Tuesday (September 23rd)

Welcome reception & cocktail

19:00-19:15 **Registration at the *Grandhotel Prague* - *Conference room* (Tatranská Lomnica 8, 059 60 Vysoké Tatry)**

19:15-19:25 **Michal Zajaček, Natalia Shagatova, Patrik Čechvala**, Foreword of the organizers

19:25-19:40 **Michal Zajaček**, Scope of the Tatra Astro Summit: purpose and goals + Historical note about Rainer Weiss (1932-2025) and his contribution to gravitational-wave astrophysics

19:40-20:00 **Petr Kurfürst**, Architectural gems of the Tatra Mountain region: from wooden chalets to grandhotels and functionalism (Bohuslav Fuchs, Dušan Jurkovič and more)

20:00-21:00 Free discussion with refreshment (basic food & drinks will be provided; additional drinks can be ordered and paid individually by participants)

21:00-00:00 Individual discussion and orders possible at the hotel bar

Wednesday (September 24th)

Main Tatra Astro Summit Day - Location: Astronomical Institute, Slovak Academy of Sciences

8:30-8:45 **Welcome notes**

Stars (including the Sun), stellar populations, exoplanets, exoasteroids - Session 1 (Chair: Norbert Werner)

8:45-9:00 **Augustin Skopal**, *Z And*-type outbursts in accreting white dwarf binaries (keynote)

9:00-9:15 **Maksim Gabdeev**, Morphological classification of eclipsing binary stars using computer vision methods

9:15-9:30 **Zoltán Garai**, Dynamics of the AU Mic system as observed with CHEOPS

9:30-9:45 **Jozef Lipták**, Stellar activity – effect of binaries

9:45-10:00 **Petr Kurfürst**, Supernovae as tracers of the structure and evolution of the surrounding universe

10:00-10:15 **Július Koza**, Exploring Solar Flares: The Magnetism of Flare Loops

10:15-10:30 **Jakub Cehula**, Magnetar giant flares as a new site of r-process nucleosynthesis

10:30-11:00 Coffee/Tea break

Stars (including the Sun), stellar populations, exoplanets, exoasteroids - Session 2 (Chair: Maksim Gabdeev)

11:00-11:15 **Ján Budaj**, A swarm of dusty objects in orbit around the central star of planetary nebula WeSb 1 (keynote)

11:15-11:30 **Marek Skarka**, First scientific results with PLATOSpec

11:30-11:45 **Asen Christov**, Brief overview of FZU activities for the LISA project, in the Vera C. Rubin collaboration and instrumentation for astronomy (keynote)

11:45-12:00 **Norbert Werner**, QUVIK - An Agile Ultraviolet Space Telescope (keynote)

12:00-13:30 Lunch in Hotel Academia

Observational and theoretical characteristics of compact objects, galactic nuclei, and galaxy clusters - Session 1 (Chair: Izzy Garland)

13:30-13:45 **Luboš Neslušan**, Newly discovered property of relativistic gravity in the interior of compact objects (keynote)

13:45-14:00 **Martin Kološ**, Black hole magnetosphere

14:00-14:15 **Vladimír Karas**, Accretion-assisted inspirals near galactic nuclei SMBH (keynote)

14:15-14:30 **Taj Jankovič**, Radiation-hydrodynamics of star-disc collisions

14:30-14:45 **Monika Viskotová**, Spectral signatures of quasiperiodic outflows in galactic nuclei

14:45-15:00 **Michal Zajaček**, Can we detect eclipses of galactic nuclei and what are they useful for?

15:00-15:15 Coffee/Tea break

Observational and theoretical characteristics of compact objects, galactic nuclei, and galaxy clusters - Session 2 (Chair: Natalia Shagatova)

15:15-15:30 **Matúš Labaj**, Compact stellar clusters as potential IMBH hosts

15:30-15:45 **Henry Best**, What's in a Transfer Function?

