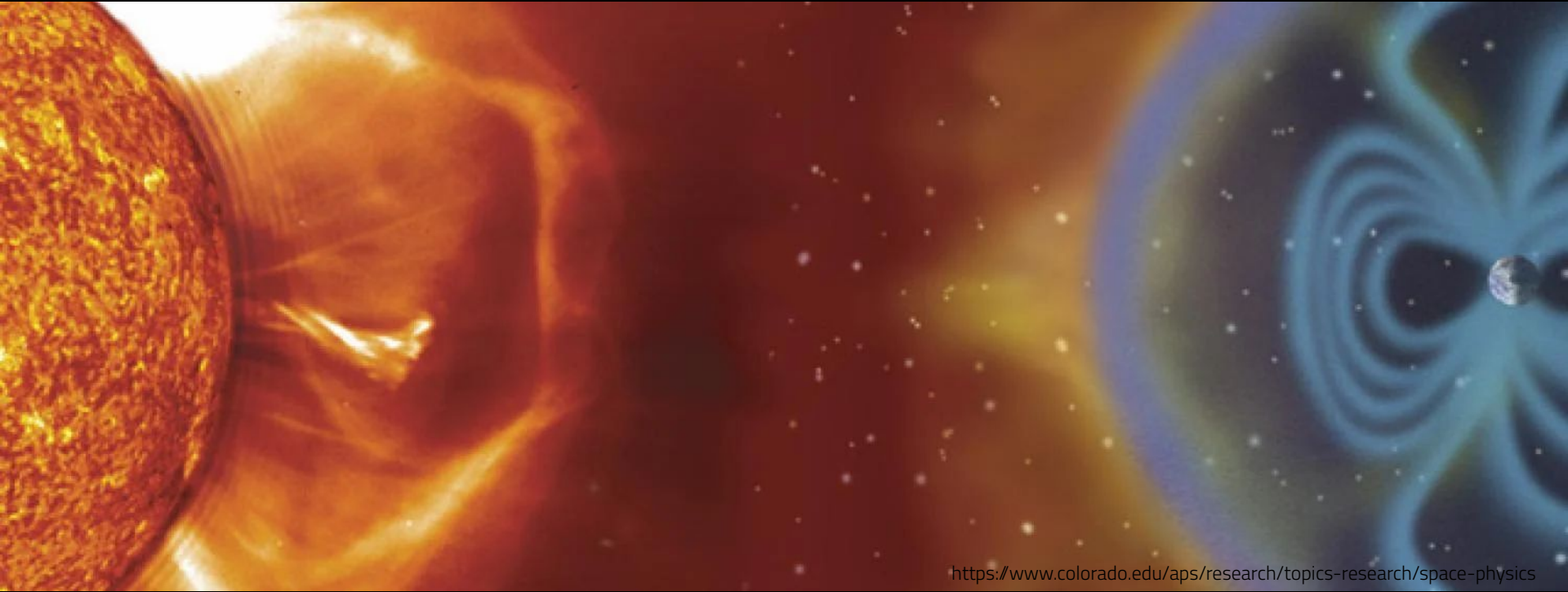
at the Institute of Experimental Physics SAS

