МОНГОЛ УЛСЫН ЗАСГИЙН ГАЗАР

БАТЛАН ХАМГААЛАХ ЯАМ

ЭРДЭМ

ASIA-PACIFIC SPACE COOPERATION ORGANIZATION APSCO

INTERSPUTNIK

Space Cooperation

Program & Abstracts

Ulaanbaatar, Mongolia
22-23 March, 2026

Organizers:

Mongolian Academy of Sciences

Intersputnik International Organization of Space Communications

Asia-Pacific Space Cooperation Organization

Sponsors:

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Lierda 利尔达

Introduction

On 22 March 1981, under the international “Interkosmos” program, the Soyuz-39 spacecraft, crewed by cosmonaut V. Dzhanibekov and Mongolia’s first cosmonaut J.Gurragchaa, launched from the Baikonur Cosmodrome. The following day, the spacecraft successfully docked with the Salyut-6 orbital station, forming the Soyuz-39 / Salyut-6 / Soyuz T-4 orbital complex.

During their mission, the crew conducted more than 30 scientific experiments in space physics, technology, Earth observation, and biomedical sciences. The mission concluded successfully on 30 March 1981. This historic spaceflight elevated Mongolia onto the global stage as the world’s 10th nation to send a human into space, the 20th to develop scientific instruments for orbital research, and one of the first five nations to perform extravehicular scientific measurements.

The Interkosmos cooperation nurtured Mongolia’s first generation of space scientists and engineers capable of conducting orbital experiments and contributing to international space research. In the decades since, Mongolia has made significant advancements in remote sensing, geospatial analytics, atmospheric monitoring, satellite data applications, and national mapping.

The cosmonaut J.Gurragchaa, Hero of Mongolia, initiated the creation of Astropark, which was opened in 2014. The Astropark features a hall of cosmology, a planetarium, and a museum of planetary science. The Astropark was landmark achievement in public education and it has welcomed more than 146,000 visitors since its opening. In 2021, it was expanded into the Space Research Center of the Institute of Astronomy and Geophysics, followed by a complete technological upgrade in 2024. Future plans include establishing a state-of-the-art aerospace laboratory for satellite systems, UAV development, testing, and training, and preparing Mongolia’s next astronaut program.

To celebrate these achievements and strengthen international collaboration, the Mongolian Academy of Sciences (MAS), APSCO and the Intersputnik International Organization of Space Communications jointly propose the organization of the 2026 Space Cooperation conference, to be held on 22–23 March 2026. Several international astronauts have expressed interest in attending this important event.

Greetings

Uchral Nyam-Osor

Chairman of the State Great Hural (Parliament) of Mongolia

On behalf of the Mongolian State Great Khural and myself, I would like to extend my warmest congratulations to the scientists, distinguished guests, and all participants organizing the scientific conference commemorating the 45th anniversary of Mongolian spaceflight.

In 1981, the spaceflight of cosmonaut Gurragchaa Jugderdemid and Commander Vladimir Aleksandrovich Dzhanibekov, which forever inscribed Mongolia's name in the history of human space exploration, was a source of immense pride that brought the scientific and educational achievements of our people to the attention of the world.

Today, scientific and technological progress, together with innovation-driven development, has become central components of the long-term development strategies of many nations. In this context, space exploration and space technology have emerged as key drivers of global advancement. The application of space technology and satellite-based information has generated significant benefits across numerous sectors - including environmental monitoring, climate change research, disaster risk reduction and management, and communications - while opening new opportunities for sustainable social and economic development.

For Mongolia, expanding the use of space technology and satellite data, strengthening national research and innovation capacity, and further enhancing international scientific cooperation are important priorities within the framework of the country's long-term development policy.

In pursuit of these objectives, the State Great Khural of Mongolia will continue to provide leadership and support in establishing a comprehensive legal and institutional framework for space exploration and space technology. This commitment includes promoting the training of qualified specialists, supporting the activities of research and development institutions, and facilitating the application of scientific achievements across social and economic sectors. Advancing the use of space technology and satellite data, together with strengthening the legal framework for the development of the space research sector, will play a key role in ensuring Mongolia's knowledge-based development.

I am confident that this scientific conference, convened to commemorate the 45th anniversary of Mongolian spaceflight, will provide an important platform to reflect on the history, current achievements, and future prospects of our nation's space exploration efforts. It will also contribute significantly to strengthening cooperation among scientists and to identifying new opportunities for science-based development.

I wish you every success in the deliberations of this conference and in your continued accomplishments in scientific endeavors.

Zandanshatar Gombojav
Prime Minister of Mongolia

On Distinguished guests, ladies and gentlemen,

Esteemed cosmonaut, Major General, Hero of Mongolia, Jügderdemidiin Gurragchaa,

It is my great honor to extend warm congratulations on the occasion of the 45th anniversary of Mongolia's first human spaceflight.

Forty-five years ago today, Mongolia's first cosmonaut launched aboard Soyuz-39, marking a historic milestone that made Mongolia the tenth country in the world and the second in Asia to send its citizen into space. This achievement stands not only as a source of national pride, but also as a testament to the power of scientific endeavor and international cooperation.

Hero of Mongolia J. Gurragchaa, your mission opened a lasting gateway for Mongolia's engagement in space science. The experiments conducted aboard Salyut-6 laid an important foundation for generations of Mongolian researchers and continue to influence national scientific development today.

Building on the achievements of 1981, Mongolia has steadily strengthened its space sector over the past four decades, expanding international cooperation through participation in the Intercosmos programme, and as a founding member of both the Intersputnik International Organization of Space Communications and the Asia-Pacific Space Cooperation Organization (APSCO). Mongolian scientists have since advanced research in space physics, medicine, and remote sensing, while promoting the practical use of satellite technologies for national development.

Today, Mongolia remains committed not only to using space technologies, but also to strengthening its own scientific and technological capabilities and contributing meaningfully to international cooperation in this field.

We expect that the agreements signed and partnerships initiated through this conference will lead to concrete outcomes and lasting collaboration. The Government of Mongolia remains firmly committed to supporting these efforts.

On behalf of the Government of Mongolia, I extend sincere appreciation to all those who contributed to the development of Mongolia's space sector, especially Hero of Mongolia J. Gurragchaa, as well as our international partners, researchers, distinguished guests, and delegates participating in this conference.

Enkhbayar Jadamba
First Deputy Prime Minister,
Minister of Economy and Development
Chairman of the National Space Policy Council of Mongolia

On behalf of the Ministry of Economy and Development, as well as personally, I am honored to extend my warm and sincere greetings and best wishes to the distinguished scholars, researchers, and honored guests participating in this scientific conference commemorating to the 45th anniversary of the first Mongolian human spaceflight.

In 1981, Mongolian citizen and cosmonaut Gurragchaa Jugderdemid successfully flew into space, an achievement that elevated Mongolia's standing and forever inscribed its name in the chronicles of human space exploration. This significant achievement opened a new chapter in the advancement of Mongolia's science and technology, inspired generations of young people to pursue careers in science, engineering, and innovation, and established an important foundation for the nation's science, technology, and research policy development.

Today, the space sector has emerged as a vital driver of economic growth and innovation worldwide. Satellite technologies and space data driven solutions are contributing meaningfully to economic expansion and technological progress, while elevating the development of multiple sectors to new heights. In this context, Mongolia remains firmly committed to advancing an innovation and high technology driven economy, with continued emphasis on strengthening scientific research, experimental development, and human resource capacity.

This scientific conference not only commemorates the historic achievements of space exploration, but also as an important platform for fostering closer linkages between scientific and technological advancement with economic growth, promoting new ideas and research directions, and expanding cooperation.

I would like to express my sincere appreciation to the organizing institutions and to all participating scholars and researchers. I am confident that your valuable intellectual contributions and research outcomes will significantly advance Mongolia's scientific and innovation landscape, and will serve as a solid foundation for the nation's future growth and prosperity.

Demberel Sodnomsambuu

President of the Mongolian Academy of Sciences

It is my great pleasure to welcome all participants to the Space Cooperation Scientific Conference in Ulaanbaatar, Mongolia. This conference is a significant occasion, as it commemorates the 45th anniversary of the historic joint Soviet-Mongolian space flight and highlights the importance of international cooperation in the peaceful exploration and use of outer space.

Today, space science and technology play an increasingly important role in sustainable development, communications, environmental observation, education, and innovation. In this context, cooperation among countries, scientific institutions, and international organizations is essential. Mongolia highly values its partnership with organizations such as APSCO and Intersputnik and appreciates their support in strengthening regional and global space collaboration.

The Mongolian Academy of Sciences is committed to promoting scientific research, international partnership, and the development of young scientists. We hope this conference will foster meaningful dialogue, new ideas, and future cooperation, while also inspiring the next generation to contribute to the advancement of space science and technology.

On behalf of the Mongolian Academy of Sciences, I extend my sincere thanks to all organizers, speakers, and participants, and I wish the conference every success.