15:45-16:00 **Izzy Garland**, Bar-driven fuelling of AGN (keynote)

16:00-16:15 **Congyao Zhang**, Mapping Hot Gas Kinematics in Galaxy Clusters: Recent Progress with XRISM (keynote)

16:15-16:30 **Tomáš Plšek**, Studying radio-mechanical AGN feedback with X-ray cavities

16:30-16:45 **Dan Hu**, Diffuse radio emission within and beyond galaxy clusters

16:45-17:00 **Tomáš Ondro**, Lognormal seminumerical simulations of the Lyman alpha forest

17:00-17:15 Coffee/Tea break

High-Energy and Multi-messenger astrophysics (Chair: Jakub Cehula)

17:15-17:30 **Petr Trávníček**, Highlights from the Pierre Auger Observatory (keynote)

17:30-17:45 **Patrik Čechvala, Jakub Juryšek**, The SST-1M Project: Present and Future (keynote)

17:45-18:00 **Petr Hamal**, Optical Systems for astro particle experiments: Research and Development at JLO

18:00-18:15 **Jakub Řípa**, GRB-detecting nanosatellites GRBAlpha, VZLUSAT-2 and GRBBeta (keynote)

18:15-18:30 **Filip Münz**, QUVIK data processing

"Before dinner" talks (Chair: Michal Zajaček)

18:30-18:45 **Lýdia Štofanová**, Lessons learnt: ISU SSP25 in South Korea (keynote)

18:45-19:00 **Vladimír Karas**, Meeting near high peaks: Les Houches, Aspen, Sesto ...

20:15- Conference Dinner in Tatranská Lomnica, Grill Pub Restaurant

Thursday (September 25th)

Astronomical Instruments in the High Tatras

9:00-10:00 **Visit of astronomical instruments at the Astronomical Institute** - Location: Astronomical Institute, Slovak Academy of Sciences

11:00-11:30 **Cable-car from Tatranská Lomnica to Skalnaté Pleso station** - location of the Base Station in Tatranská Lomnica

12:00(:20:40) **Groups taking a cable-car to Lomnický Peak Solar Observatory**

13:30-14:30 **Visit of the Skalnaté Pleso Observatory**

14:30- **Optional hike (weather permitting) from Skalnaté Pleso to Hrebienok along the Tatranská Magistrála trail (red)**, visit of Zamkovský chalet on the way

Abstracts

Michal Zajaček (Masaryk University)

Scope of the Tatra Astro Summit: purpose and goals + Historical note about Rainer Weiss (1932-2025) and his contribution to gravitational-wave astrophysics

In this introductory talk, I will summarize the main motivation behind the Tatra Astro Summit 2025. With the participants from almost all major astronomical and physics institutes in Slovakia and the Czech Republic, it provides an ideal place for new collaborations and exchange of knowledge and experience. I will also remind the participants about the tenth anniversary of the first gravitational-wave detection (September 14, 2015). Rainer Weiss, who passed away close to the tenth anniversary, contributed in a decisive way to the construction of modern laser-beam based gravitational-wave detectors. Perhaps it is not so known that as a child in 1938 Rainer Weiss spent some time with his parents in the High Tatras in Czechoslovakia in one of the historical hotels, perhaps Grandhotel Praha...it was from here they decided to flee via Prague to the USA.

Petr Kurfürst (Masaryk University)

Architectural gems of the Tatra Mountain region: from wooden chalets to grandhotels and functionalism (Bohuslav Fuchs, Dušan Jurkovič and more)

In this contribution we will learn that the Tatra region is not only important for its scientific legacy (Astronomical Institute, Skalnate Pleaso and Lomnicky Peak Observatories) but it is also a region of bold architectural designs adjusted to quite often harsh climatic conditions. Mountain chalets are uniquely positioned at the altitude exceeding 2000 meters above the sea level. The cabel-car station at the Lomnicky Peak is the highest building in Central Europe. In contrast to high-altitude chalets, one can admire the environment of cosy grandhotels at lower altitudes. A long tradition of climate-spa sanatoriums combined with the traditional folk and church architecture brings a unique blend of

architecture to the Tatra region visitors nowadays.

Augustin Skopal (Astronomical Institute, Slovak Academy of Sciences)

Z And-type outbursts in accreting white dwarf binaries

I will introuce basic characteristics of Z And-type outbursts in cataclysmic variables, particularly in symbiotic stars.

