



Challenges of Capacity-Building in a Multi-State Environment

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Multi-State Cooperation

- Joint development and shared application
- Access to shared space data and scientific information
- Access to new space technology, science and application
- Decreased risks associated with technology
- Education and training opportunities to develop human resource
- Reputation of space programs and projects
- Equal rights in governance of the organization (for organizational cooperation)
- Jointly formulating unified understanding and response to technical and legal challenges
- Space-related symposiums and forums to build connections with space industry



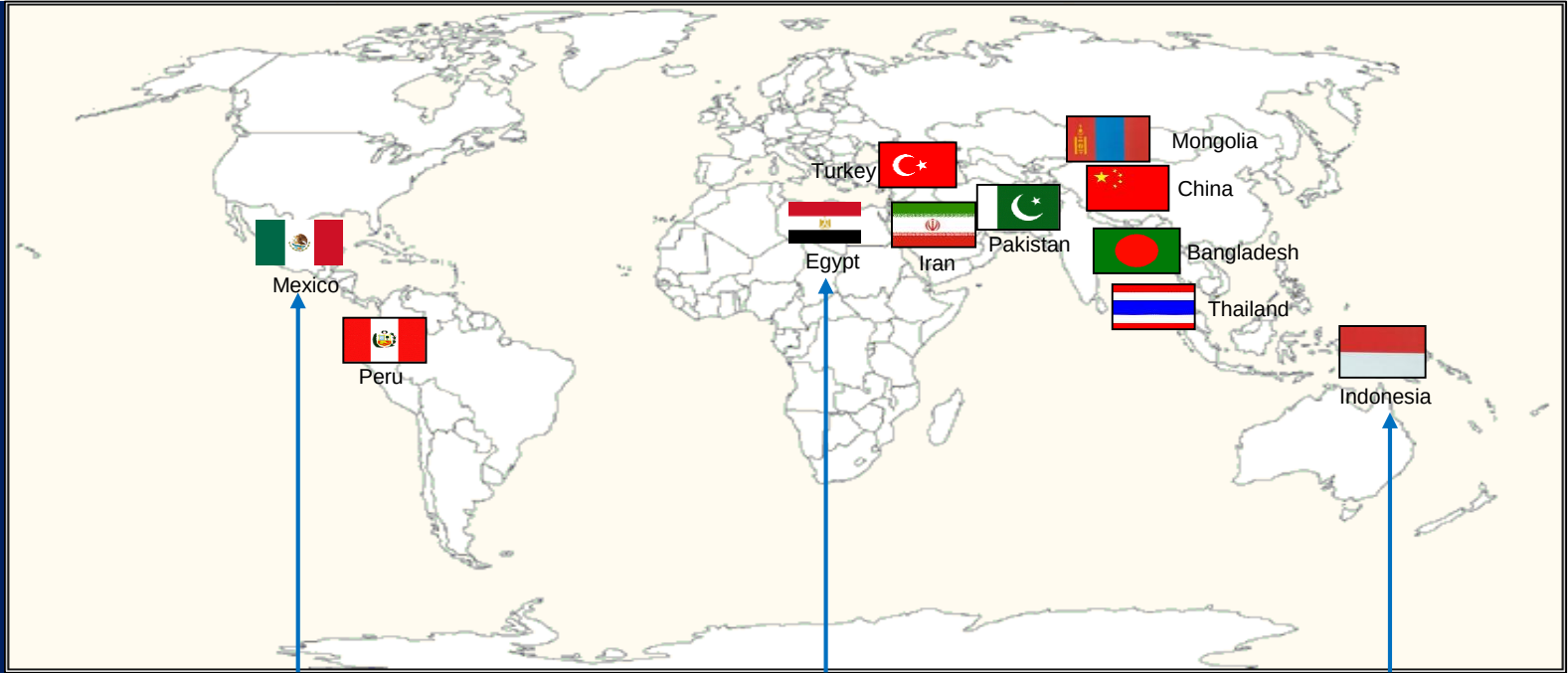


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APSCO: a regional cooperation

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Observer State

Associate Member

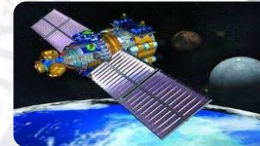
Signatory State



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Fields of Cooperation

1. Space technology and programs of its applications;
2. Earth observation, disaster management, environmental protection, satellite communications and satellite navigation and positioning;
3. Space science research;
4. Education, training and exchange of scientists / technologists;
5. Establishment of a central data bank.
6. Other cooperative programs agreed upon by the Member States.