Academician S. Demberel
President
Mongolian Academy of Sciences

**Statement from the Asia-Pacific Space Cooperation Organization (APSCO)
for the Space Cooperation Scientific Conference
March 2026, Ulaanbaatar, Mongolia**

It is with great pleasure that the Asia-Pacific Space Cooperation Organization (APSCO) joins the Space Cooperation Scientific Conference in Ulaanbaatar, co-organized with the Mongolian Academy of Sciences and the Intersputnik International Organization of Space Communications. This gathering not only marks the 45th anniversary of the historic joint Soviet-Mongolian space flight, but also stands as a testament to the enduring power of international partnership in advancing humanity's presence in space.

At APSCO, we firmly believe that space knows no borders. Established in 2008 and headquartered in Beijing, APSCO brings together member states across the Asia-Pacific region under a shared vision: to promote multilateral cooperation in space science, technology and applications through consultation, collaboration and shared benefits. Our projects—from satellite data sharing and disaster monitoring to deep space exploration—are all built upon the principle that collective effort yields greater achievements for all.

Mongolia, as a founding member of APSCO, has long been an important partner in this journey. The upcoming inauguration of the Asia-Pacific Space Science Observatories (APSSO) facility in Mongolia is a proud milestone. It reflects not only our organization's commitment to building regional space infrastructure, but also Mongolia's growing role in contributing to space science and inspiring its people.

We also believe it is important to involve the public and inspire young people. The future of space exploration depends on the youth—their curiosity, dreams, and courage to explore new things. APSCO supports educational programs, student satellite projects, and training activities to help young people develop their skills. Mongolia has many talented and energetic young people. We hope this conference will encourage them to think about careers in space science and technology.

Looking to the future, APSCO will continue to support peaceful and sustainable space activities for everyone. We would like to thank our hosts in Mongolia, all the experts taking part, and the people of Mongolia for their warm welcome. Together, we are building a future where space brings us closer, inspires us more, and benefits all of humanity.

Dr. Jiang Hui
Secretary-General
Asia-Pacific Space Cooperation Organization (APSCO)

Welcome Address by Ksenia Drozdova, Director General of Intersputnik, to Attendees of the Space Cooperation Scientific Conference (Mongolia, 22 March 2026)

Distinguished colleagues, ladies and gentlemen,
On behalf of the Intersputnik International Organization of Space Communications, I am delighted to welcome all attendees of today's conference, held in honour of the 45th anniversary of the historic spaceflight by Mongolia's first cosmonaut, Mr. Jügderdemidiin Gurragchaa. It was with great pleasure that we've accepted the invitation from the Mongolian Academy of Sciences to co-organise the Space Cooperation Scientific Conference, in partnership with the Asia-Pacific Space Cooperation Organization.

Mongolia has long maintained a close and long-standing collaboration with Intersputnik. I must emphasize that Mongolia is far more than just Intersputnik's Member. It was there at the very inception of our Organization, as one of the nine founding states that established it in 1971.

Our history of collaboration dates back to the construction of the Orbita station in 1981, which was subsequently renamed Naran. It served as the first satellite ground station for the Intersputnik international network. It enabled the people of Mongolia to access satellite communications, as well as television and radio broadcasting services. This location currently hosts the essential technical assets of most satellite communication providers in Mongolia.

Today, our partnership continues to flourish. The Ministry of Digital Development, Innovation and Communications of Mongolia consistently takes an active role in Intersputnik's global initiatives and events. The Ministry delegates its experts to sessions of the Intersputnik governing bodies, playing a vital role in pivotal strategic decisions across all areas of Organization's development. Intersputnik's resources further enable the Ministry to receive expert advice and up-to-the-minute information on global trends in the satellite and digital sectors. Mongolian experts are proactive contributors to Intersputnik's youth initiatives and professional capacity-building programmes.

Intersputnik remains fully committed to further expanding our collaboration, both by strengthening existing ties and fostering new strategic partnerships. This commitment encompasses the advancement and promotion of new satellite and broadcasting technologies, alongside the sharing of expertise and the development of Mongolia's own human capital for its national space industry.

I would like to extend my sincere gratitude to the organisers of the Space Cooperation Scientific Conference for their kind invitation. I wish all attendees and guests every success in their work and look forward to a productive cooperation!

Ksenia Drozdova
Director General
Intersputnik International Organization of Space Communications

Gurragchaa Jugderdemid
Cosmonaut of Mongolia

I extend my warm New Year's greetings to you and wish you great success, new achievements, and the best ideas in all your endeavors. For me, the newly beginning year 2026 will be a year filled with many meaningful occasions and good fortune.

One of the greatest undertakings in which I have taken part—the 45th anniversary of the Soviet-Mongolian joint spaceflight—will be commemorated this year. Mongolia's active participation in the International Interkosmos Program led to this historic joint spaceflight. Our citizens know well that this mission not only became a real milestone for Mongolia's science and space research, but also significantly enhanced our country's international reputation.

With the aim of further strengthening Mongolia's international standing and increasing our participation in the field of space research, we are preparing to hold an international scientific conference entitled "Space Cooperation", jointly organized with international space organizations, on March 22–23, 2026, in Ulaanbaatar.

In addition to many reputable organizations from abroad, we have also sent invitations to cosmonauts from the Russian Federation and the Republic of Kazakhstan, to Phạm Tuân, the first Asian cosmonaut from Vietnam, and to Yang Liwei, the first taikonaut of the People's Republic of China.

We warmly invite all domestic and international organizations and individuals who are interested in the achievements of human spaceflight and space research to actively participate in this conference.

Distinguished guest

Phạm Tuân
Cosmonaut of Vietnam

Phạm Tuân (born 14 February 1947 in Thái Bình Province, Vietnam) is a Vietnamese cosmonaut, fighter pilot, and senior military officer. He is historically significant as the first Vietnamese and the first Asian person to travel into space. Tuân flew aboard Soyuz 37, launched on 23 July 1980 from Baikonur Cosmodrome under the Soviet Intercosmos, which enabled astronauts from allied countries to participate in space missions.

During the flight, Tuân and Soviet cosmonaut Viktor Gorbatko docked with the Salyut 6, where they conducted scientific experiments in microgravity, Earth observation, and materials science. The mission lasted nearly eight days and represented an important milestone in international cooperation in space exploration, as well as a major achievement for Vietnam's scientific and technological presence on the global stage.

Before his selection as a cosmonaut, Phạm Tuân served as a fighter pilot in the Vietnam People's Air Force during the Vietnam War, where he gained distinction for his combat service. In recognition of his spaceflight and contributions to science and aviation, he was awarded the prestigious title Hero of the Soviet Union. He later rose to the rank of lieutenant general and remained an influential figure in Vietnam's aerospace and defense sectors.

Agenda

20-21 March 2026

Time	Activity	Details / Speakers
ARRIVAL AND REGISTRATION		
All Day	Arrival / Hotel check-in	Airport pick-up, arrival of participants and hotel check-in
15:00 - 18:00	Registration	Registration and distribution of conference materials and commemorative gifts

22 March 2026

	Activity	Details / Speakers
I. OPENING AND PLENARY SESSION (All Participants)		
Venue: Event Hall and Lobby		
08:00 - 09:00	Registration	
09:00 - 10:00	Welcome Address - Mongolian Academy of Sciences (MAS) Commemorative Address - 45th Anniversary of Mongolia's First Space Flight Greetings from • Secretary General of APSCO • Director General of INTERSPUTNIK	Opening Ceremony
10:00 – 10:10	Short Video "45th Anniversary of the First Mongolian in Space"	
10:10 - 10:30	Group photo (All Participants)	
10:30 - 10:50	Keynote speech – MAS: Mongolia in Space: Past, Present, Future	
10:50 - 11:10	Keynote Speech – INTERSPUTNIK: Overview of the Global Satellite Communications Industry	
11:10 - 11:30	Keynote Speech – APSCO: The Asia-Pacific Space Cooperation Organization Flagship Projects and Activities	
11:30 - 11:50	Signing Ceremony MOU	(MAS, APSCO) and (MAS, INTERSPUTNIK)
11:50 - 13:00	Lunch Break	
13:00 - 13:20	Opening ceremony of the stamp issued by Mongol Post JSC	"65th Anniversary of the First Human Spaceflight and 45th Anniversary of the First Mongolian in Space"
Technical Session I: Space Science and Observation		
Moderator: Gantugs Tsegmid, APSCO		
13:20 - 13:35	Leading Regional Collaboration for a Safe Space Environment: Progress and Prospects of the APSPO Project in Support of Long-Term Sustainability of Outer Space	Liu Jing, National Astronomical Observatories, China
13:35 - 13:50	Astronomical Observatory in Mongolia	Amarsaikhan Zorigoo, IAG, MAS, Mongolia
13:50 - 14:05	Pakistan's Space Science Program: An Overview	Muhammad Iqbal, SUPARCO, Pakistan
14:05 - 14:20	Ground-Based Astronomical Observation in Peru: The CONIDA Astronomical Observatory Initiative	Erick Gregorio Meza, CONIDA, Peru
14:20 - 14:35	Space science activities in Thailand	Apichat Leckngam, NARIT, Thailand
14:35 - 14:50	Space Science and Observation Facilities in Türkiye	Şule ÇEKEN YÜGRÜK, TUA, Türkiye
14:50 - 15:05	Information & Intelligence, Anytime & Anywhere	TsingAI Comm., Inc., China
15:05 - 15:30	Coffee Break	