Maxim Gabdeev (Pavol Jozef Šafárik University in Košice)

Morphological classification of eclipsing binary stars using computer vision methods

Developing robust methods for the automatic analysis of eclipsing binaries (EBs) is crucial for leveraging the vast datasets produced by modern photometric surveys. This presentation focuses on our recent work applying computer vision (CV) techniques to the morphological classification of EB light curves. We investigated the effectiveness of fine-tuning pre-trained CV models for this astronomical task, specifically comparing the performance of two prominent architectures: ResNet50 (a Convolutional Neural Network) and Vision Transformers (ViT). A key challenge was adapting these models, designed for natural images, to work effectively with light curves. We addressed this by proposing and testing a novel light curve-to-image transformation method based on polar coordinates and hexbin density mapping. This transformation proved essential in overcoming issues encountered with standard representation of a light curve. We will present the classification results distinguishing detached/overcontact systems and identifying starspots, highlighting the successes achieved and the remaining challenges for fully automated analysis.

Zoltán Garai (Astronomical Institute, Slovak Academy of Sciences)

Dynamics of the AU Mic system as observed with CHEOPS

In this contribution, we summarize the results of the AU Mic campaigns conducted with the CHaracterizing ExOPlanet Satellite (CHEOPS) space telescope between 2020 and 2023. AU Mic is a highly active M-dwarf with an edge-on debris disk and two known transiting sub-Neptunes, as well as a possible third planetary companion. The observations reveal a 7:4 spin-orbit commensurability for planet b, yielding repeatable spot-occultation geometry. The two transiting planets exhibit significant transit-timing variations (TTVs). A dynamical analysis of the system indicates that the observed TTVs can be explained by a third planet with an orbital period of about 12.6 days and a mass of about 0.2 Earth masses. We also explored the system's orbital geometry and found AU Mic c to be on a likely misaligned orbit. This result was recently confirmed with spectroscopic observations.

Jozef Lipták (Astronomical Institute, Czech Academy of Sciences)

Stellar activity – effect of binaries

Stellar activity in solar-type stars is caused by magnetic fields driven by stellar rotation. Because the rotation is dampend by viscous forces and stellar winds as the star ages, high rotation rates are present in very young stars or stars in close binaries. We would like to present an ongoing work on characterisation of active binary star candidates (binary status, orbit, stellar parameters, activity, lithium abundance, magnetic fields) using Pucheros and PLATOSpec echelle spectrographs at E1.52 telescope at La Silla Observatory (ESO).

Petr Kurfürst (Masaryk University)

Supernovae as tracers of the structure and evolution of the surrounding universe

The loss of mass from hot stars in general, including supernovae (SNe) which contribute the most, has a direct impact not only on the evolution of stars but also on the evolution of the larger universe. We study the interactions of expanding SNe with the aspherical dense surrounding medium (CSM) of various morphologies, including nearby stellar or galactic disks, bipolar lobes, and other structures that may be present in their vicinity. These interactions are manifested by irregularities such as abrupt increases and decreases in brightness in the light curves, asymmetries in the spectral lines, and the overall pattern of relative polarization of the studied environment. Detailed analysis of these observables and their identification with multidimensional radiative hydrodynamical models as well as radiative transfer calculations can be a powerful tool for revealing the structure and morphology of the interstellar medium and its formation history.

Július Koza (Astronomical Institute, Slovak Academy of Sciences)

Exploring Solar Flares: The Magnetism of Flare Loops

The Sun is an active star that releases enormous amounts of energy during solar flares, which result from the sudden release of magnetic energy in the corona. This presentation explores the magnetic fields in so-called flare loops—brightly glowing structures that appear during these explosive events—using state-of-the-art instruments. A key role in these observations is played by the Swedish 1-meter Solar Telescope (SST), which enables imaging of solar flares at exceptionally high resolution. Using a technique called spectropolarimetry, researchers can determine the strength and orientation of magnetic fields thousands of kilometers above the solar surface. The talk highlights a notable case of the second-strongest flare in the past solar cycle, observed with the SST. The observation provided a unique measurement of magnetic field in this exceptional event. Understanding flare phenomena is important also for practical reasons, as strong flares can impact satellites, navigation systems, and electrical grids on Earth.