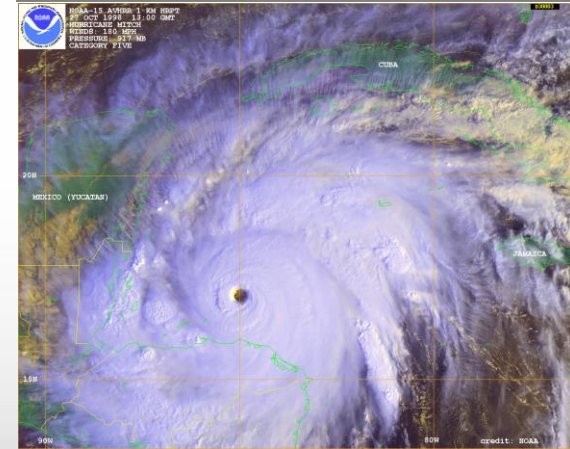
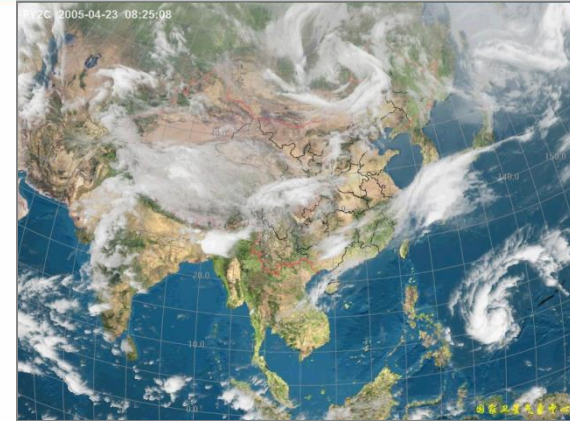




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Challenges of Multi-State Cooperation

1. Economic and technical gaps among participating states
2. Delays in decision making due to long and complicated decision chains
3. Difficulty in measuring cooperation benefits





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Networking of the Cooperative Activities

$$2 + 6 + 4$$

- Two knowledge sharing exchange platforms
 - Six cooperative networks
- Four ways of education/training

Ⓢ APSCO International Symposium (since 2009)

Organized biennially (even years: 2016, 2018, 2020....)

- | | |
|--|---|
| 1. Space Cooperation for the Asia-Pacific Region (July 2009, Thailand) | 5. Satellite Remote Sensing (RS) and Geographic Information System (GIS) Development in the Asia-Pacific Region (October 2013, Turkey) |
| 2. Food Security and Monitoring of Agriculture trough Satellite Technology (September 2010, Pakistan) | 6. Global Navigation Satellite System (GNSS) Technology and Applications (November 2014, Bangladesh) |
| 3. Earthquake monitoring and early warning by using space technology and its applications (September 2011, Beijing) | 7. Telemedicine in Asia-Pacific Region (November 2015, China) |
| 4. Communication satellite Technology and Applications (November 2012, Indonesia) | 8. Space Technology and Applications (October 2016, Peru) |

Introducing the participants with new developments in the field





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...Subject-oriented Exchange Platforms

② Space Law and Policy Forum

Organizes biennially (odd years: 2015, 2017, 2019...)