Šimon Mackovjak

Slovak Academy of Sciences







<https://www.colorado.edu/aps/research/topics-research/space-physics>

Space Physics in Košice



Prof. Juraj Dubinský



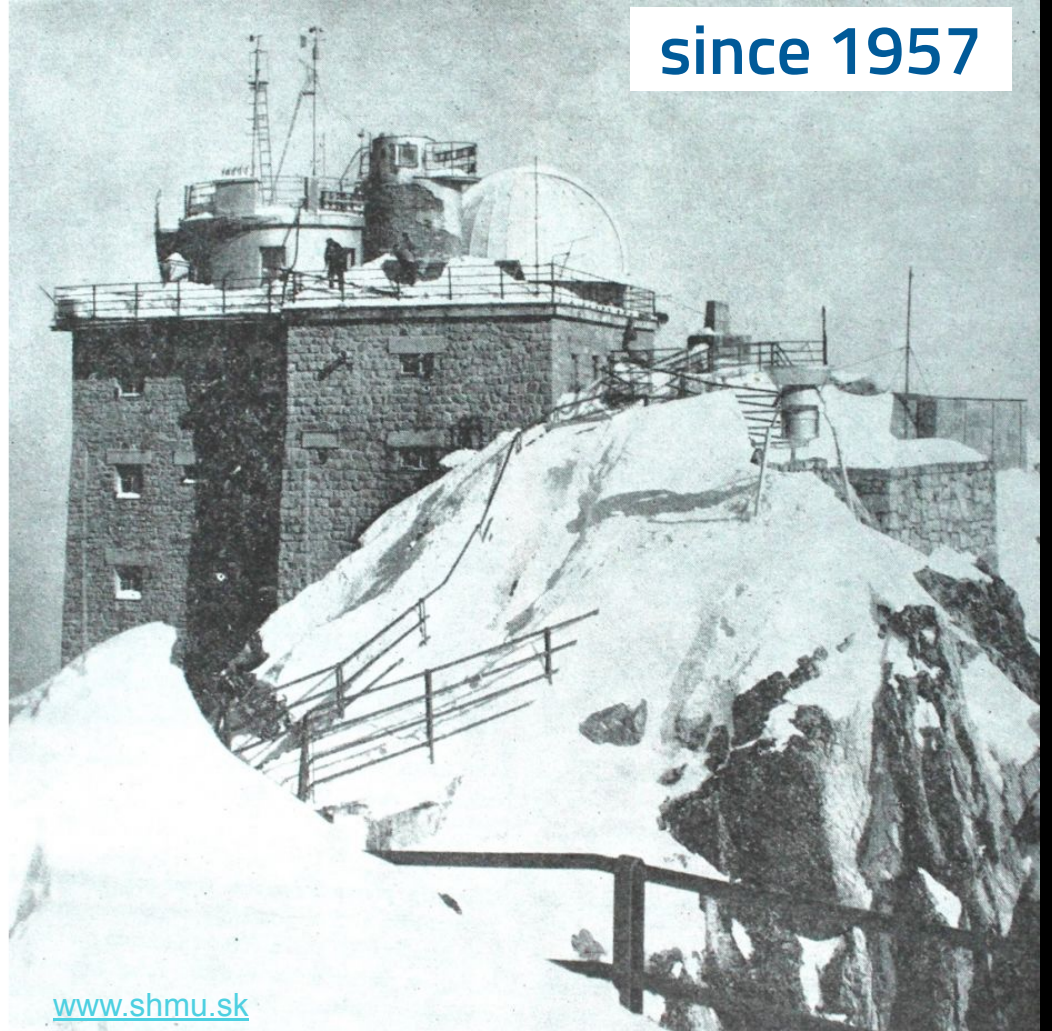
Prof. Karel Kudela

Ing. Jozef Rojko

since 1940

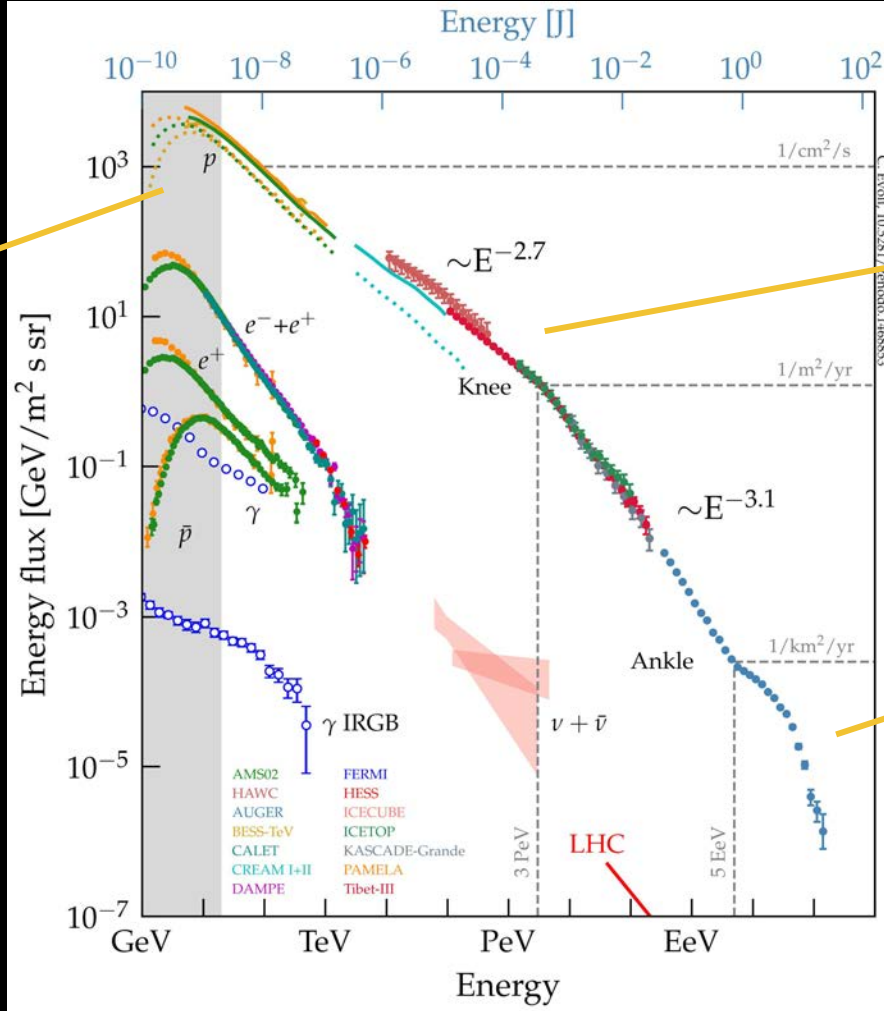


since 1957



www.shmu.sk

Solar cosmic rays



Galactic cosmic rays

Extra-galactic cosmic rays

Space-based instruments from Košice



Our 1st instrument: SK-1
Space mission: INTERKOZMOS-17

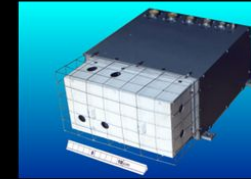
1977



SK-1
Interkozmos-17 (1977)