Technical Session II: Space Policy, Law and Capacity Building		
Moderator: Elina Morozova, Intersputnik |		
15:30 - 16:00	Introductory panel discussion on space policy, law and capacity building	Intersputnik
16:00 - 16:15	The drafting history and cooperative significance of the Agreement on the Rescue and Return of Astronauts	Elina Morozova, Intersputnik
16:15 - 16:30	Action Team on Lunar Activities Consultation	Guoyu Wang, Beijing Institute of Technology
16:30 - 16:45	Responsible use of AI in space and Earth Observation (EO) and use of EO for disaster-related applications	Hamid Mehmood, United Nations Office for Outer Space Affairs
16:45 - 17:00	Shaping the future: supporting young professionals today	Iaroslav Vasianin, Intersputnik
17:00 - 17:30	Q&A	
III. OFFICIAL 45TH ANNIVERSARY BANQUET		
17:30 - 21:00	Banquet	Ikh Mongol Urgoo Event Hall

23 March 2026

Time	Activity	Details / Speakers
Technical Session III: Space Technology and Application - 3rd Space and Aerospace Technology Conference		
Moderator: D. Erdenebaatar, MAS		
08:30 - 09:30	Day 2 registration (Coffee) & Opening	
09:00 - 09:15	Development of Modern Remote Sensing Methods and Technologies	D.Amarsaikhan, IGG, MAS, Mongolia
09:15 - 09:30	Space activities of the National University of Mongolia and Non-Governmental Organizations - MOSTA	Turtogtokh Tumenjargal, National University of Mongolia
09:30 - 09:45	BDS Spatio-Temporal Information Integrated Service Platform Empowering Global Smart Applications	Junjie Xu, China Time and Space Information Group Co., Ltd.
09:45 - 10:00	On observing water surfaces changes from space	Stefano Vignudelli, Consiglio nazionale delle Ricerche, Italy
10:00 - 10:15	Geoscientific application of space geodetic techniques in Khureltogoot Astronomical Observatory, Mongolia	Amarjargal Sharav, IAG, MAS, Mongolia
10:15 - 10:30	Bridging the Gap: Advancing Regional Development via the APSCO Data Sharing Service Platform	Tatiya Chuentragun, APSCO
10:30 - 10:45	GalaxySpace - LEO Satellite Constellation for a Connected Future	Peter Huang, GalaxySpace, China
10:45 – 11:00	Introduction to Space Science Activities in Bangladesh	Naim Islam Talukder, SPARRSO, Bangladesh
11:00-11:15	A Proposal for a Shared TT&C Infrastructure: The APSCO Multimission Space Operations Platform Initiative	Dong Wei, Emposat Co., Ltd., China
11:15- 11:30	4D Characterization of Tropospheric Water Vapor Dynamics Over Ulaanbaatar: A Machine Learning Approach During Extreme Weather Events	Bulgan Gankhuyag, IMDT, MAS, Mongolia
11:30 - 12:00	Coffee break & Poster Session	
12:15 - 12:30	Closing Remarks of Conference	
12:30 - 13:30	Lunch Break	Event Hall

Session I
Space Science and Observation

Leading Regional Collaboration for a Safe Space Environment: Progress and Prospects of the APSPO Project in Support of Long-Term Sustainability of Outer Space

Liu Jing[1,2]

[1]National Astronomical Observatories, China

[2] University of Chinese Academy of Sciences, China

The rapidly growing volume of space debris poses significant challenges to the safety of outer space activities. To maintain a stable and clean space environment, halt the increase in the space debris population, and safeguard the long-term sustainability of outer space activities has become an international consensus. All countries have successively introduced policies for space debris environment governance and formulated laws and regulations to promote space debris mitigation.

As a regional international organization, APSCO has also made considerable efforts in this regard. As an important foundational initiative, the APSPO project has received joint support from all member states. Over the past years, with the support of the Secretariat, the project has achieved initial results in facility and capacity building, data sharing, and the establishment of cooperation mechanisms.

Faced with the increasingly complex development landscape and technical challenges of outer space activities, the APSPO project holds enormous potential. On the one hand, it can develop a regional space traffic management platform test system to contribute to ensuring the safety of member states' space activities. On the other hand, it can serve as a demonstration platform for international cooperation mechanisms, setting best practices for advancing broader international cooperation and promoting the long-term sustainability of outer space.

Astronomical Observatory in Mongolia

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Mongolia is one of the countries with highly favorable natural conditions for astronomical observations. Its vast territory, low population density, and relatively low level of light pollution provide excellent opportunities for clear and precise observation of celestial objects. This presentation introduces the astronomical observatories in Mongolia, their roles, and main activities. In particular, it highlights the work of the Institute of Astronomy and Geophysics, including its primary research directions and observational environment. In addition, the presentation outlines the geographical and climatic advantages of Mongolia, emphasizing its potential for astronomical observations. Future opportunities for development and the importance of international collaboration are also discussed. This presentation aims to showcase Mongolia's potential to become a promising regional hub for astronomical observation and research.

Keywords. Astronomical Observatory, Mongolia, Solar Observation

Pakistan's Space Science Program: An Overview

Muhammad Iqbal, Amjad Ali, Zafar Iqbal

Pakistan Space and Upper Atmosphere Research Commission-SUPARCO, Pakistan

Pakistan's space science program, led by the National Space Agency i.e. Pakistan Space and Upper Atmosphere Research Commission (SUPARCO), has progressively evolved from early atmospheric studies to a broader scientific framework that includes satellite development, astronomical research and participation in international space science initiatives. This talk presents an overview of Pakistan's progress in these areas and highlights the country's growing capabilities in space science and technology sector. In recent years, Pakistan has embarked on its development efforts to strengthen indigenous space capabilities. This involves a range of initiatives that expands from the steps towards development/operation of a rage of earth observation and communication satellites to wider range of space technology applications in the sectors like environmental monitoring, resource management, disaster assessment, and scientific research and contributions towards global initiatives like International Lunar Research Station (ILRS). These initiatives also contribute to building technical expertise and encouraging innovation within the national space sector. Pakistan's astronomical research infrastructure comprises of Optical telescopes installed at research institutions and observatories enabling observations of celestial objects, transient events, and space weather. The development of modern observatory facilities with advanced telescope systems marks an important step toward improving the country's capacity for astronomical data collection and analysis. Future plans include the installation of large aperture telescopes to support deep space research. Pakistan is also actively involved in international collaborations, including initiatives under the Asia-Pacific Space Cooperation Organization (APSCO) such as the Asia Pacific Space Science Observatories (APSSO). Participation in programs like the International Lunar Research Station (ILRS) further reflects Pakistan's growing interest in cooperative lunar and deep-space research. Overall, Pakistan's space science program demonstrates a steady transition toward a more integrated ecosystem combining satellite development, space technology applications, observational astronomy and international collaboration, positioning the country to play an increasingly active role in regional and global space science initiatives.

Keywords. Space Science, Space Observation, Astronomy, Space Weather, ILRS

Ground-Based Astronomical Observation in Peru: The CONIDA Astronomical Observatory Initiative

Erick Meza

Comisión Nacional de Investigación y Desarrollo Aeroespacial del Perú- CONIDA,
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This contribution presents the CONIDA Astronomical Observatory, a ground-based astronomical facility operated by the Comisión Nacional de Investigación y Desarrollo Aeroespacial (CONIDA), the Peruvian Space Agency. The observatory is located in the region of Moquegua in southern Peru and supports optical observations of the southern sky.

The facility includes telescopes and supporting instruments that have been implemented for astronomical observations and monitoring programs. Initial observational campaigns carried out during the commissioning phase are described, including stellar occultation observations by minor bodies of the Solar System. Future observational plans and opportunities for collaboration are also outlined.

Keywords: Ground-based astronomy; Astronomical observatories; Southern sky observation.

Space science activities in Thailand

Apichat Leckngam

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Space science activities in Thailand have evolved from remote sensing applications to ambitious lunar exploration partnerships and interactive public education. The sector is primarily driven by the National Astronomical Research Institute of Thailand (NARIT) and the Geo-Informatics and Space Technology Development Agency (GISTDA).

