



APRSAF
ASIA-PACIFIC REGIONAL
SPACE AGENCY FORUM



Summary Report by Space Frontier Working Group

APRSAF-30, 2024

**November 25th
November 26th, 27th**

**Kibo-ABC Workshop
Space Frontier Working Group**



Kibo-ABC Workshop Summary Report

Co-Chairs:
Dr. Tony Robinson (ASA)
Dr. Masaki Shirakawa (JAXA)

Participants

52 Participants from 13 countries/region, 18 organizations
(including on-line/video participants)

Country/Region	No	Organizations
Australia	11	ASA, OGLA, Dream Rover (Kibo-RPC participants)
Austria	1	UNOOSA
Bangladesh	1	STEMX365
Indonesia	4	BRIN/INASA
Japan	11	JAXA, DigitalBlast, Inc.
Malaysia	6	MYSA

Country/Region	No	Organizations
Philippines	4	PhilSA
Singapore	1	Space Faculty
Taiwan	4	TASA
Thailand	6	GISDA, NSTDA, Mahidol University
Vietnam	1	VAST-STI
UAE	1	MBRSC
USA	1	NASA

Special presentation by **JAXA Astronaut Furukawa**

Presentation of each country's experiment executed in the Kibo module of the ISS.



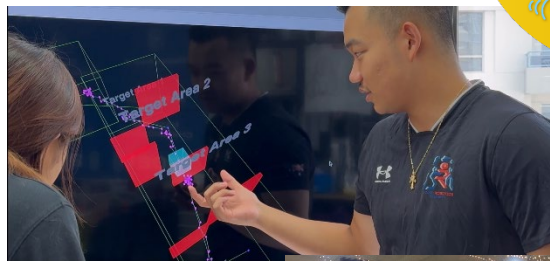
5th Kibo Robot Programming Challenge



The Kibo-ABC members reported and discussed about Kibo-RPC.

● Country and Region Report

- **Record number** of participants increased from **1685** in the 4th Kibo-RPC to **2788** in the 5th Kibo-RPC with PhilSA as a new member.
- The program benefited from a great exposure in the media.
- Video messages from students showed their enthusiasm about the program.



● Best practices & Lessons Learned

- Follow-up in tutorial and workshops in each country/region.
- Beginner students experienced difficulties with programming.



● Discussion

- Methods to support beginners: sharing opportunities of multilateral workshops.
- Participant categories: creation of multiple levels of programming.



● Future work

- **New space utilization opportunity, 6th Kibo-RPC is on-study** ; consideration on possible multilateral workshops.
- Consideration on implementing participant categories for 7th Kibo-RPC or after.

Asian Try Zero-G 2023

The Kibo-ABC members reported and discussed about ATZ-G.



● Country and Region Report

- **Record number** of participants increased from **480** in the ATZ-G 2022 to **570** in the ATZ-G 2023.
- The program benefited from a great exposure in the media.
- Great opportunity for students to see their experiment implemented in the ISS live by a JAXA Astronaut.

● Best practices & Lessons Learned

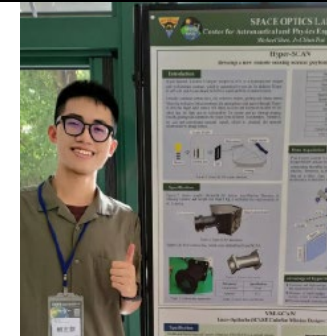
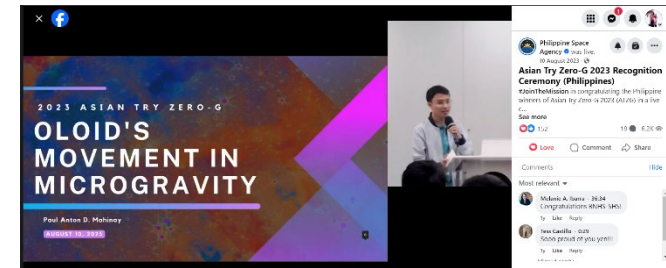
- Students actively presented their experience.
- Further educational support about the space environment is expected.

● Discussion

- Criteria for theme selection: clarify the evaluation metrics for standardization.
- Ground experiment: can be conducted by each country/region to their discretion.

● Future work

- **New space utilization opportunity, ATZ-G 2025** is on-going ; theme selection criteria will be clarified.



Space Seed for Asian Future (SSAF)

The Kibo-ABC members reported and discussed about Asian Herb in Space (AHiS) and a proposition of a new SSAF project.



