



# JAXA Cooperation Activities with Asian Countries on Kibo/ISS Utilization through APRSAF

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Space Environment Utilization Center  
Human Space Systems and Utilization Mission Directorate  
Japan Aerospace Exploration Agency*

United Nation/Malaysia Expert Meeting

# Basic Space Policy

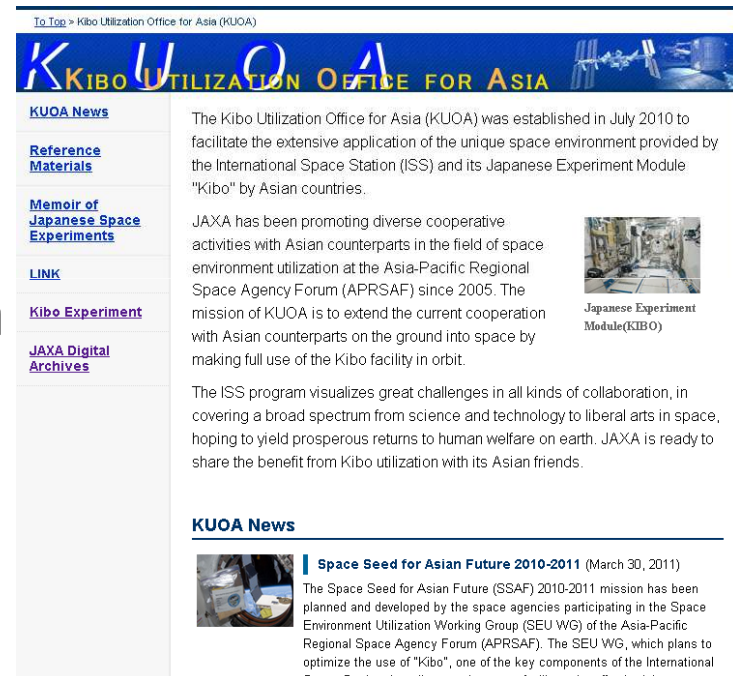
....as the only participant in the International Space Station Program in Asia, the Government will promote international cooperation with Asian countries by providing them with the opportunities to use “Kibo” for experiments.

*by the Strategic Headquarters for Space Policy  
“Basic Plan for Space Policy – Wisdom of Japan  
Moves Space –” June 2, 2009*

# KUOA

## “Kibo” Utilization Office for Asia

KUOA was established under the Space Environment Utilization Center, Human Space Systems and Utilization Mission Directorate of JAXA in July 2010, to facilitate Kibo utilization by Asian countries.



The screenshot shows the KUOA website with a blue header and a navigation menu on the left. The main content area contains introductory text about the office's establishment and mission, a photo of the Japanese Experiment Module (KIBO), and a news section titled "Space Seed for Asian Future 2010-2011".

[To Top](#) > Kibo Utilization Office for Asia (KUOA)

### K U O A

KIBO UTILIZATION OFFICE FOR ASIA

**KUOA News**

The Kibo Utilization Office for Asia (KUOA) was established in July 2010 to facilitate the extensive application of the unique space environment provided by the International Space Station (ISS) and its Japanese Experiment Module "Kibo" by Asian countries.

JAXA has been promoting diverse cooperative activities with Asian counterparts in the field of space environment utilization at the Asia-Pacific Regional Space Agency Forum (APRSAF) since 2005. The mission of KUOA is to extend the current cooperation with Asian counterparts on the ground into space by making full use of the Kibo facility in orbit.

The ISS program visualizes great challenges in all kinds of collaboration, in covering a broad spectrum from science and technology to liberal arts in space, hoping to yield prosperous returns to human welfare on earth. JAXA is ready to share the benefit from Kibo utilization with its Asian friends.