Space Missions & Research in Thailand

- Thai Space Consortium (TSC): A collaboration of 13 scientific agencies and universities aiming to develop and launch Thai-made satellites, under the project named TSC.
- Lunar Exploration: Thailand is an international partner in China's Chang'e-7 program. The Thai-developed MATCH (Moon Aiming Thai-Chinese Hodoscope, a neutron monitor) instrument is scheduled to deploy on the 2026 lunar mission to conduct frontier space research.
- Satellite Technology: Thailand has launched 15 satellites to date. Recent milestones include the successful launch of homegrown satellites like KNACKSAT-2 (3U CubeSat) and the development of THEOS-2A components.
- Microgravity Research: Thai researchers from Kasetsart University have conducted experiments on liquid crystal behavior in microgravity, which was launched to the International Space Station (ISS).
- Space Situational Awareness (SSA): Thailand's Space Situational Awareness (SSA) is a rapidly growing sector and focusing on tracking space objects and mitigating collision risks to ensure the safety of national assets like the THEOS satellites. Thailand is going to install the SSA telescope which corroborate under a member state of APSCO (Asia-Pacific Space Cooperation Organization).

Space Science and Observation Facilities in Türkiye

Şule ÇEKEN YÜGRÜK*

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This study provides an overview of the space science and observation ecosystem in Türkiye. The Turkish Space Agency (TUA), established in 2018, coordinates this ecosystem under the National Space Program (MUP). This ten-year roadmap includes key goals such as lunar exploration (AYAP) and human spaceflight. A major part of this program is the Turkish Astronaut and Science Mission (TABM). During this mission, thirteen scientific experiments were conducted on the International Space Station to study microgravity's effects on life and material sciences.

In addition to these missions, Türkiye has significant ground-based observation facilities. The Eastern Anatolia Observatory (DAG) features a 4-meter telescope with adaptive optics. It is strategically located to fill a critical longitude gap in the Northern Hemisphere for infrared and visible light observations. The TÜBİTAK National Observatory (TUG) also provides high-precision data with its 1.5-meter telescope. Furthermore, several university observatories support this network. For example, Ankara University uses an Echelle spectrograph, and Çanakkale Onsekiz Mart University operates a 1.22m robotic telescope. Together, these facilities create a strong infrastructure for spectroscopic and optical research, fostering international collaboration in the field of space sciences.

Keywords. Space Policy, Observational Astronomy, Science Missions, DA

Make Information & AI Anytime & Anywhere

TsingAI Comm., Inc. China

Currently, with SpaceX's Starlink in the United States as a representative, global communication satellite resources are experiencing explosive growth. China's communication satellites are also in rapid expansion, including Tsinghua University-led medium Earth orbit communication constellation "TSN", low Earth orbit communication constellations GW and Qianfan, as well as market capital-driven Lingshu Constellation (narrowband communication) and Lingyao Constellation (broadband communication). The increase in satellite resources will inevitably lead to vigorous development of satellite applications and terminal industries, with rapid market growth and technological iteration. Trends in satellite terminals and applications include: integration terminal of multi-orbit, multi-system satellites; convergence of space-ground integrated information; integration of communication and AI. Mongolia, with its vast territory and sparse population, offers high cost-effectiveness for space-ground integrated information networks, presenting broad application prospects. Through cooperation with local Mongolian partners in fields such as mining, transportation, agriculture, livestock farming, education, government and so on, we will not only address communication challenges but also promote the construction of local large model and the application of AI.

Session II
Space Policy, Law and Capacity Building

Description of the Session

This session brings together distinguished experts from international organizations, national policy circles and academia to explore the evolving landscape of space policy, law and capacity building, with perspectives spanning global governance, national engagement and institutional practice.

The session will open with a moderated panel discussion designed to provide a clear and accessible overview of how space governance functions today – including the roles of the United Nations system, national actors and international legal frameworks. This introductory exchange will set the scene by addressing who shapes space governance, why it matters, and how it increasingly affects all of us, including everyone in the audience.

The introductory panel discussion will be followed by a series of focused presentations, where speakers will examine specific topics in greater depth, ranging from the historical development of key space law instruments to emerging issues such lunar activities' coordination, responsible use of space technologies and capacity-building initiatives.

The session will conclude with an interactive Q&A segment, offering participants the opportunity to engage directly with the speakers, raise questions and share perspectives.

Bringing together complementary expertise and practical experience, the session aims to move from broad understanding to deeper insight, and to foster a dynamic dialogue on the present and future of space governance.

The drafting history and cooperative significance of the Agreement on the Rescue and Return of Astronauts

Elina Morozova

Intersputnik International Organization of Space Communications

The Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (the Rescue Agreement) was commended by the United Nations General Assembly in December 1967 by a unanimous vote of 115 States. Given the highly humanitarian nature of this treaty, the General Assembly requested the depositary governments to open it for signature at the earliest possible date. This was done in April 1968, and by December of the same year the Rescue Agreement had entered into force, becoming a major milestone in the development of international space law and another important step toward stronger international cooperation.

The drafting history of the Rescue Agreement was far from short or easy. It took almost ten years of lively discussions within the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS), all during the Cold War. The broader geopolitical situation and the difficult events of that period inevitably affected the negotiations. Whenever the USSR and the United States reached a better mutual understanding, the Legal Subcommittee of COPUOS met in an atmosphere of reduced international tension. Periods of promising cooperation were, however, often followed by complete deadlock. Yet even at moments of sharp disagreement, when compromise between the two major space powers seemed impossible, one point remained clear: outer space should not become a theatre of conflict.

In this process, the role of a number of COPUOS member States was especially important. They often helped overcome deadlocks and opened the way for further progress.

This presentation looks at the difficult negotiations on the Rescue Agreement and the sharply differing views expressed during its drafting, while showing that they ultimately pointed in the same direction: recognition of the absolute value of human life and the need for humanitarianism in all circumstances. The Rescue Agreement became not only an invaluable contribution to the peaceful exploration and use of outer space, but also a vivid example that agreement is always possible when the interests of all humankind are at stake.

Harnessing Space-based Information and Responsible GeoAI for Weather, Hazard and Disaster Resilience: The Work of UNOOSA and UN-SPIDER

Hamid Mehmood

United Nations Office for Outer Space Affairs

This presentation examined the growing role of the United Nations Office for Outer Space Affairs (UNOOSA), and in particular the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER), in advancing the responsible use of artificial intelligence (AI), Earth observation, and geospatial technologies for disaster risk reduction and sustainable development. The presentation highlighted how the current "golden age" of Earth observation - characterized by unprecedented satellite data availability, expanding computing power, and rapid advances in GeoAI—creates major opportunities for improving weather, hazard, and disaster resilience worldwide. At the same time, it emphasized that these opportunities must be accompanied by strong policy attention to ethics, transparency, equity, and capacity-building.

A central focus of the presentation was the need for responsible AI in space and Earth observation. Key challenges discussed included opaque AI decision-making, gaps in human oversight for time-critical and autonomous systems, the environmental footprint of large geospatial models, insufficient evaluation of emerging foundation models, persistent data bias toward the Global North, unequal access to data and computing resources, risks of manipulation and misinformation, and unresolved issues of ownership and licensing. In response, the presentation drew on UNOOSA's policy-oriented work to argue for a fair, inclusive, and trustworthy GeoAI ecosystem that supports all countries, especially developing nations.

The presentation also underscored the importance of localizing geospatial foundation models through context-specific data curation, domain adaptation, local validation, lightweight deployment, and institutional capacity-building. This approach is essential for ensuring that AI-enabled geospatial systems produce reliable and meaningful results in diverse operational settings. Practical examples from UN-SPIDER and partner initiatives—including drought early warning, flood impact forecasting, and transboundary geospatial platforms—demonstrated how space-based data and AI applications can support preparedness, response, and resilience at national and regional levels. The presentation additionally referred to emerging tools such as Digital Twins and SatGPT as promising innovations for interactive analysis, scenario exploration, and decision support.

Overall, the presentation argued that the future of space-enabled disaster resilience depends not only on technological innovation, but also on governance, capacity-building, and international cooperation that ensure such innovations are accessible, accountable, and beneficial to all.

The Action Team on Lunar Activities Consultation (ATLAC)

Guoyu Wang

Beijing Institute of Technology Law School

This presentation examined the growing role of the United Nations Office for Outer Space Affairs (UNOOSA), and in particular the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER), in advancing the responsible use of artificial intelligence (AI), Earth observation, and geospatial technologies for disaster risk reduction and sustainable development. The presentation highlighted how the current "golden age" of Earth observation - characterized by unprecedented satellite data availability, expanding computing power, and rapid advances in GeoAI—creates major opportunities for improving weather, hazard, and disaster resilience worldwide. At the same time, it emphasized that these opportunities must be accompanied by strong policy attention to ethics, transparency, equity, and capacity-building.