Jakub Cehula (Charles University)

Magnetar giant flares as a new site of r-process nucleosynthesis

Magnetar giant flares (GFs) are the most powerful non-cataclysmic neutron star outbursts, with the December 2004 GF from the magnetar SGR 1806-20 being the most notable example. Motivated by radio afterglows suggesting baryonic ejecta, we proposed that mass ejection occurs when a GF-driven shock propagates through the magnetar crust. Relativistic hydrodynamic simulations show that the flare excavates neutron-rich material with high entropy and rapid expansion, enabling heavy-element nucleosynthesis through the rapid neutron-capture process (r-process). Radioactive decay in the ejecta powers a brief $\sim$ 10–15 min, luminous $\sim 10^{39}$–10^{40} erg/s optical/UV kilonova-like transient, potentially detectable within a few Mpc by wide-field monitors such as QUVIK. The decay also produces Doppler-broadened gamma-ray lines, consistent with an unexplained hard signal after the 2004 GF, and implying $\sim 10^{-6}$ solar masses of newly synthesized r-process material. Magnetar GFs may thus represent the second confirmed r-process site, contributing 1–10 % of Galactic abundances.

Ján Budaj (Astronomical Institute, Slovak Academy of Sciences)

A swarm of dusty objects in orbit around the central star of planetary nebula WeSb 1

Exoplanets and smaller bodies have been detected orbiting different kind of stars. However, we do not know of any such objects in planetary nebulae, the short-lived stage of stellar evolution between the

asymptotic giant branch and white dwarf phases. The planetary activity (destruction and formation) may be accompanied by dust clouds. Hence, we searched for dust occultation events in planetary nebulae using archival photometric data. We show that the central star of PN WeSb 1 features numerous dimming events with typical durations of a few days to weeks that are up to 3 mag deep. This variability is mainly stochastic with an indication of a 400 d period. The occultations are almost grey, indicating dust grains larger than about 0.1 μm. Based on our follow-up observations, we argue that the central star is a wide binary and that these events are most probably caused by debris from disintegrated small rocky bodies that escaped from the former asymptotic giant branch star to find safe harbour around the companion star. The latter star dominates the optical spectrum enabling us to see the eclipses. This means that planetary systems are present and undergo violent evolution during the planetary nebula stage.

Marek Skarka (Astronomical Institute, Czech Academy of Sciences)

First scientific results with PLATOSpec

Eight years after the initial idea of building a high-resolution spectrograph in Chile, we have the first results. I will demonstrate capabilities of the PLATOSpec instrument on exoplanets and stars and review the current operations.

Asen Christov (Institute of Physics, Czech Academy of Sciences)

Brief overview of FZU activities for the LISA project, in the Vera C. Rubin collaboration and instrumentation for astronomy

Brief overview of FZU activities for the LISA project, in the Vera C. Rubin collaboration and instrumentation for astronomy.

Norbert Werner (Masaryk University)

QUVIK - An Agile Ultraviolet Space Telescope

I will present the status and summarise the science case of the Quick Ultra-Violet Kilonova surveyor—QUVIK mission. QUVIK is an ultra-violet (UV) space telescope on an approximately 200 kg small satellite with a moderately fast re-pointing capability and a real-time alert communication system, approved for a Czech national space mission. The satellite, which is expected to launch in 2030, will provide key follow-up capabilities to increase the discovery potential of gravitational wave observatories and future wide-field multi-wavelength surveys. The primary objective of the mission is the measurement of the UV brightness evolution of kilonovae, resulting from mergers of neutron stars, to distinguish between different explosion scenarios. This remarkably agile mission will also provide unique follow-up capabilities for other transients both in the near- and far-UV bands. Between the observations of transient sources, the satellite will perform observations of other targets of interest for the scientific community, such as stars, stellar systems, and galactic nuclei.

Luboš Neslušan (Astronomical Institute, Slovak Academy of Sciences)

Newly discovered property of relativistic gravity in the interior of compact objects

When a spherically symmetric relativistic compact object, like a neutron star, is modeled, there are four non-trivial Einstein's field equations (EFEs), which contain four unknown quantities. When the common stress-energy tensor is considered, two of these equations are identical, therefore we have only three EFEs, but four unknown quantities remain. The fourth equation must be supplied from outside

of the general relativity. Dealing with a realistic object, only the equation of state of realistic gas can be the fourth equation. However, various equations, corresponding to the assumptions originating in a human fantasy, were also considered and the resulting conclusions have been used as the arguments in a description of real objects. We explain that the proper general relativity, not modified with some additional postulates, generates qualitatively other gravity than we thought on the basis of Newtonian physics. This gravity is also oriented outward in the interior of compact object.