Space Law Workshops with UN OOSA

APSCO Space Law and Policy Forum

1 Role of International Space Law in the Development and Strengthening of International and Regional Cooperation in the Peaceful Exploration and Use of Outer Space (2009, Iran)

APSCO Space Law and Policy Forum (June, 2012, Beijing, China)

2 Activities of States in Outer Space in Light of New Developments: Meeting International Responsibilities and Establishing National Legal and Policy Frameworks (2010, Thailand)

APSCO Space Law and Policy Forum (June, 2013, Beijing, China)

3 The Role of National Space Legislation in Strengthening the Rule of Law (2014, China)

APSCO Space Law and Policy Forum (September, 2015, Beijing, China)

4 -

APSCO Space Law and Policy Forum (10-12 Jul 2017, Harbin, China)





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6 Cooperative Networks

⑪ Education and Training Center/Network

A Network for frequent Exchange of Knowledge among Member States





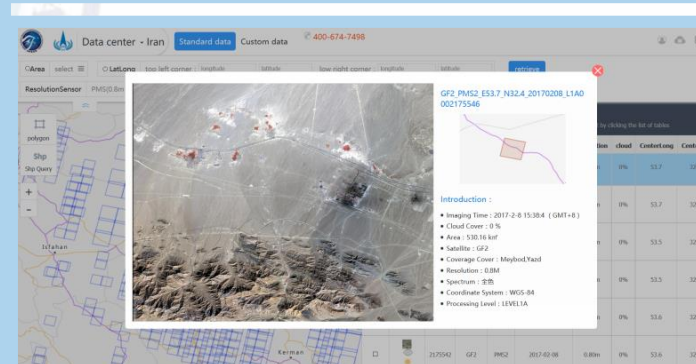
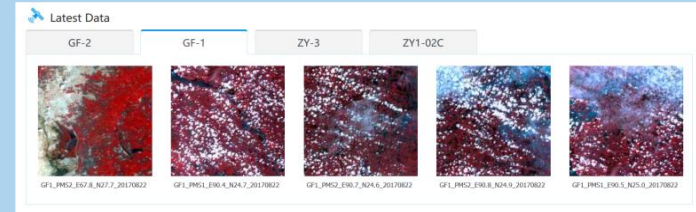
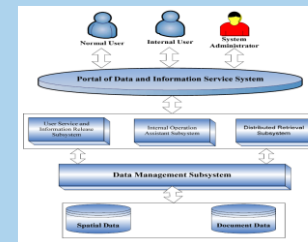
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... 6 Cooperative Networks

② Data Sharing Service Platform (DSSP)

- **Network for sharing satellite data**
 - Data provided by 9 Earth-Observation satellites from China
 - Turkey, Pakistan, Peru data will join in
 - More than 223,000 satellite images, only 5100 used
 - More than 20 million km² coverage area
 - Providing almost 1000 scenes/year to each MS of different resolution level
 - 35 Authorized Users

New cloud service platform





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... 6 Cooperative Networks

③ Asia-Pacific Ground-Based Optical Space Objects Observation System (APOSOS)

- **Ground-based Space Objects Observation Network**
 - Telescope Diameter: 150 mm
 - Aperture : 150 mm
 - Focal length: 500 mm
 - APOSOS Data Process and Service Center
- **Peaceful uses for**
 - Space object detecting, tracking and identifying
 - Orbit determination and cataloging
 - Collision early warning
 - Space debris re-entry prediction



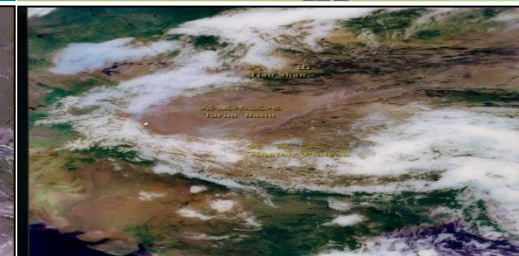
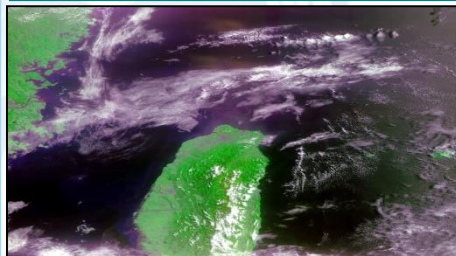
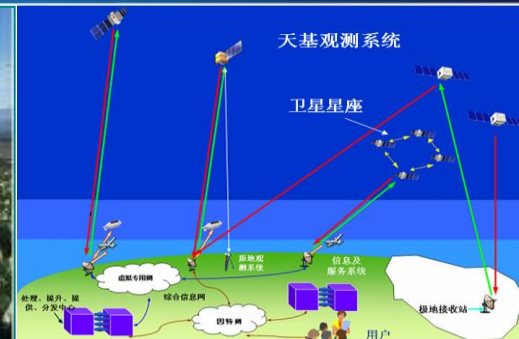