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Shaping the Future: Supporting Young Professionals Today

Iaroslav Vasianin

Intersputnik International Organization of Space Communications

The presentation explores the role of space capacity building in shaping the future of the global space sector, with a particular focus on supporting young professionals. In the context of rapid technological advancement, increasing commercialization, and the growing complexity of space activities, the development of human capital is identified as a key factor for sustainable space governance.

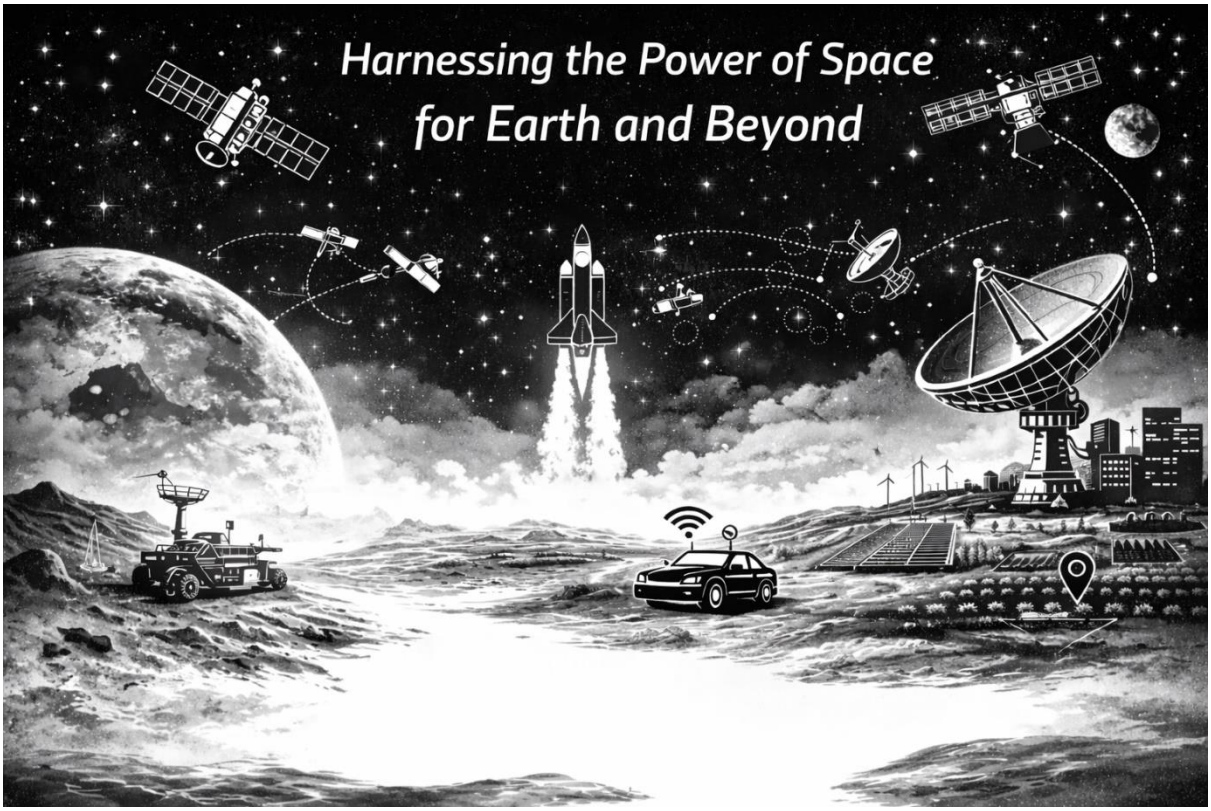
The presentation highlights the importance of capacity building as recognized in the United Nations documents, including the Guidelines for the Long-term Sustainability of Outer Space Activities and the Space2030 Agenda. These instruments emphasize capacity building as a central pillar of international cooperation, aimed at expanding access to the benefits of space activities while ensuring the long-term sustainability of the outer space environment.

It also reviews practical capacity-building initiatives implemented by international organizations, such as the United Nations Office for Outer Space Affairs and the International Telecommunication Union. These initiatives include training programmes, workshops, fellowships, and online learning platforms designed to strengthen technical expertise, policy understanding, and institutional capabilities.

Special attention is given to the activities of the Intersputnik International Organization of Space Communications in the field of space capacity building. These include international conferences, targeted training programmes, cooperation with universities, and initiatives supporting the youth within the framework of the Youth Far Beyond Borders project.

It is argued that expanding access to capacity-building opportunities, particularly in developing countries, and investing in young professionals are essential for ensuring the long-term sustainability and effective governance of space activities.

Session III
Space Technology and Application



Development of Modern Remote Sensing Methods and Technologies

D.Amarsaikhan, B.Byambadolgor, D.Enkhjargal

Institute of Geography and Geoecology, Mongolian Academy of Sciences, Mongolia

The modern development of remote sensing (RS) represents one of the most significant technological achievements in recent history, fundamentally transforming how humans observe, analyze, and manage the Earth's surface. RS, defined as the acquisition of information about objects or areas from a distance using satellite or airborne sensors, has evolved from a limited scientific technique into a powerful, data-driven system that supports a wide range of global applications.

A major factor in this development has been the advancement of sensor technologies. Modern RS systems are equipped with a variety of sensors, including optical, microwave, LiDAR, and thermal instruments. Optical sensors, particularly multispectral and hyperspectral systems, capture data across numerous wavelengths of the electromagnetic spectrum, enabling detailed analysis of vegetation, soil, minerals, and land-cover classes. Microwave sensors provide the capability to collect data regardless of weather conditions or daylight, making them invaluable for monitoring floods, forest changes, and surface deformation. Meanwhile, LiDAR technology enables precise three-dimensional mapping of terrain and surface structures, while thermal sensors contribute to the measurement of land surface temperature and energy balance.

Another important aspect of modern RS is the integration of advanced data processing techniques. The increasing volume of satellite data has necessitated the use of cloud computing and big data platforms. Tools such as Google Earth Engine enable users to process vast amounts of spatial data efficiently without requiring extensive local computing resources. At the same time, artificial intelligence and machine learning algorithms have become essential for analyzing complex datasets.

The applications of modern RS are extensive and continue to expand. In environmental monitoring, RS plays a vital role in tracking climate change, deforestation, desertification, and biodiversity loss. In agriculture, it supports precision farming by providing information on crop health, soil moisture, and yield estimation. It is also indispensable in disaster management, enabling rapid assessment of natural disasters such as floods, wildfires, and earthquakes. Additionally, RS contributes to urban planning by monitoring land-use changes and infrastructure development, and it supports water resource management through the observation of seas, lakes, rivers, and glaciers.

The aim of this study is to demonstrate how modern RS methods and technologies can be applied to environmental management, natural resource assessment, land-cover monitoring, and other applications. To this end, various case studies conducted in Mongolia at the national, regional, and local levels are presented and discussed.

Keywords: Modern RS, methods, technologies, applications

Space Activities of the National University of Mongolia and Non-Governmental Organizations: MOSTA

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[2]Space mission development laboratory, National Univeristy of Mongolia, Mongolia
[3]Mongolian Space Technology Association NGO, Mongolia

Space activities in Mongolia have been developing through the combined efforts of universities, research groups, governmental and non-governmental organizations. This presentation highlights the role of the Nano Satellite Development Laboratory at National University of Mongolia (NUM) and the Mongolian Space Technology Association (MOSTA) in advancing space science, engineering education, research capacity, and public outreach. At NUM, space-related activities have expanded through academic programs, laboratory development, CubeSat initiatives, and student-centered hands-on training in space systems engineering. A major driver of this progress has been the Mongolia–Japan Higher Engineering Education Development project (M-JEED), which has supported capacity building in engineering and research, strengthened international university collaboration, and contributed to the long-term development of space engineering at NUM.

The presentation will also discuss the contribution of MOSTA as a non-governmental organization that promotes space technology awareness, supports youth engagement, and helps connect academia, industry, and the public through outreach and collaborative activities. Together, Mongolian Academy of Science, NUM and MOSTA represent an important model for developing Mongolia's emerging space sector by combining formal education, research, practical engineering experience, and community participation. Their activities are helping build national human capacity, encourage innovation, and inspire the next generation of Mongolian engineers and space professionals.

BDS Spatio-Temporal Information Integrated Service Platform Empowering Global Smart Applications

Xu Junjie

China Time and Space Information Group Co., Ltd., China

High-precision navigation systems serve as critical infrastructure for the development of the digital economy. By providing centimeter-level positioning capabilities, they empower diverse industries and support the implementation of smart applications. From ensuring the safe operation of autonomous vehicles to guiding precise drone operations and optimizing routes for smart logistics, high-precision navigation plays an indispensable role.

The BeiDou Navigation Satellite System (hereinafter referred to as BDS) is a world-class system independently constructed and operated by China. In 2024, China Space-Time Information Co., Ltd. (hereinafter referred to as China Space-Time) was officially established. As the sole operator of the BDS, the company is comprehensively accelerating the marketization, industrialization, and internationalization of BDS application, delivering high-precision space-time information services to users globally.