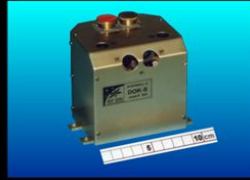
DOK-T
Prognoz-10 (1981)



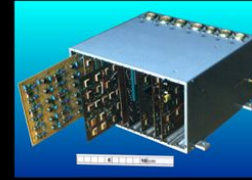
DOK-1
Intershock (1985)



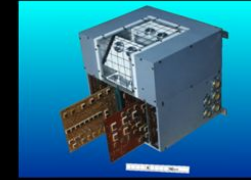
SPE-1
Active (1989), MIR (1996)



DOK-S
Active (1989)...1996 (4x)



SONG-E
Coronas-I (1994), -F.(2001)



DOK-2
Interball (1995, 1996)



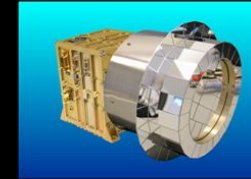
SLED-2
MARS-96 (1996)



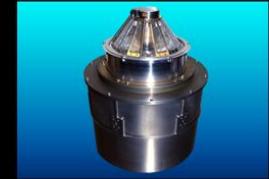
NUADU
Double Star (2004)



MEP-2
Radioastron (2011)



PICAM
BepiColombo (2018)



PEP - JDC
JUICE (2023)

Let's imagine Space Science as the pipeline:

SPACE PHENOMENA -> DATA -> INFORMATION -> KNOWLEDGE

Opportunities for Young Astronomers / Physicists

- Astroparticles science
- Heliophysics / Space Weather science

HELIOPHYSICS SYSTEM OBSERVATORY

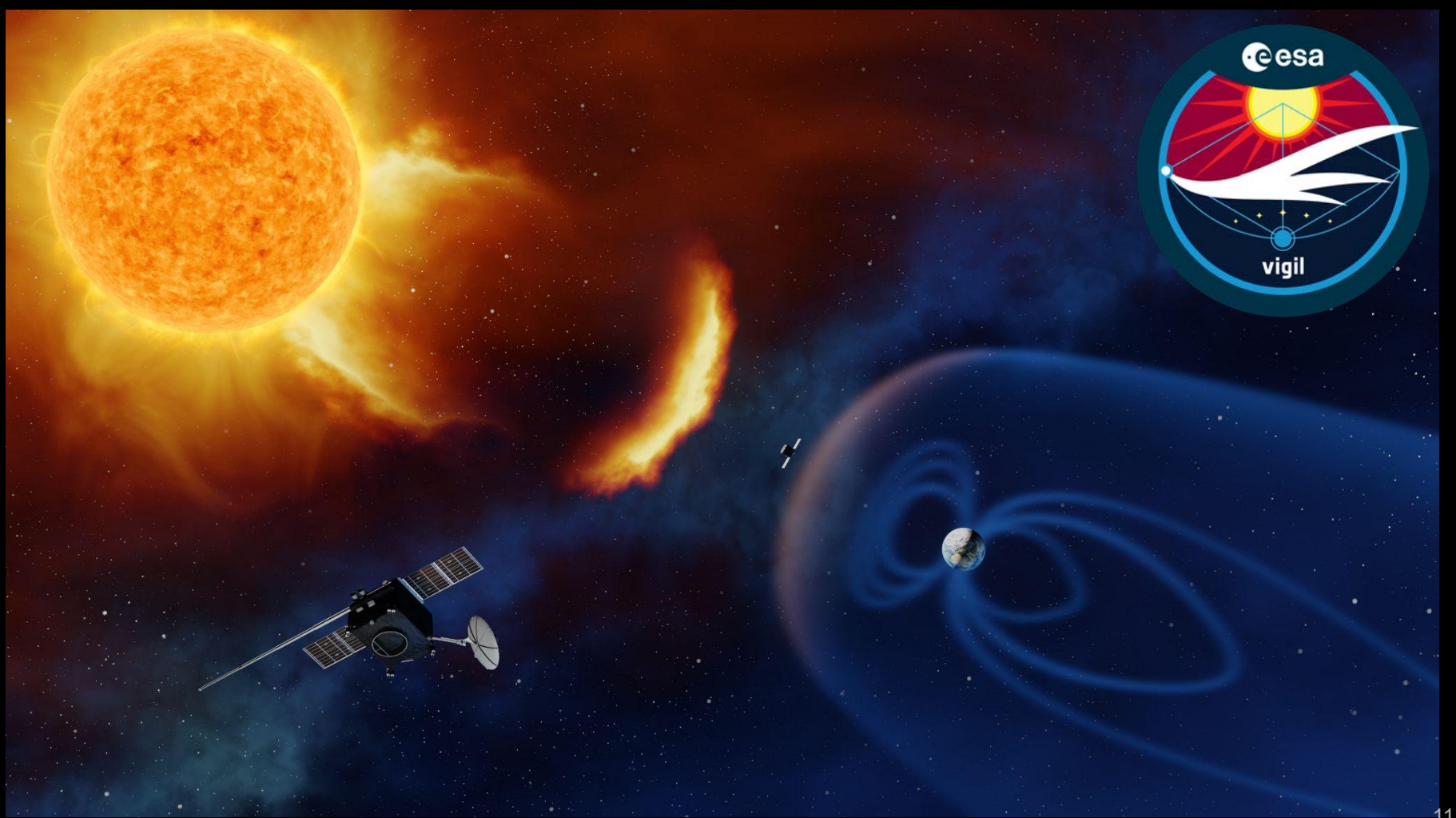
- 20 Operating Missions with 27 Spacecraft
- 6 Missions in Formulation