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... 6 Cooperative Networks

④ Disaster Monitoring Network

- Remote Sensing Techniques for Drought Study (Pakistan)
- Estimation of Rice Field Using Satellite Sensors (Thailand)
- Compatible GNSS Terminals for Emergency Management and Disaster Rescue (EMDR)
- Determining Precursor Ionospheric Signatures of Earthquakes by Ground-Based Ionospheric Sounding (Earthquake)
- Framework for Researches on Application of Space Technology for Disaster Monitoring in the APSCO Member States (Framework)
- CHARTER similar mechanism & Seek to become a member of CHARTER (policy)



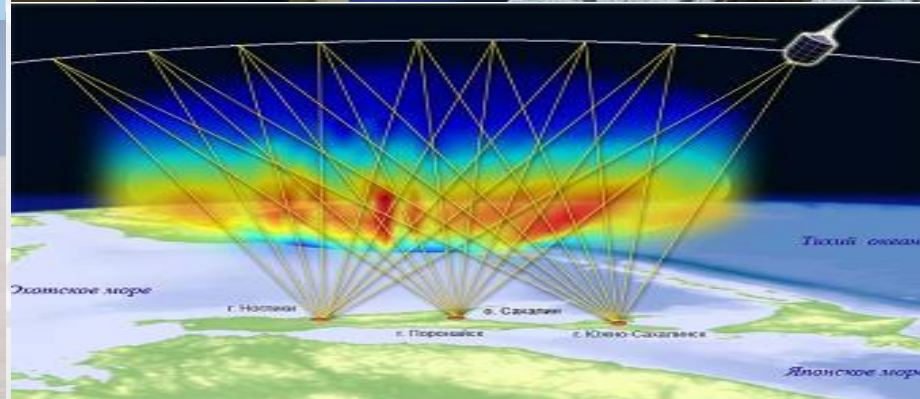


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... 6 Cooperative Networks

⑤ Space Technology Application Network

- COMSAT-Based Tele-Medicine Network
- Radiometric Calibration for Satellite Sensors Network
- Ionosphere Modeling through Study of Radio Wave Propagation and Solar Activity
- Ka-Band Rain Attenuation Modeling