Currently, China Space-Time is actively promoting comprehensive BDS applications worldwide. The company is seeking partners to jointly deploy BDS Space-Time Service Platform. China Space-Time also provides short message services and secure, trusted precise positioning services for specific regions, assisting international partners in realizing smart applications and driving a comprehensive upgrade in digital infrastructure development.

Keywords. Astronomical Observatory, Mongolia, Solar Observation

On Observing Water Surface Heights Changes from Space

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The observation of the global water targets is highly dependent on the recent and future launches of satellites. Satellites provide key information for studying, monitoring, and forecasting the dynamics of water targets. New and improved satellite data sets have been developed and have directly impacted our understanding of ocean and hydrological processes. In particular, radar altimeters are an invaluable tool to retrieve from space water level. More than a decade of research the advantages of satellite altimetry, which ensures global coverage and regular temporal sampling. In this brief presentation, an integrated view of the state-of-the-art in radar altimetry applied to water targets is provided, with examples showing particular phenomena (e.g. sea level rise, river flooding, etc.).

Keywords. satellite, radar altimetry, water level, ocean, lakes, rivers

Geoscientific Application of Space Geodetic Techniques at Khureltogoot Astronomical Observatory

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Advances in space technologies have transformed the science of geodesy into a key component of modern Earth observation. Contemporary geodetic methods enable precise monitoring of solid Earth dynamics, mass redistribution, and changes in the hydrosphere, cryosphere, and atmosphere. These observations provide high-resolution spatial and temporal data that are essential for understanding the Earth as an integrated system and for investigating processes related to global environmental change. Over the last decade, the accuracy of space geodetic measurements has improved dramatically. A worldwide international effort in global geodesy enabled positions in remote regions to be determined in three-dimensional Cartesian coordinates relative to the Earth's center with centimeter-level precision. Geodetic observations also enable routine determination of Earth rotation parameters with precision at the level of approximately 0.1-0.2 milli-arcseconds for polar motions and in the tens of microseconds for daily length of day variations.

Khurel Togoot Astronomical Observatory, like many other observatories around the world, has been involved in global geodetic observations throughout the history of the international programs, particularly the Intercosmos program. The Observatory has been carrying out continuous optical observations using Zenith and Passage telescopes (Carl Zeiss) to determine the latitude and the longitude, and synchronous photographic observations of artificial satellites on the background of the stars using AFU75 and FAS3 telescopes (former USSR). These observations have supported the determination and refinement of the Earth model and contributed to studies of the atmosphere at global, regional, and local scales.

Nowadays, with the invention of space microwave techniques such as GNSS and DORIS, the Khureltogoot Observatory contributes to the International Terrestrial Reference Frame of the Earth Rotation Service by high-rate low-latency GNSS observations of 4 stations, of which one is IGS only station in Mongolia and co-located with DORIS since 2024. These GNSS stations have over two decades of observation records and serve as the backbone of the national geodetic reference frame. As a multi-disciplinary tool, we use GNSS observations to study crustal deformations, ionosphere and troposphere variations in terms of precipitable water vapour and total electron content derived from the GNSS/GPS signals. INSAR remote sensing is also used for detecting co-seismic deformations and focal mechanism determination of moderate-sized earthquakes occurring in Mongolia. These pioneering, multi-disciplinary applications are essential to the Mongolian geoscientific community, using emerging technologies to solve complex dynamic Earth system problems to integrate it for predictive modeling.

Keywords: *Space geodesy, dynamic Earth observation and monitoring, Mongolia*

Bridging the Gap: Advancing Regional Development via the APSCO Data Sharing Service Platform

Tatiya Chuentragun

Director General, Department of Program Operation and Data Service, Asia Pacific Space Cooperation Organization (APSCO)

This presentation aims to highlight APSCO's efforts to bridge the gap in creating social and economic value from space technology and applications for its Member States and the wider region.

We are currently witnessing an explosion in Earth Observation (EO) capacity. Thousands of new satellites are being launched, generating petabytes of high-resolution data daily. We have more eyes on Earth than ever before. The convergence of massive datasets with Machine Learning now allows us to automate analysis, turning raw pixels into semantic understanding. Yet, despite these advances, critical gaps remain. Too often, these data and technologies are not fully utilized—they are not yet as available, accessible, affordable, and applicable as they should be.

APSCO is actively working to narrow these gaps by providing direct support to Member States and delivering tangible value to users through regional cooperation. Key initiatives include, but are not limited to: the APSCO Data Sharing Service Platform, the APSCO Disaster Response Mechanism, APSCO Space Application Projects (focusing on Remote Sensing and Geospatial Information), and the APSCO Education and Training Program

Satellite development, ground station solutions

Peter Huang

GalaxySpace, China

This report consists of three main parts: the introduction of the new space era and its driving forces; the overview of GalaxySpace and its innovations in satellite development and applications; and the prospects for collaborations in this field. As China's pioneering unicorn in commercial space and satellite Internet, GalaxySpace excels in independent LEO satellite R&D, low-cost mass production, and constellation operation, boasting a nationwide industrial layout and verified, advanced space-ground integrated solutions. The company has delivered up to date more than 40 small satellites, covering both remote sensing and telecommunication applications, for the clients and its own network. Its low earth orbit (LEO) constellation network, currently in its trial phase, has validated broadband use cases across various regions. It has forged in-depth partnerships with local governments and telecom operators across Southeast Asia, the Middle East, Africa, and Latin America, with satellite services now entering implementation in these regions. GalaxySpace proposes a co-build and co-share model for building space infrastructure, capacity, and various applications for the coming years.

Introduction to Space Science Activities in Bangladesh

Md. Naim Islam Talukder

Bangladesh Space Research and Remote Sensing Organization (SPARRSO), Bangladesh

This presentation outlines the nation's strategic transition from a consumer of satellite data to an active participant in global space science and technology. It highlights major government initiatives, including feasibility studies for a domestic satellite manufacturing facility, a rocket launching station, and the development of a dedicated Space Industrial Park designed to foster high-tech research and foreign investment.

The document further emphasizes Bangladesh's expanding international presence, notably becoming the 54th signatory of the NASA-led Artemis Accords in 2025. It currently deals with key projects such as the Bangabandhu-2 Earth Observation satellite and the integration of Starlink for rural connectivity. It also notes the emergence of the domestic private space industry, exemplified by the startup DhumketuX and its goal of launching a commercial rocket by 2027. Beyond infrastructure, the presentation showcases how space technology enhances national security and sustainable development through maritime boundary delineation, disaster management, and agricultural monitoring. Ultimately, these activities aim to position Bangladesh as a significant regional player in the global space economy.

A Proposal for a Shared TT&C Infrastructure: The APSCO Multimission Space Operations Platform Initiative

Dong Wei

Emposat Co., Ltd., China

Background: The rapid expansion of LEO satellite constellations and national space programs in the Asia-Pacific region has created an urgent demand for reliable, cost-effective TT&C and data downlink services. However, sovereign ground station coverage remains a critical bottleneck for many member states of the APSCO, limiting their independent space operations and application development.

Proposal: The presentation details a concrete joint initiative between APSCO and Emposat Co., Ltd. to develop the APSCO Multimission Operations Platform (AMOP). The AMOP is designed as a shared, open-access infrastructure to provide standardized TT&C and mission support services, thereby lowering the entry barrier and operational costs for national space programs across the region.

Methodology & Model: The platform's architecture is based on a hybrid, three-tier ground station network integrating new and existing assets. A key innovation is the proposed "1+1+1" tripartite cooperation model, detailing the roles, investments, and revenue-sharing mechanisms among APSCO member states (as investors and users), APSCO (as coordinator and governance body), and the commercial service provider (as technology and operational implementer). This model addresses financial sustainability and equitable benefit distribution.

Expected Outcomes & Significance: The AMOP aims to: 1) Democratize access to essential space infrastructure, 2) Foster technology and capability transfer through shared operations, and 3) Establish a scalable, replicable framework for future multilateral space cooperation under the APSCO framework. A phased implementation roadmap will be presented. The initiative represents a significant step from principle to practice in building an integrated Asia-Pacific space community, with the long-term goal of evolving into a regional hub for space-derived data and applications.