■	FORMULATION
■	IMPLEMENTATION
■	PRIMARY OPS
■	EXTENDED OPS



OPERATING & FUTURE

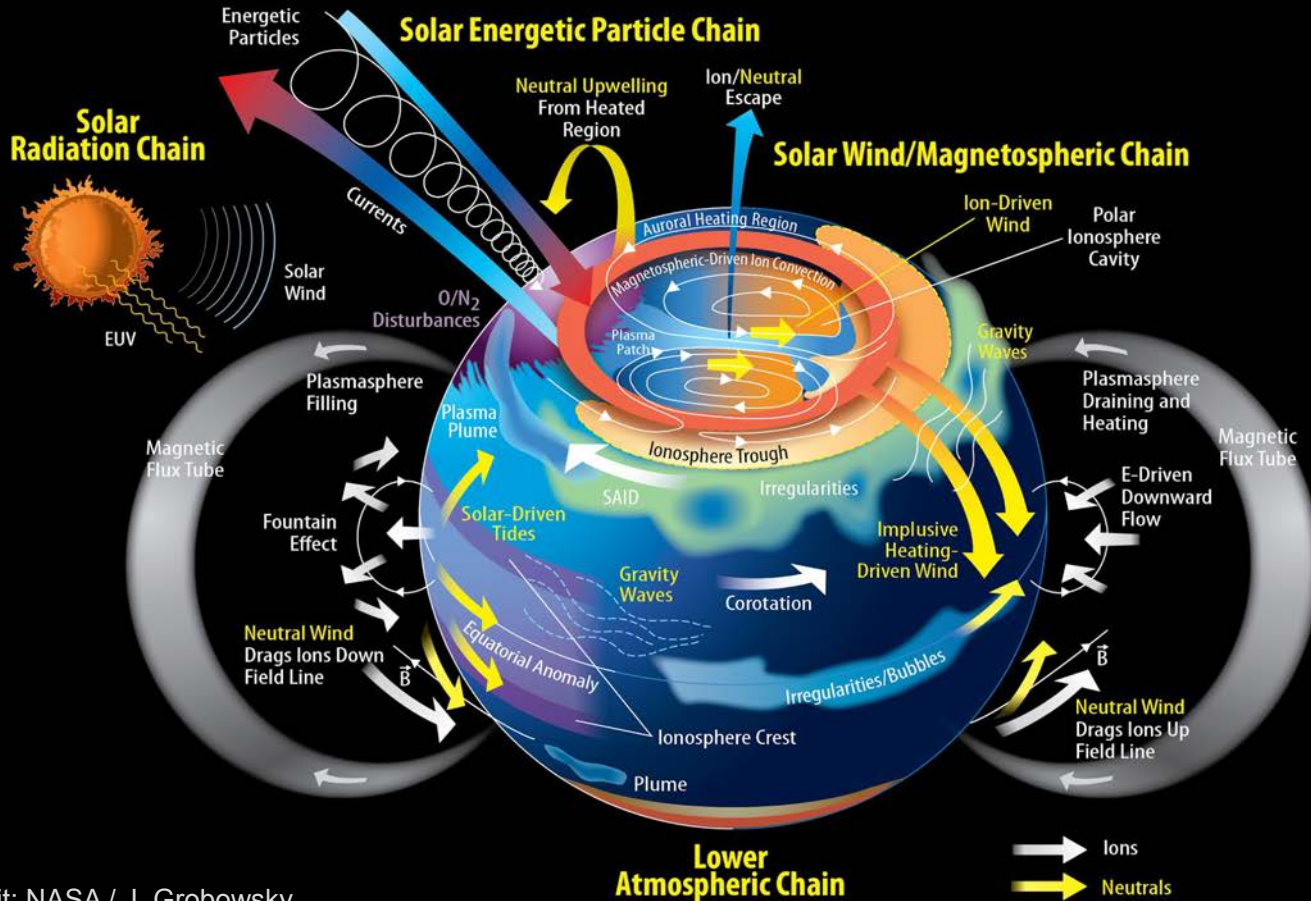
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Opportunities for Young Astronomers / Physicists