- **Country and Region Report about AHiS**

- Each country explained their unique activities (Comic Strips, Recipe Contest)
- This project inspired students about space development.

- **Creation of a New Project & Discussion**

- **Australia, Japan and Thailand** presented a new project proposal for plant growth substrates experiment, encouraging grass-roots local program creation through Kibo, to create experiments where various types of plants will be grown using Lunar/Martian regolith simulant.
- Protocol has to be decided for standardization of the experiments. Discussion about possible experiments criteria (moon gravity, ground experiment with RPM, different cultivation conditions/containers, etc.).

- **Future work**

- Members of Kibo-ABC initiative to agree on **proceeding with consideration of new plant experiments** in support of space exploration.





Space Frontier Working Group Working Group Summary Report

Co-Chairs:
Dr. Alessandra Monerris Belda (ASA)
Dr. Shirakawa Masaki (JAXA)

Participants

82 Participants from 15 countries/region, 37 organizations
(including on-line/video participants)

Country/Region	No	Organizations
Australia	14	ASA, CSIRO, OGLA, Curtin University, Swinburne University
Austria	1	UNOOSA
Bangladesh	1	STEMX365
Egypt	1	Egyptian Space Agency
India	4	ISRO, National Board Of Examinations In Medical Sciences New Delhi, Space Generation Advisory Council
Indonesia	2	BRIN
Japan	34	METI, JAXA, DB, Elevation Space, IHI Co. Ltd., ispace, JAMSS, JSF, Nissan Electric, Task, Yuki Precision
Malaysia	5	MYSA

Country/Region	No	Organizations
Netherlands	1	ISECG/ESA
Philippines	2	PhilSA, SGAC-PH
Singapore	1	Space Faculty
Sweden	1	Swedish Space Corporation
Taiwan	5	TASA, Institute of Space system Engineering, Tsing Hua University, Tensor
Thailand	6	GISTDA, EmOne (Thailand) Co. Ltd., Mahidol University,
UAE	1	MBRSC
Uruguay	1	Unisq
Unknown	2	Unknown

Activities and future plans from each organization

- Space activities and future plans for Space Environment Utilization were reported from **10** countries and region.

(Australia, Bangladesh, Indonesia, Japan, Malaysia, Philippines, Singapore, Taiwan, Thailand and UAE)

- ✓ Space Programs and National Policies
- ✓ Space Technologies & Space Exploration Projects
- ✓ Kibo-ABC activities (Asian Herb in Space, Kibo Robot Programming Challenge and Asian Try Zero-G)
- ✓ STEM Programs and Activities
- ✓ Participation to Conferences/Workshops, Space-science/Astronomy related Events/Programs
- ✓ Future Projects/Events



NESARC
 NEW ZEALAND SPACE AGENCY
 NZAN
 Philippines
 *PhISA
 *DOST-SEI
 KARI
 Rep. of Korea
 *KARI
 MALAYSIAN SPACE AGENCY (MYSA)
 Malaysia
 *MYSA
 Singapore
 *SSTL
 *Space Faculty
 SSTA SPACE FACULTY
 JAXA
 Japan
 *JAXA
 Taiwan
 *TASA
 TASA
 BRIN
 Indonesia
 *BRIN
 KIBO-ABC
 Asian Beneficial Collaboration through Kibo Utilization
 Thailand
 *GISTDA
 *NSTDA
 NSTDA
 Bangladesh
 *NMST
 Australia
 *ASA
 *ANU
 Vietnam
 *VAST-STI
 UAE
 *UAESA
 *MBRSC
 وكالة الإمارات للفضاء
 UAE SPACE AGENCY
 Australian Space Agency
 Australian National University
 STP
 مركز محمد بن راشد للفضاء
 MOHAMMED BIN RASHID SPACE CENTRE

Kibo Utilization

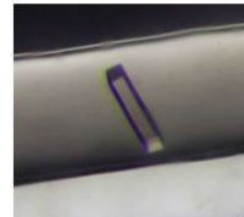
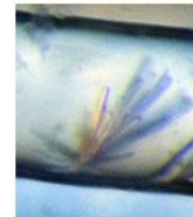
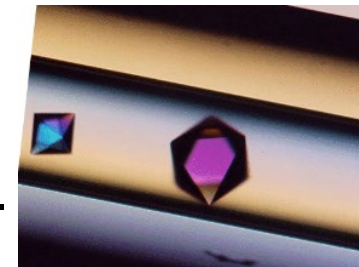
● Kibo Utilization Workshop in Australia

- Held 5th December 2023 at the Powerhouse Museum, Sydney, NSW
- **Australia's expansive Microgravity community** continues to benefit and grow from the collaboration.