Martin Kološ (Institute of Physics, Silesian University in Opava)

Black hole magnetosphere

Extreme conditions in the magnetosphere of black holes cause a variety of interesting phenomena which are the subjects of intensive studies of modern multi-messenger astrophysics. The central theme of this talk is the analytical and numerical study of various high-energy radiative processes in the combined gravitational and electromagnetic fields taking into account the synchrotron radiation reaction and bremsstrahlung of charged particles moving in curved spacetime, scattering and decay of charged particles in the close vicinity of black holes, black hole energy extraction and treatment of chaos in the dynamical environment of black holes. The results of our theoretical studies can bring fundamental contributions to understand various currently investigated phenomena as relativistic jets, ultra-high-energy cosmic rays, black hole accretion disks, quasi-periodic oscillations and others, where the general relativistic effects with electromagnetic contributions are important.

Vladimír Karas (Astronomical Institute, Czech Academy of Sciences)

Accretion-assisted inspirals near galactic nuclei SMBH

Tidal disruption events occur when a star approaches the black hole on an orbit whose pericenter is close to the critical radius. A fraction of the star's material becomes ejected, while the rest remains bound on a new trajectory. The orbital dynamics of stellar debris close to a supermassive black hole are different due to relativistic precession and frame dragging. We explore an accretion-disc driven mechanism that helps to bring stars close enough to the critical radius, $R_{\rm t}$, and below it. The orbital decay can be enhanced by the hydrodynamical influence of the interstellar environment and gravitational radiation losses. The duty cycle of the associated (quasi-)periodicity should reflect the mechanisms of orbital decay that dominate in each given system.

Taj Jankovič (Institute of Physics, Czech Academy of Sciences)

Radiation-hydrodynamics of star-disc collisions

Quasi-periodic eruptions (QPEs) are newly discovered transients of unknown nature occurring near supermassive black holes, which feature bright X-ray bursts separated by approximately 10 hours. A promising model for QPEs is the star-disc model, where a star interacts periodically with a black hole's pre-existing accretion disc, creating shocks that expel dense gas clouds from which radiation emerges. We performed the first 3D radiation-hydrodynamics simulations to investigate the dynamics of the star-disc collisions, the properties of the ejected gas clouds, and the resulting radiation signatures. We found that star-disc collisions generate a nearly paraboloidal bow shock. The collision drives an outflow of gas both in the forward and backward directions relative to the star's motion. These outflows are asymmetric, with the forward outflow carrying more mass and producing a brighter luminosity than the backward component.

Monika Viskotová (Masaryk University)

Spectral signatures of quasiperiodic outflows in galactic nuclei

I will report about our initial results concerning spectral modelling of quasiperiodic X-ray spectral features associated with quasiperiodic erupter sources (QPEs).

Michal Zajaček (Masaryk University)

Can we detect eclipses of galactic nuclei and what are they useful for?

In this contribution, I will present the analysis of prospects of detecting orbiting stars using mm light curves of radio core in nearby radio-loud active galactic nuclei (AGN). If the star eclipses the radio core, it can be detected as a clear "dip" in the light curve, depending on its cross-section with respect to the galactic radio core. I will discuss the dip depth, duration, and recurrence timescale and how these could be applied to infer crucial parameters of AGN, such as the supermassive black hole (SMBH) mass.

Matúš Labaj (Masaryk University)

Compact stellar clusters as potential IMBH hosts

I will present our 3D magnetohydrodynamic simulations of inflow-outflow dynamics in compact stellar systems hosting an intermediate-mass black hole (IMBH). IMBHs are still a missing category of black holes in terms of mass, lying between stellar black holes up to $\sim 100\,M_\odot$ and supermassive black holes with $\gtrsim 10^6\,M_\odot$. A promising environment for hosting IMBHs are compact and dense stellar systems, such as those in the inner parts of globular clusters and in young stellar associations in the Galactic center (IRS 13 and IRS 1W associations).

Henry Best (Masaryk University)

What's in a Transfer Function?