- Astroparticles science
- Heliophysics science
- Space-Earth interface science

Terrestrial Atmospheric ITM Processes

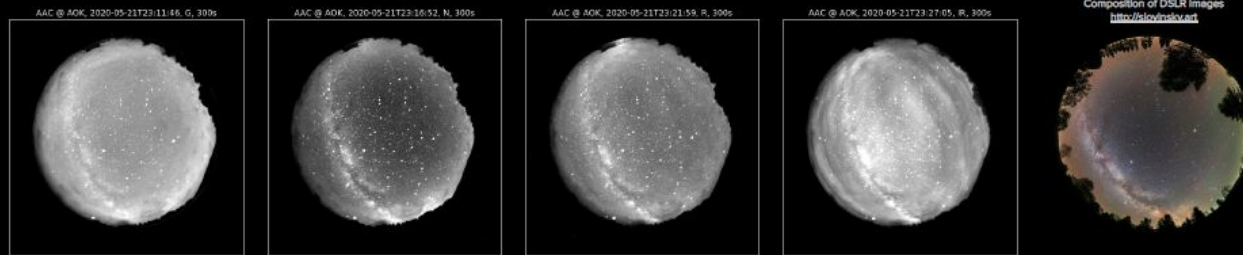


Credit: NASA / J. Grobowsky

AMON-ES

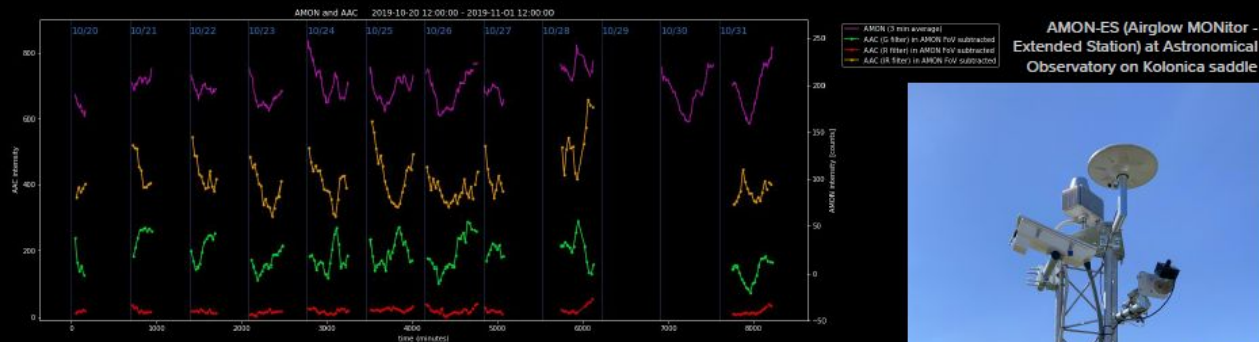
All-sky Airglow Camera

- 557.8 nm (OI - green line)
- 568.5 nm (no airglow)
- 630.0 nm (OI - red line)
- 700-900 nm (OH)

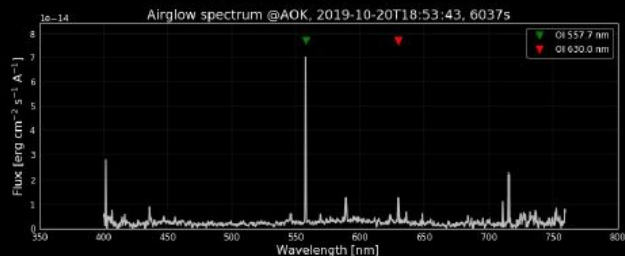


AMON photometer

We've detected consistency between airglow variation measurements by AMON (Mackovjak et al. 2019, <https://doi.org/10.1016/j.nima.2018.12.073>) UV photometer (300-480 nm) and All-sky Airglow Camera data