4D Characterization of Tropospheric Water Vapor Dynamics Over Ulaanbaatar: A Machine Learning Approach During Extreme Weather Events

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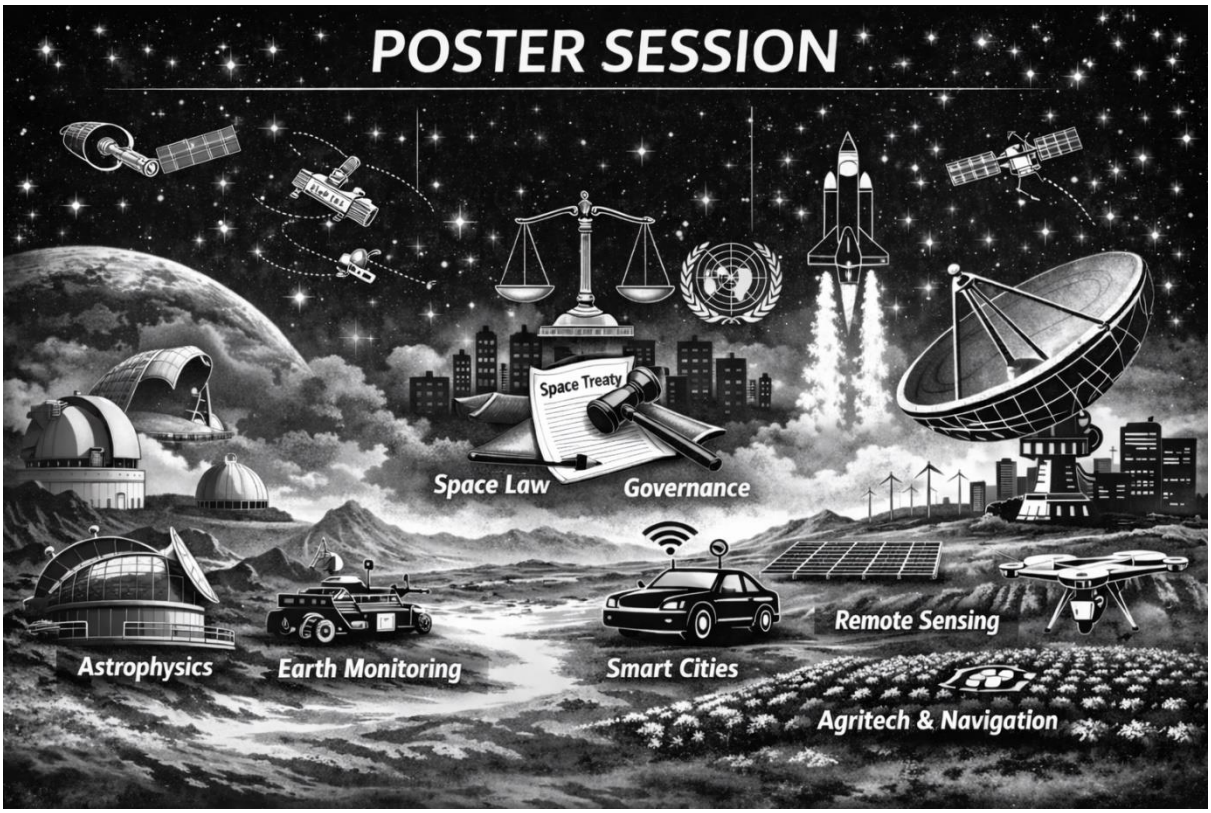
The accurate spatiotemporal monitoring of tropospheric water vapor is essential for mitigating the impacts of severe weather in landlocked, high-altitude regions like Mongolia. This study presents a high-resolution 4D tropospheric tomography model developed for Ulaanbaatar, leveraging the synergy between Global Navigation Satellite System (GNSS) observations and ERA5 reanalysis data.

A Machine Learning (ML) framework was implemented to reconstruct the water vapor density across atmospheric layers, incorporating advanced spatial and geopotential constraints to refine vertical profiling. The model was rigorously tested during two contrasting scenarios: a stable atmospheric period and an extreme convective storm event in early 2024.

Results indicate that the GNSS-ML model successfully captured rapid moisture convergence (Perceptible Water Vapor spikes) up to 6 hours prior to the onset of severe weather, a feat unattainable by conventional twice-daily radiosonde launches. Validation against radiosonde profiles (Station 44272) showed a significant improvement in accuracy, with RMSE values consistently lower than traditional interpolation methods. This research demonstrates that integrating GNSS-derived delays with ML provides a robust, real-time monitoring tool for enhancing short-term meteorological forecasting and early warning systems in Mongolia's capital.

Keywords: GNSS Meteorology, 4D Tomography, Machine Learning, Ulaanbaatar, Extreme Weather.

Poster session



Earthquake Monitoring Using Psi and Sentinel-1 Sar Data

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On January 12, 2021, a magnitude Ml6.5 earthquake struck the Khankh Sum area of Khuvsgul province. Seismic displacements were calculated using the two-pass interferometric method, and the PSI technique determined the displacement time series. The study's field data encompassed 26 descending orbit data sets from 2019 to 2022, employing VV polarization in IW mode of the Sentinel-1B satellite. On the left side of the fault, 2 pieces of land near the west shore of the lake are shown to have subsided to a maximum of 25cm (Line-Of-Sight). An additional subsidence of up to 8 cm was observed in the right part of a crack, and the two planes of the crack deformed differently. Also, deformation may have occurred near the bottom of the northern half of the lake as indicated by one complete phase of the interferometer on the west and east shores of the lake. Over the three-year observation period, aside from the displacement at the Khankh earthquake epicenter, there was either zero displacement or no observable movement within the 50x100 km area under investigation.

Keywords: Khankh, psi, stamps, insar, interferometry, snap, sentinel, satellite

Application of Some Crystalline Materials with Different Structures in Space Technology

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Crystalline materials with different structures, including photonic and phononic crystals, offer unique electromagnetic, mechanical, and thermal properties that make them highly suitable for space technology applications. Their different lattice structures allow precise control over wave propagation, vibration modes, and energy transport, enabling advanced satellite communication, radiation shielding, and thermal management. In particular, phononic crystals with hexagonal lattice arrangements can manipulate phonon dispersion, providing effective vibration damping and thermal regulation under the extreme conditions of space, such as microgravity, temperature fluctuations, and high radiation exposure.

In this context, the phonon spectra of densely packed hexagonal Zn and Y crystals were calculated along high-symmetry Γ–M and Γ–K directions using a dynamical matrix expressed in terms of radial and tangential force constants. Model potentials and force constants derived from experimental elastic constants were employed, allowing a direct correlation between theoretical predictions and neutron inelastic scattering measurements. The comparison validated the accuracy of force-constant-based dynamical models in reproducing lattice vibration behavior, confirming the predictive capability of these approaches for designing space-relevant crystalline materials.

By integrating these different crystalline structures into spacecraft components, engineers can achieve improved signal propagation in photonic systems, enhanced mechanical stability, and efficient thermal and vibration management. Furthermore, the use of Zn- and Y-based phononic crystals demonstrates potential for multifunctional space applications, where controlling both phonon and electromagnetic behaviors is critical. Continued research in this field is expected to advance the development of lightweight, durable, and high-performance materials that enhance satellite reliability, communication efficiency, and protection against space environment hazards.

Keywords: Crystalline materials, Photonic crystals, Phononic crystals, Hexagonal lattice, Space applications, Phonon spectra, Satellite technology

Radar technology in Defence system

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Radar (Radio Detection and Ranging) is a critical technology in both civilian and military domains, including aircraft detection, missile tracking, air defense, and maritime surveillance.

Beyond defense applications, radar systems play a vital role in studying the Earth's upper atmosphere and ionosphere, a plasma region extending from approximately 60 km to over 1000 km above the surface, which strongly influences radio wave propagation and satellite communication. Ionospheric plasma conditions are highly dynamic and significantly affected by solar activity, such as solar flares and coronal mass ejections, which can induce geomagnetic storms and modify plasma density and electric fields. Ground-based radar systems provide essential measurements of plasma motion, electron density variations, and ionospheric convection patterns.

These observations improve our understanding of the complex interactions among the solar wind, magnetosphere, and ionosphere, supporting space weather monitoring and forecasting. This study emphasizes the integration of radar observations with satellite and GNSS data, highlighting the importance of radar technology for both operational applications and scientific research in mitigating the effects of geomagnetic disturbances.

Keywords: Radar technology, Ionosphere, Plasma density, Solar activity, Space weather, GNSS, Ionospheric convection

The Impact of Informal Learning in Museums: A Comparative Study with Other Learning Environments

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The learning environment and instructional methods play an important role in students' knowledge acquisition and long-term knowledge retention. The aim of this study was to compare the effects of different learning environments on students' learning outcomes and long-term knowledge retention in science education. A quasi-experimental research design was employed, and students were divided into four groups. The first group participated in practice-based experimental lessons, the second group engaged in museum-based learning activities, the third group experienced an integrated approach combining practical experiments and museum learning, and the fourth group received traditional lecture-based instruction. All groups completed a pretest before the intervention and a posttest after the instruction. To evaluate long-term knowledge retention, recall tests were administered six months and nine months after the intervention. The findings indicate that learning environments based on active participation can enhance students' understanding of scientific concepts and support more stable knowledge retention. In particular, the integrated approach combining experimental practice and museum-based learning tended to produce higher learning outcomes in both short-term and long-term assessments. In contrast, the traditional lecture-based method showed relatively lower levels of knowledge retention. These results suggest that diversifying learning environments and integrating hands-on activities with informal learning contexts can play an important role in promoting deeper understanding and sustained learning in science education.