● Protein Crystal Growth (PCG) Experiments

- Protein crystal growth and drug design in space.
- JAXA PCG experiment in the ISS and presentation of the results.



Ground (2.1~2.5Å) Space (1.3Å)

● Electrostatic Levitation Furnace (ELF)

- ELF's specifications and applications.
- Various utilization's use-cases (e.g. Turkey under commercial utilizations, the US under the JP-US OP3 agreement).



J-SSOD and Exposed Facility

● JAXA Exposed Experiment Utilization

- JEM Small Satellite Orbital Deployer (**JSSOD**) services and its advantages.
- IVA-replaceable Small Exposed Experiment Platform (**i-SEEP**).
- Small Payload Support Equipment (**SPySE**).

● KiboCUBE Program (UNOOSA)

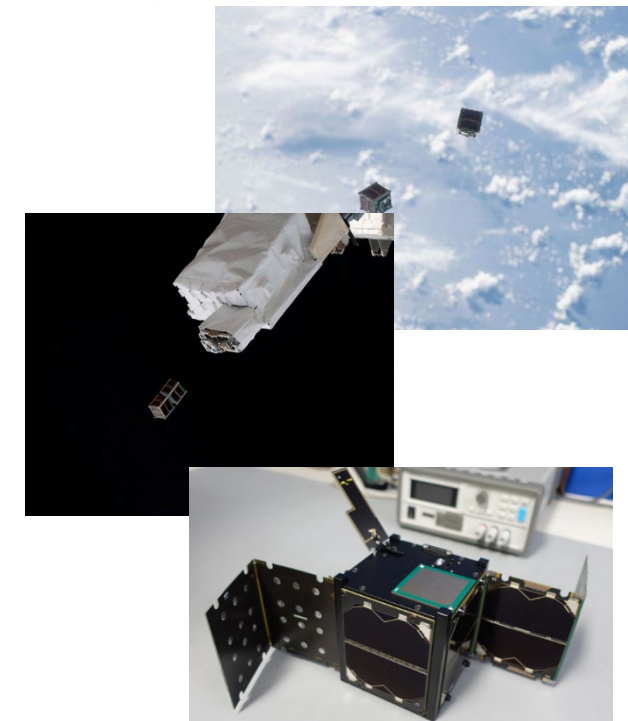
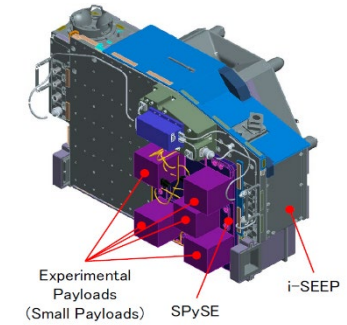
- **KiboCUBE** Program and its Application procedure.
- **Joint-team from Tanzania and Cote d'Ivoire was selected for the 8th KiboCUBE in 2024.**

● J-CUBE Program

- **J-CUBE** Program and its Application procedure.

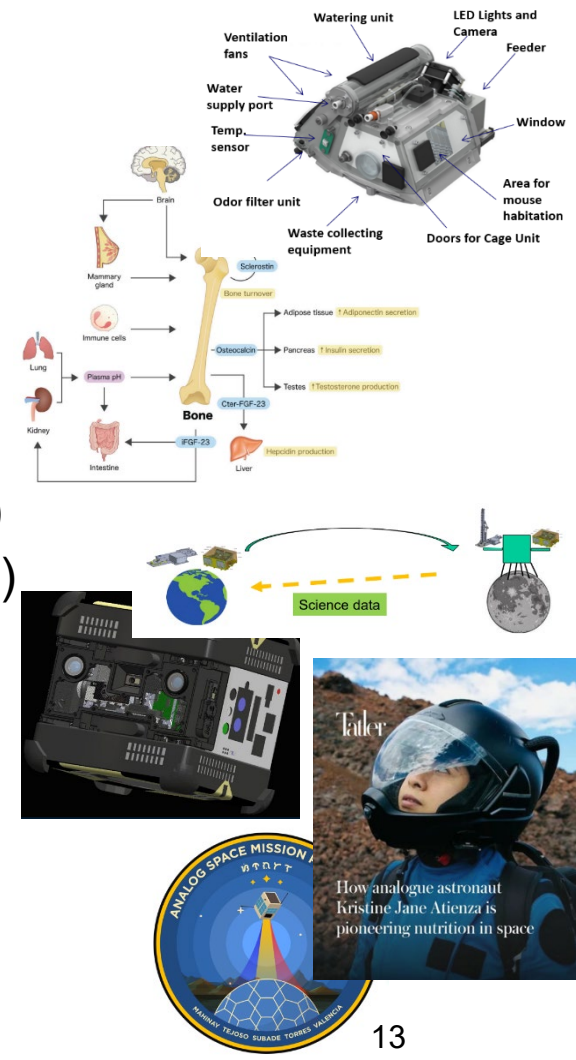
● Use-case: **Curtin University's "Binar" CubeSats Deployment**