AGN are some of the most luminous objects over long time scales and have the ability to play a key role in our understanding of the Universe. However, much is still not understood about these objects that lay at the center of galaxies. One method of probing AGN is to study their variability, where we trade spatial resolution for temporal resolution. In studying variability at different wavelengths, scientists often make certain zeroths or first order assumptions to obtain the relative sizes of emission regions. In this talk, I will discuss what information is encoded in these correlations, how transfer functions are computed, and the relationship between observable signals and physically constructed transfer functions.

Izzy Garland (Masaryk University)

Bar-driven fuelling of AGN

Despite most supermassive black hole (SMBH) growth occurring via merger-free, secular processes, the underlying mechanisms are poorly understood. We investigate the role that large-scale galactic bars play in mediating this growth, by analysing the active galactic nucleus (AGN) fraction in strongly barred, weakly barred, and unbarred galaxies up to z = 0.1, with a median z=0.067. We find that strongly barred galaxies have a higher AGN fraction than weakly barred galaxies, which in turn have a higher fraction than unbarred galaxies. Thus, large-scale galactic bars appear to facilitate AGN fuelling. We then examine the complex interplay between AGN, bars, and bulges. Since bulges can be grown via the inflow of gas driven by bars, and a number of scaling relationships demonstrate a

correlation between AGN and bulges, disentangling these processes will illuminate secular fuelling, furthering our understanding of galaxy evolution as a whole.

Congyao Zhang (Masaryk University)

Mapping Hot Gas Kinematics in Galaxy Clusters: Recent Progress with XRISM

The recently launched XRISM X-ray observatory has opened a new era for galaxy cluster studies by providing the long-awaited high-resolution spectral mapping. With its ability to directly probe the kinematics of hot gas, XRISM provides crucial insights into energy circulation in supermassive black hole feedback and cluster mergers - key processes shaping the intracluster medium and large-scale structures of the Universe. I will showcase a series of ongoing projects targeting the Perseus Cluster, A2029, and A1914, and highlight our latest findings on AGN feedback, turbulence, and nonthermal pressure.

Tomáš Plšek (Masaryk University)

Studying radio-mechanical AGN feedback with X-ray cavities

The study of radio-mechanical AGN feedback provides powerful insights into the energetics of early-type galaxies and galaxy clusters. The total energy released during individual AGN outbursts has been imprinted into jet-inflated bubbles (X-ray cavities) and can be derived by estimating the total cavity extent. To this day, studies of X-ray cavities have focused mainly on individual objects, and the cavity size estimates were ultimately based on visual inspection of noisy X-ray images. We are systematically studying an extensive sample of ¿150 galaxies and clusters containing X-ray cavities. We will present preliminary results of this analysis, showing correlations with other galaxy properties (SMBH mass, thermal state of hot atmosphere, etc.) and comparing individual cavities of multi-cavity systems. Furthermore, we will present a novel machine-learning method called the Cavity Detection Tool (CADET), developed to allow an automated and reproducible study of X-ray cavities.

Dan Hu (Masaryk University)

Diffuse radio emission within and beyond galaxy clusters

Galaxy clusters are filled with hot gas that emits X-ray on Mpc scales. In addition to this thermal X-ray emission, synchrotron radiation is also observed in many clusters, often showing a spatial correlation with the X-ray emission. This non-thermal emission is thought to originate from the (re-)acceleration of relativistic electrons, powered by merger-induced turbulence or shock fronts. Recently, the discovery of inter-cluster radio bridges and mega-halos (structures larger than typical radio halos) has suggested the presence of in-situ relativistic particles and magnetic fields in the cluster outskirts and even within large-scale filaments. I'll briefly introduce the basic knowledge and discoveries of diffuse radio emission within and beyond galaxy clusters.

Tomáš Ondro (Mendel University in Brno)

Lognormal seminumerical simulations of the Lyman alpha forest

This study aims to test a potential application of lognormal seminumerical simulations for generating large number of synthetic spectra with various input parameters. This could be ideal for interpreting the high-quality data obtained from QSO absorption spectra surveys.