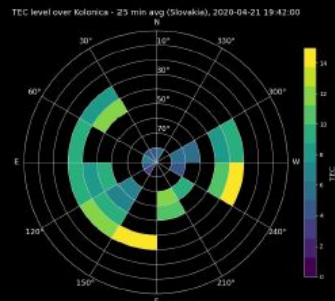


Spectrometer - airglow in physical units is ensured

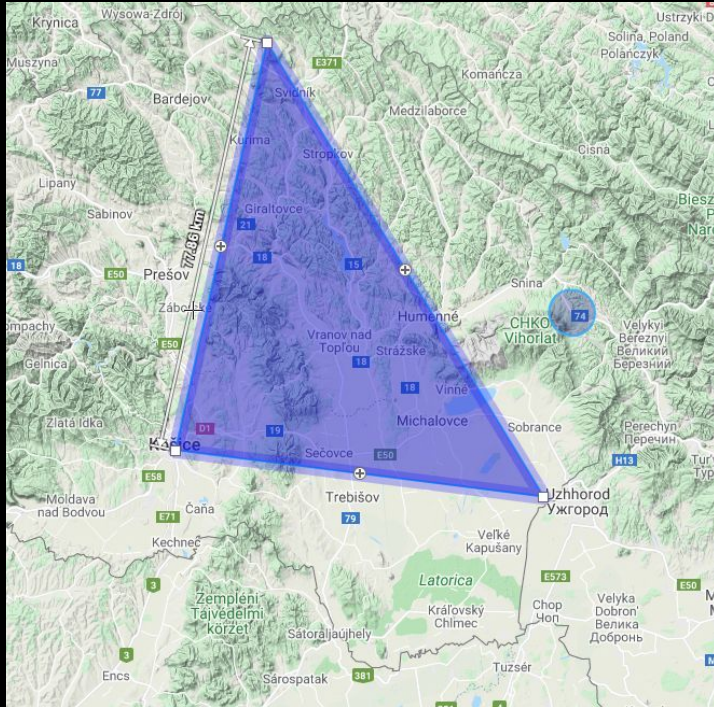


GNSS receiver

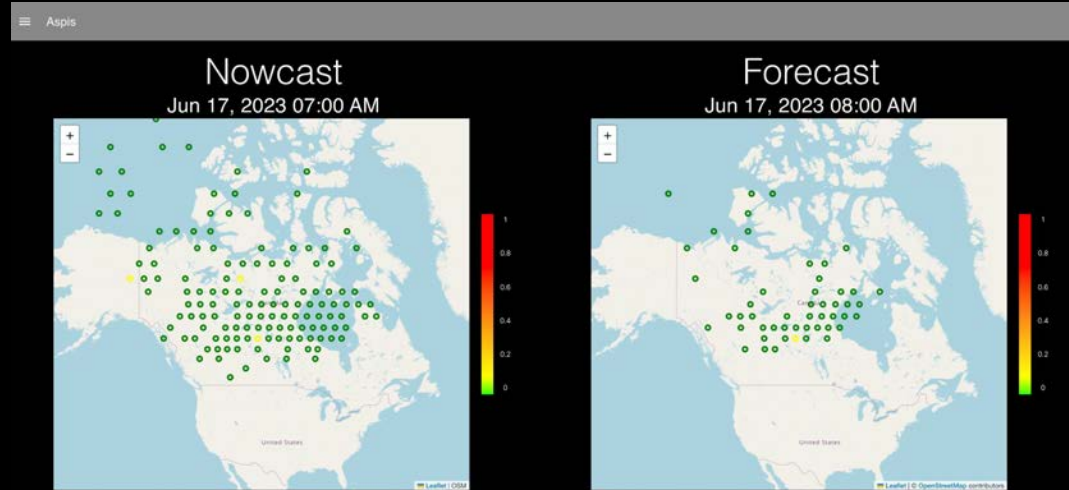
Ionospheric parameters (TEC, S4, Sigma phi) appends airglow data and provide insights to presence of disturbances

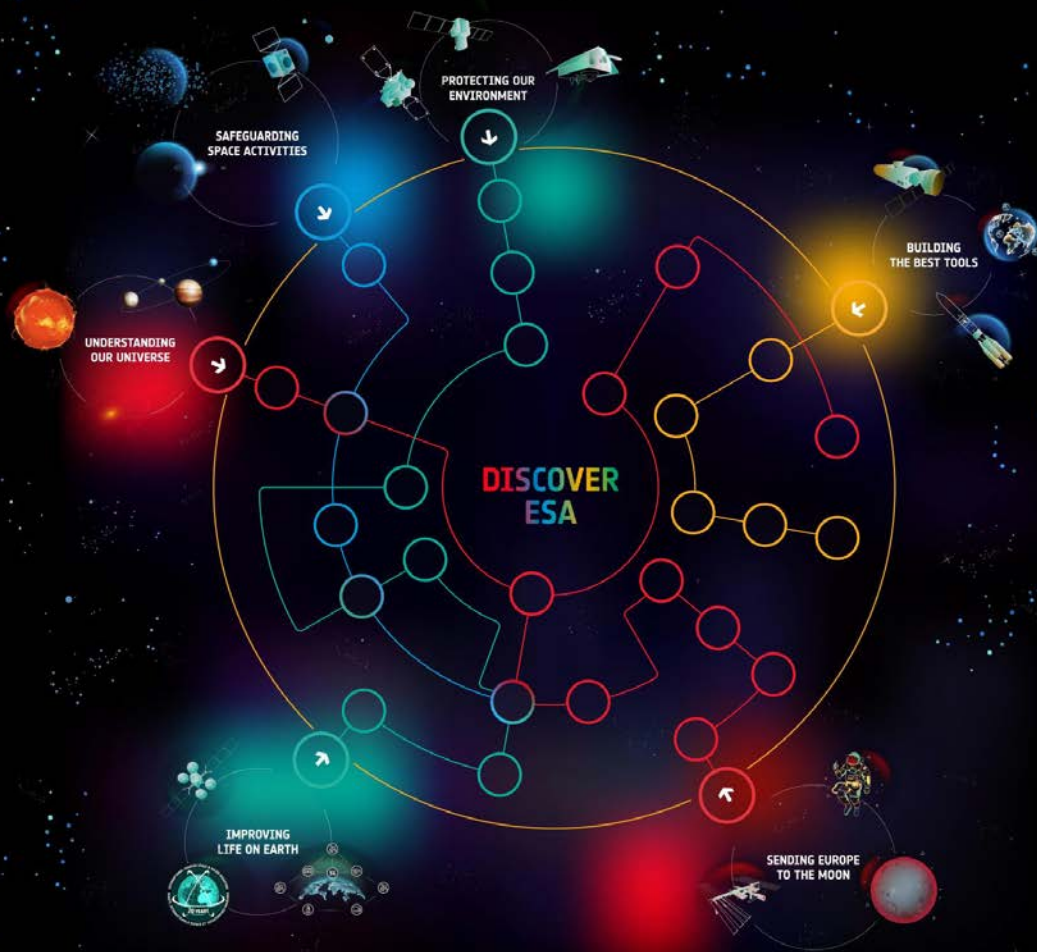


SK Doppler



ASPIS





<https://discover.esa.int>

Space Weather Services Network

- Solar Weather ESC
- Heliospheric
- Space Radiation
- Ionospheric
- Geomagnetic Conditions