- "Binar" space program and its satellites design, deployment and its operation.
- Binar-2, 3, 4 were **deployed in August 2024.**



ISS as a Platform for Post-ISS and Lunar/Mars Missions

- **Analysis of mouse tissues samples**
 - **Rodent research** in the Kibo module (JAXA, **Japan**)
 - Effects of lunar gravity on muscles with **mouse sample share** (Mahidol University, **Thailand**)
- **Research on Plant Growth**
 - Proposition of **new plant growth project** using regolith simulant (OGLA, **Australia**)
 - Prospective study on **Space agriculture** on the ISS (Mahidol University, **Thailand**)
 - Result of **plant culture with lunar regolith simulant** on the ground (JAXA, **Japan**)
- **Technologies Development**
 - **4 payloads** development for lunar rover and lunar lander (TASA, **Taiwan**)
 - **Multi-resolution Scanner** payload on the ISS's Astrobee robot for exploration (CSIRO, **Australia**)
- **Analog Space Missions**
 - Students for the Exploration and Development of Space (**SEDS**) program (SGAC-Ph, **Philippines**)



The composite image includes several key elements:

- Mouse Habitat Diagram:** A detailed view of a mouse habitat unit with labels for Ventilation fans, Watering unit, LED Lights and Camera, Feeder, Window, Area for mouse habitation, Doors for Cage Unit, Waste collecting equipment, Odor filter unit, Temp. sensor, and Water supply port.
- Bone Metabolism Diagram:** A central diagram of a bone with arrows pointing to various organs and processes: Brain, Mammary gland, Bone turnover, Adipose tissue (Adiponectin secretion), Osteoclasts, Pancreas (Insulin secretion), Testes (Testosterone production), Ovar-FGF-23, Liver (Hepcidin production), Intestine, Kidney, and Lung. It also shows Immune cells and Plasma pH.
- Science Data Flow Diagram:** Shows a satellite in orbit around Earth and the Moon, with a dashed arrow labeled 'Science data' pointing from the Moon back to Earth.
- Rover Photo:** A close-up of a rover's front section.
- Astronaut Photo:** A photo of astronaut Kristine Jane Atienza in a space helmet, with the text 'Taler' and 'How analogue astronaut Kristine Jane Atienza is pioneering nutrition in space'.
- ANALOG SPACE MISSION Logo:** A circular logo with the text 'ANALOG SPACE MISSION' and 'START' at the top, and 'MAHIDOL THAILOID SURASAK THORNES VALERON' at the bottom.

Global Space Exploration Plans

- **Presentation of Space Policies/Programs from Space Agencies in the Asia-Pacific Region.**
 - Space Exploration Activities in Japan by **JAXA**
 - "Moon to Mars Innovation" Joint Research Program by **JAXA**
 - Global Exploration Roadmap 2024 by **ISECG/ESA**
 - Sustainable Space Exploration in Malaysia by **MYSA**
 - Space Exploration and Experiment in Thailand by **GISTDA**
 - Indian Space Science Exploration Program by **ISRO**



Global Space Exploration Plans

● Round Table

- **ISECG/ESA, JAXA and MYSA** mentioned their opinion on impact by international cooperation and commercialization in their country/region.
- **ISRO and MYSA** introduced challenges and innovation in space exploration in their country.
- **GISTDA and ISECG/ESA** discussed the benefit for Asia-Pacific region to collaborate in space exploration field.
- **JAXA** also provided perspective about which technology would be important for Asia-Pacific region to grow its contributions to space exploration.



Summary

- 1. Continues to deliver Kibo utilization activities with record number of participants in 5th Kibo-RPC and ATZ-G 2023.**
- 2. Agrees to proceed with consideration of new plant experiments with regolith simulant in support of space exploration.**
- 3. Welcomes to provide another avenue for human resources development and the advancement of science and technology through space sector collaboration between industry, government, and academia with Kibo utilization toward LEO/exploration.**
- 4. Encourages regional information exchange on international space exploration initiatives.**