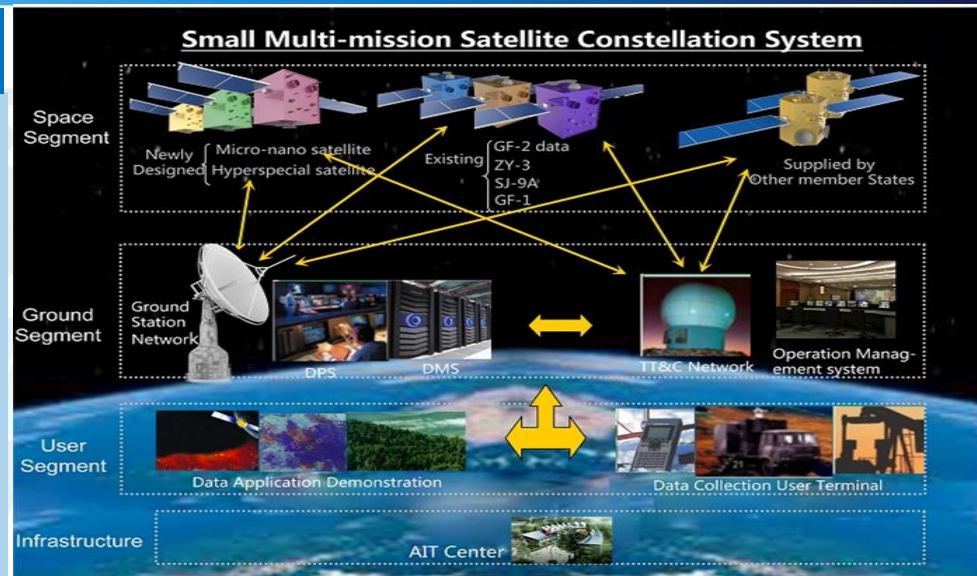


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... 6 Cooperative Networks

⑥ APSCO Joint SMMS Constellation

- The space segment
 - 3 operating satellites donated by China
 - 2 newly developed EO satellites
 - 6 nano/micro satellites for quick response communication
 - participating satellites from MS
- Asia-Pacific Ground Station Network
 - Existing network in China
 - Compatible upgraded stations in MS
- Shared AIT Facilities
- Hands-on training



APSCO's 4 ways of Education/Training

① Degree Education

- Master and PhD Programs



② Short term & On-line Training

③ New Generation Cultivating

- Space Science School
- Space Innovation Competition
- Youth Space Contest



④ Hands-on training

- Student Small Satellite (SSS)
- Space Education Curricula Development





1. Master & Ph.D. program in cooperation with BU with National Scholarship of China (MASTA&DOCSTA)

- Total 149 Master students supported since 2006; and 107 already graduated.
- Total 39 PhD students supported since 2013; and 4 already graduated.
- Topics include: RS&GIS, SATCOM, GNSS, Micro-satellite technology and Space Law.

2. Cooperation with other Universities

- MOU for cooperation with ISU signed for three years (2014-2017)
- MOU for cooperation with NPU signed for three years (2017-2019)
- Cooperation with HIT under discussion





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Degree Education: Cover the technical gap



Degree Education

No	Year	Specialization	Participants
1	DOCSTA 2013	Space Technology and Applications	5 from MS
	MASTA 2013	RS & GIS and GNSS	19 from MS
2	MASTA 2012	Global Navigation Satellite System (GNSS)	15 from MS
3	MASTA 2011	Satellite Communications (SATCOM)	13 from MS and 1 from Laos
4	MASTA 2010	Remote Sensing and Geo-information System (RS & GIS)	11 from MS
5	MASTA 2006/08	Remote Sensing and Geo-information System (RS & GIS)	14+11 from MS
TOTAL (2006-2013)			89
No	Year	Specialization	Participants
1	MASTA 2014	Remote Sensing and Geo-information System (RS & GIS)	14 from MS
2		Global Navigation Satellite System (GNSS)	
3	DOCSTA 2014	Space Technology and Applications	8 from MS
TOTAL (2014)			22

No	Year	Specialization	Participants
1	MASTA 2015	Micro Satellite	6 from MS
		Remote Sensing and Geo-information System (RS & GIS)	4 from MS
		Global Navigation Satellite System (GNSS)	3 from MS
2	DOCSTA 2015	Space Technology and Applications	8 from MS
	TOTAL (2015)		21

No	Year	Specialization	Participants
1	MASTA 2016	Space Law &Policy	4 from MS
		Remote Sensing and Geo-information System (RS & GIS)	10 from MS
		Global Navigation Satellite System (GNSS)	3 from MS
2	DOCSTA 2016	Space Technology and Applications	8 from MS
	TOTAL (2016)		25

Years	Total		
2006-2017	188	Doctor	Master
	26,000USD/person/two years 46,000USD/person/three years	39	149



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... APSCO's 4 ways of Education/Training

② Short Trainings

- 28 trainings organized
- More than 600 trainees
- 32 countries in the Asia Pacific region benefitted
- Various disciplines since 2009
- Free of charge for participants