Keywords: science education, hands-on learning, museum education, learning environment, knowledge retention.

Agile Governance for Emerging Space Nations: A GRA Triad Framework for Resilient Space System Development

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As the global space sector transitions into the NewSpace era, developing countries such as Mongolia face distinct challenges in building effective space programs without the institutional legacy of established spacefaring nations. This study explores the gap between Mongolia's long-term strategy (Vision 2050), its short-term policy framework (Guidance for the Development of Space Science and Technology), and the absence of a comprehensive regulatory framework. Using Qualitative Systems Analysis (QSA), the research compares governance models across advanced, developing, and emerging space nations. The findings show that adopting legacy institutional structures often leads to structural misalignment in latecomer states. To address this, the study proposes an Agile Governance Model based on the GRA Triad—Governance, Resilience, and Agility—linking strategic vision, regulatory mechanisms, and operational execution. This adaptive approach supports resilient space sector development and sustainable growth in emerging spacefaring countries.

Keywords. Space governance, Systems Engineering, New Space, Emerging countries, Mongolia

Design, Development and Flight Testing of a Near-Transonic Amateur Sounding Rocket Using a K-Class KNSB Solid Rocket Motor

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Mongolian Rocketry Association of Amateur / Apogee Space Program, Mongolia

This study presents the design, construction, and flight testing of an amateur sounding rocket powered by a K-class KNSB (Potassium Nitrate–Sorbitol) solid rocket motor. The project investigates propulsion performance, near-transonic airframe design, flight data acquisition, and recovery system reliability. A carbon fiber airframe was designed to withstand aerodynamic loads approaching Mach 0.95. Propellant burn characteristics were analyzed by comparing theoretical burn rate predictions with static motor test data. Flight data was recorded using a Quantum Eggtimer flight computer, enabling the extraction of altitude, velocity, and acceleration profiles. Additional instrumentation included an onboard camera system for stage verification and recovery diagnostics. Flight trajectory simulations were performed prior to launch and compared with actual flight paths using GPS and Google Earth tracking data. The results demonstrate strong correlation between predicted and measured propulsion performance and provide insights into amateur near-transonic rocket design and flight dynamics.

Measurement device for Thrust Force of a Solid-Propellant Rocket Motor

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[1]Nano-Satellite Development Laboratory, National University of Mongolia, Mongolia

Accurate and high-speed measurement of thrust force and rapid transient behavior during combustion is a critical requirement in the development of amateur and research-oriented solid-propellant rocket motors. This study presents the design and experimental validation of a thrust force measurement device developed to meet these requirements for amateur solid rocket motors. The experimental test stand is based on a DYMK-001 load cell, whose low-level output signal (0--10~mV) is amplified using a programmable gain amplifier and digitized by a high-resolution 24-bit AD7193 analog-to-digital converter. System control and data processing are implemented using a Raspberry Pi microcontroller, and a high-frequency data acquisition algorithm is developed to capture rapid thrust variations. The achieved data acquisition rate reaches approximately 1200~samples~per~second (SPS), demonstrating sufficient temporal resolution to fully capture abrupt thrust changes during motor operation. Calibration and accuracy evaluation experiments indicate that the measurement error approaches the targeted 1\% limit, achieving an overall accuracy of 1.07\%. The results confirm that the developed thrust measurement device provides reliable, high-speed, and accurate data acquisition, making it suitable for solid-propellant rocket motor development and experimental research applications.

TEMUULEL: System Architecture and Mission Development of 1U CubeSat

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Temuulel is a 1U CubeSat mission developed by students and researchers at the National University of Mongolia and the Institute of Astronomy and Geophysics. The mission objectives include Earth observation and magnetic field measurements in Low Earth Orbit (LEO). This paper describes the satellite's architecture, specifically an On-Board Computer (OBC) utilizing three microprocessors and four memory units to manage all subsystem interfaces. The design employs a shared memory architecture for data exchange and storage between subsystems. Currently in the engineering model integration phase, the project has validated core functions including housekeeping data collection and imaging. Testing identified magnetic interference within the Attitude Determination system, leading to the implementation of software-based filtering. As an educational and technological demonstration, Temuulel establishes a technical framework for Mongolian aerospace engineering and enhances domestic capacity for future nanosatellite missions.

Keywords: 1U CubeSat, On-Board Computer, Integration Testing, Earth Observation, Nanosatellite

MN-NEXCUBE: Development Progress of a 3U CubeSat Mission for Space-Based Monitoring of Dust Aerosols

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Yellow dust storms are a major environmental and public health concern in East and Central Asia. This paper presents the development progress of MN-NEXCUBE, a 3U CubeSat mission designed for detecting and characterizing yellow dust in Earth's atmosphere. Developed within the framework of the APSCO CubeSat Competition, this mission focuses on retrieving Aerosol Optical Depth and Degree of Polarization from multispectral and polarimetric imaging data. These parameters enable the estimation of aerosol concentration, distribution, and optical properties, improving the observation of dust events.

The system includes a multispectral polarimetric camera payload and supporting subsystems, including the On-Board Computer (OBC), Electrical Power System (EPS), Communication (COM), and Attitude Determination and Control System (ADCS). Current development focuses on subsystem-level design and validation. The OBC has completed core functional testing, including real-time clock and memory operations. The EPS has demonstrated stable power delivery and successful charge–discharge performance. The COM subsystem architecture has been updated and partially verified, while the ADCS is currently under development with an initial one-axis control approach.

The project is in the subsystem testing and early integration phase, with ongoing efforts toward full system integration and performance verification. Current results show steady progress in subsystem development, although design revisions have affected the overall timeline.

By implementing a low-cost polarimetric sensing approach, MN-NEXCUBE contributes to the development of CubeSat-based environmental monitoring and provides a foundation for future aerosol observation missions in Mongolia.

Keywords: CubeSat, Yellow dust storms, Environmental monitoring, Subsystem, Polarimetric sensing

Variations of the Geomagnetic Field and Solar–Terrestrial Interactions

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Interplanetary (IP) shock driven by the solar wind compressed Earth's magnetosphere and triggered significant electromagnetic disturbances in the polar ionosphere. This study investigates the immediate ionospheric response and the underlying physical mechanisms following the shock impact. Observations reveal both vertical plasma drift and enhanced horizontal motion, while radar measurements indicate a clear reversal of ionospheric convection. This reversal disrupted the pre-existing velocity shear equilibrium, suggesting that the shock-induced electric field was effectively mapped into the E region, thereby intensifying velocity gradients.

During the preliminary phase of the sudden impulse (SI), a dusk-to-dawn electric field is identified as the primary driver of horizontal plasma motion. Furthermore, the convection reversal is found to be closely associated with downward field-aligned currents.

This study integrates multi-point observations from spacecraft missions, including ACE, THEMIS, GOES, Swarm, and DMSP, together with ground-based radar measurements, to comprehensively investigate the magnetosphere–ionosphere coupling processes triggered by the interplanetary shock. The results provide new insights into the direct and rapid response of the cusp ionosphere and contribute to an improved understanding of global magnetospheric dynamics under sudden changes in solar wind conditions and the interplanetary magnetic field (IMF).

Keywords: Magnetosphere–ionosphere coupling, Ionospheric convection, plasma dynamics, sudden impulse

Capabilities and Scenario Applications of BeiDou Navigation Satellite System

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The BeiDou Navigation Satellite System (BDS) is one of the UN-recognized global GNSS independently constructed by China. With 30 operational BDS-3 satellites, it delivers all-weather positioning accuracy better than 10 meters and timing accuracy within 20 nanoseconds. Uniquely, BDS SMS enables communication where traditional networks fail. As exclusive operator, China Space-Time Information Co., Ltd. (CSTI) accelerates the market-oriented and international application of BDS. CSTI is building a comprehensive space-time information operation and service system. Leveraging the BDS Space-Time Service Platform, integrating multi-constellation data, SBAS, and low-orbit augmentation, CSTI facilitates deep industry integration and enhances application efficiency. Key results demonstrate versatile scenario applications. In intelligent mining, BDS high-precision positioning combined with InSAR and GIS enables real-time safety monitoring and automated surveying. For intelligent herding, satellite collars utilize Short Message for livestock tracking. Furthermore, CSTI partners with ground operators to embed Short Message into smartphones, serving over 30 million public users for emergency rescue, while industry terminals support messages up to 3883 bit. This framework signifies a major advancement in space-time information utility. By enhancing application efficiency across sectors like agriculture, disaster monitoring, smart grids, and urban management, CSTI promotes reliable space-based communication and high-precision PNT services. This study underscores BDS's pivotal role in driving industrial digitalization and fostering global space cooperation through robust, scalable infrastructure.

Appendix