Main Goal:

To add Slovakia to SWESNET

Slovak SWE capabilities

Solar weather

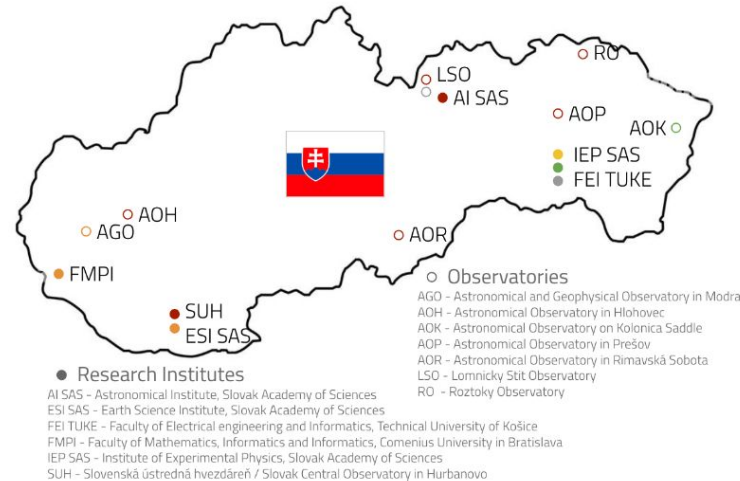
- Expert groups at Department of Solar Physics AI SAS & SUH
- High altitude observatory with two Lyot coronagraphs at the LSO
- Routine observations of photosphere and chromosphere at SUH, AOP, AOH, AOR, RO
- Solar radiospectrometer CALLISTO at SUH

Space Radiation

- Expert group at Department of Space Physics IEP SAS
- Continuous measurements of secondary cosmic rays at LSO since 1980
- Studies of particles propagation in heliosphere and magnetosphere

Heliospheric Weather

- Engineering group at Department of Space Physics IEP SAS
- Participation on development of space missions (e. g., Double Star, Radioastron, BepiColombo, JUICE)



Ionospheric Weather

- Expert group at Department of Space Physics IEP SAS & FEI TUKE
- Observation of Airglow and Ionospheric parameters at AOK
- Feasibility studies within ESA / PECS projects

Geomagnetic Conditions

- Expert groups at Geophysical Division ESI SAS & FMPI
- Geomagnetic observations at GMO ESI SAS & AGO
- Research of geomagnetic conditions in Central Europe region and historical extreme magnetic storms

Summary

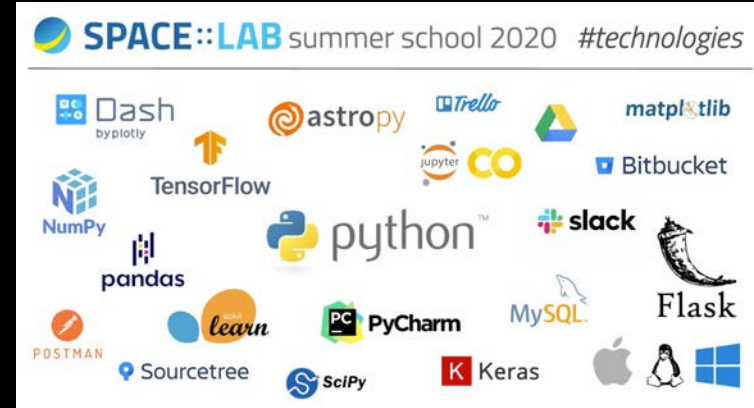
There is space for your
research of SPACE



SPACE::LAB summer school

Interconnection of Space and IT community

- 2019: Machine learning and Space data
- 2020: Develop your own virtual observatory
- 2021: Space, Cloud & Deep learning
- 2022: Merging Space & IT
- 2023:



Exploring Space Science with GPT

 **SPACE::LAB** summer school

21. - 24. 8. 2023

SPACE::LAB - Bulharská 4, Košice

Registruj sa do 31. 7. 2023 na space-lab@saske.sk