Petr Trávníček (Institute of Physics, Czech Academy of Sciences)

Highlights from the Pierre Auger Observatory

The Pierre Auger Observatory is the world's largest detector of Ultra-High-Energy Cosmic Rays (UHECR). To study various properties of the cosmic-ray showers it uses a unique combination of measurement techniques: detection of particles at ground, detection of the fluorescence light emitted in the air, measurement of the accompanying radio signal and direct muon detection. The upgrade of the Observatory has recently started a new phase of data collection and provides additional insight into the electromagnetic component of showers and temporal structure of the signal traces in surface stations. Alongside the review of the measured energy spectrum, mass composition, arrival directions of UHECRs including the discovery of the large-scale anisotropy and also considering the multi-messenger physics, the talk aims to shed more light into the perspectives for future extended observations with AugerPrime and potential discoveries.

Patrik Čechvala, Jakub Juryšek (Institute of Physics, Czech Academy of Sciences)

The SST-1M Project: Present and Future

The Single-Mirror Small Size Cherenkov Telescope (SST-1M) was developed by a consortium of institutes in Switzerland, Poland, and the Czech Republic. The SST-1M design is based on the Davies-Cotton concept, featuring a 4-meter mirror and an innovative SiPM-based camera. It is most sensitive to gamma rays in the TeV and multi-TeV energy bands. Since 2021, two SST-1M prototypes have been commissioned at the Ondřejov Observatory in the Czech Republic. Recently, the SST-1M Collaboration published a detailed study describing the performance of both telescopes, including an extensive study of possible sources of systematic effects, which was validated by observation of the Crab Nebula. Besides that, several galactic and extragalactic gamma-ray sources have been observed, resulting in multiple detections. In this contribution, we present the status of the SST-1M observatory, results of the observation campaign during the first years of commissioning, and the future prospects.

Petr Hamal (Joint Laboratory of Optics, Palacky University and Institute of Physics, Czech Academy of Sciences)

Optical Systems for astro particle experiments: Research and Development at JLO

The Joint Laboratory of Optics (JLO) develops and manufactures advanced optical systems, including segmented mirrors, for leading astroparticle physics experiments such as SWGO, CTA, Auger, FAST, Hyper-Kamiokande, ATLAS, and POEMMA. The lecture will present JLO's expertise in astro-optics and highlight its role in designing and delivering optical technologies for large international collaborations.

Jakub Řípa (Masaryk University)

GRB-detecting nanosatellites GRBAlpha, VZLUSAT-2 and GRBBeta

Results from GRBAlpha, VZLUSAT-2 and GRBBeta nanosatellites and their on-board gamma-ray detectors for monitoring transients, will be presented. GRBAlpha was a 1U CubeSat launched in 2021 to a low Earth orbit (LEO) and successfully operated for more than 4 years until 2025. VZLUSAT-2 is a 3U CubeSat launched in 2022 and it operates on LEO for more than 3 years. Both missions have detected about 360 gamma-ray transients including over 180 long and short gamma-ray bursts (GRBs), including the most intense GRB ever recorded GRB 221009A and the second brightest GRB 230307A. The new family member, GRBBeta 2U CubeSat, integrated at Masaryk University, launched in 2024 already detected 10 gamma-ray transiens. Gamma-ray detectors on these nanosatellites are based on

CsI(Tl) scintillator readout by silicon photomultipliers (SiPMs) and these missions also provide unique opportunity to study radiation damage of SiPMs at LEO.

Filip Münz (Masaryk University)

QUVIK data processing

Planning of observations and extracting as much of astrophysical information as possible from data retrieved from space is the main contribution to the processes of the future UV mission QUVIK, the first Czech space telescope. The reality of observational constrains and pressure on complexity reduction, namely shifting more demanding analysis tasks from the spacecraft to ground segment modifies our original ideas of the telescope performance, but we still hope to be a strong match to the best UV observatories in the next decade.

Lýdia Štofanová (Masaryk University & Czech Aerospace Research Center)

Lessons learnt: ISU SSP25 in South Korea

During the summer 2025 I was a teaching associate for the Space Studies Program, more specifically space sciences department, of the International Space University. I wanted to share with all of you my insights, what the program is about, and the opportunities that came my way through this experience. Maybe some of you would like to participate too?

Vladimír Karas (Astronomical Institute, Czech Academy of Sciences)

Meeting near high peaks: Les Houches, Aspen, Sesto ...

We argue that high mountains are a particularly inspirative environment for (astro)physical schools and workshops.