On-line Training

- APSCO and all of its 8 Member States
- 7 trainings organized on various disciplines since 2014





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Tailored MS by MS Short Training Programs

Short Trainings in 2017

Time	Activities	Location
25-29 April	DSSP Training	Pakistan
8-12 May	DSSP Training	Turkey
22-26 May	DSSP Training	Thailand
5-9 June	DSSP Training	Mongolia
24-28 July	DSSP Training	Bangladesh
7-11 August	DSSP Training	Peru
27-30 August	DSSP Training	Iran
4-8 July	APSCO Training Course on “Space Law and Policy”	Harbin, China
25-31 October	APSCO Training Course on Disaster Management in collaboration with UNSPIDER	Beijing, China



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... APSCO's 4 ways of Education/Training

③ New Generation Cultivating

- Provides long run sustainability of development for space science, technology, and their applications in the MS of APSCO;
- Stimulates the interaction among students and internationally recognized lecturers
- Motivates them to pursue a career in space sciences and space engineering.

2016 -2017 activities:

- First Science School Program in cooperation with ISSI-BJ (in Thailand)
- Space Competitions (CanSat Competitions, in Mongolia)
- APSCO Youth Space Contest in Jul 2017 (in China)





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... APSCO's 4 ways of Education/Training

④ Hands-on practical training

Student Small Satellite (SSS)

Hands-on practical training until the flight model is made

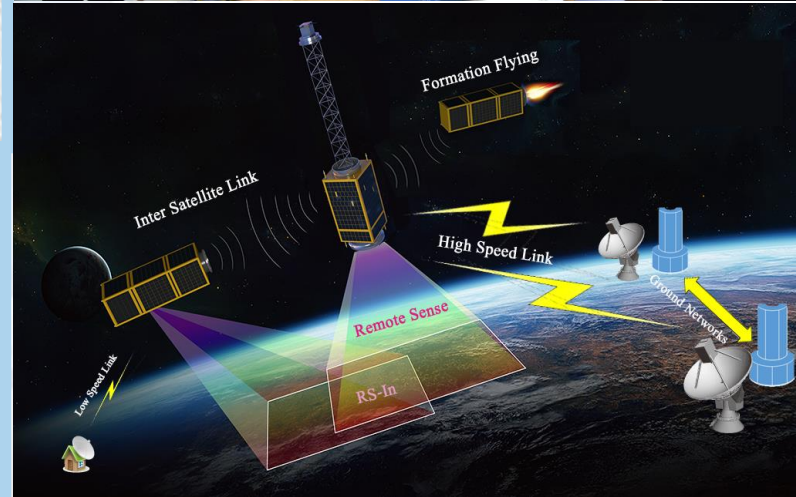
For senior undergraduates and above levels

- “1+2” satellites: a Micro-satellite and two Cube-satellites Constellation;
- One 30kg micro-satellite with dimension of 350*350*650mm;
- Two 4kg with 3U Cube-Sats.

Participation based on technical level

Space Education Curricula Development

- Develop a draft version of curricula for space education for Member States
- In collaboration with Beihang University and Regional Center for Space Science and Technology Education in Asia and the Pacific (China) (UN-RCSSTEAP)
- Could be adopted as UN standard space education curricula.





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Summary of capacity-building outcomes

DATA SHARING

- 223,000 images available
- 1000 High resolution images per Member State per year - free of cost
- Data-sharing through Cloud Service Platform
- RS data from Member States pledged

EDUCATION AND TRAINING

- 39 Doctor, 139 Master
- 28 trainings with 600 trainees
- 7 on-line trainings
- Space Science Schools
- Youth Space Contest
- Hands-on Practice until flight Model

Services and Pilot Projects

- Charter-similar Disaster Monitoring Mechanism
- Pilot Projects and Research Framework
- Radiometric Calibration Project

INTERNATIONAL EVENTS

- 8 International Symposiums
- 3 UN Workshops on Space Law & Policy
- 4 APSCO Space Law & Policy Forums



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**THANK YOU
FOR YOUR ATTENTION!**