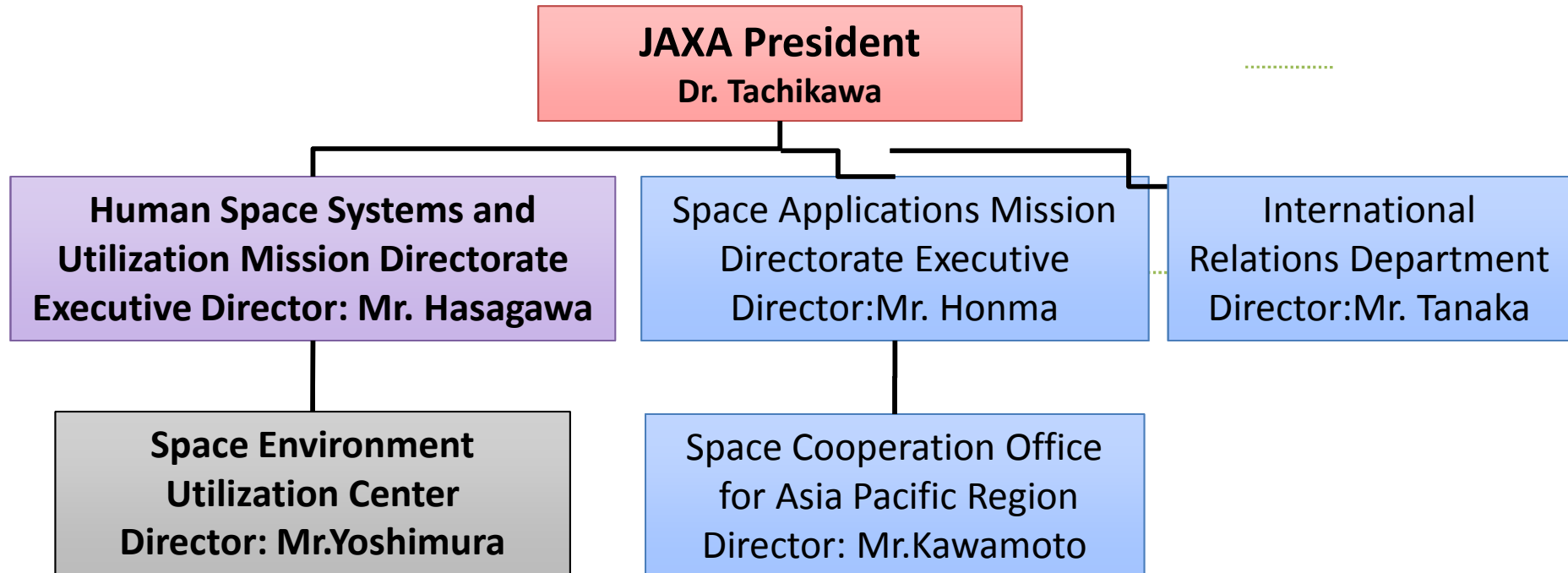
**KUOA News**

**Space Seed for Asian Future 2010-2011** (March 30, 2011)

The Space Seed for Asian Future (SSAF) 2010-2011 mission has been planned and developed by the space agencies participating in the Space Environment Utilization Working Group (SEU WG) of the Asia-Pacific Regional Space Agency Forum (APRSAF). The SEU WG, which plans to optimize the use of "Kibo", one of the key components of the International Space Station, has discussed ways to facilitate the effective joint

<http://iss.jaxa.jp/en/kuoa/>

# KUOA



- Kibo Utilization Planning
- Kibo Utilization Project Promotion
- Space Experiment Mission Group (Integration, Payload Dept., Ops)
- EF Payload Mission Group (Payload Dept)
- **Kibo Utilization Office for Asia**

# What is Kibo Utilization?

- To obtain beneficial results from activities optimally utilizing the unique environment of the Kibo module.
- These activities include education, culture and life sciences as well as technological challenges and research in natural sciences.
- The unique environment of Kibo includes, microgravity, cosmic radiation and isolated closed conditions.
- The ability of ***mission integration***, namely making various components work together, is vital.

# The Road to Joint KIBO Utilization

- Establishing a local system to conduct space utilization.
  - Promotion of the user community
  - A publicity campaign
  - Building capability on ***mission integration***
- Balanced and mutually beneficial cooperation
  - Shared opportunities and information
  - Implementation under a bilateral agreement

# APRSAF

- The Asia-Pacific Regional Space Agency Forum (APRSAF) was established in 1993 to enhance space activities in the region.
- APRSAF currently organizes four working groups: Earth Observation, Communication Satellite Applications, Space Education and Awareness, and Space Environment Utilization  
Kibo utilization cooperation is discussed at the Space Environment Utilization Working Group (SEU WG)

18<sup>th</sup> APRSAF is scheduled on December 6 through 9 in Singapore.



17<sup>th</sup> APRSAF 23-26 November 2010 in Australia

# SEU WG of APRSAF

- Introductory sessions on space environment utilization were held at the 8<sup>th</sup> and 9<sup>th</sup> APRSAF
- The Space Environment Utilization Working Group (then called ISS WG) meeting was held at the 12<sup>th</sup> APRSAF, in 2005
- JAXA announced the possibility to conduct joint utilizations of Kibo with Asian countries.
- Space agencies in Malaysia, Indonesia, Thailand and Vietnam expressed their interest, and JAXA dispatched its first delegation to these countries in 2006



# Asian “Kibo” Mission Planning Task Force

- The task force was first established under the SEU WG of APRSAF, in 2008 to manage students’ parabolic experiment program, and obtained good results.
- The mission of the task force expanded to cover the planning of joint missions utilizing Kibo in education and outreach fields, as well as scientific and technological research.
- “Space Seed for Asian Future” is the first space mission planned by the task force.

# Students' Parabolic Experiments

- Utilizes 20 second microgravity produced by parabolic maneuvers of aircraft.
- Students' proposals are examined by a task force attached to SEU WG of APRSAF
- Students are given advice to improve their experiments
- The task force identify eligible proposals as flight candidate experiments
- More than 20 students in 8 teams from Malaysia and Thailand have participated in the program since 2006

# Students in Parabolic Experiments



# Parabolic Experiment Outcome

- Students expressed their creative and innovative ideas.
- The experience had a beneficial effect on students' career development.
- Space agency officers gained space *mission integration* capability.
- Japanese students were also stimulated through the program with foreign students.

# Space Seed for Asian Future

- Plant seeds from Indonesia, Malaysia, Thailand and Vietnam are sent to Kibo. The retrieved seeds were distributed for science, education and outreach purposes.
- The mission was proposed at the task force's web conference and developed into the first joint Asian Kibo utilization.
- Task force members selected their own plant species, the seeds of which are to be flown into space.
- A mission logo was designed by the task force members.

# Space Seed Mission Logo



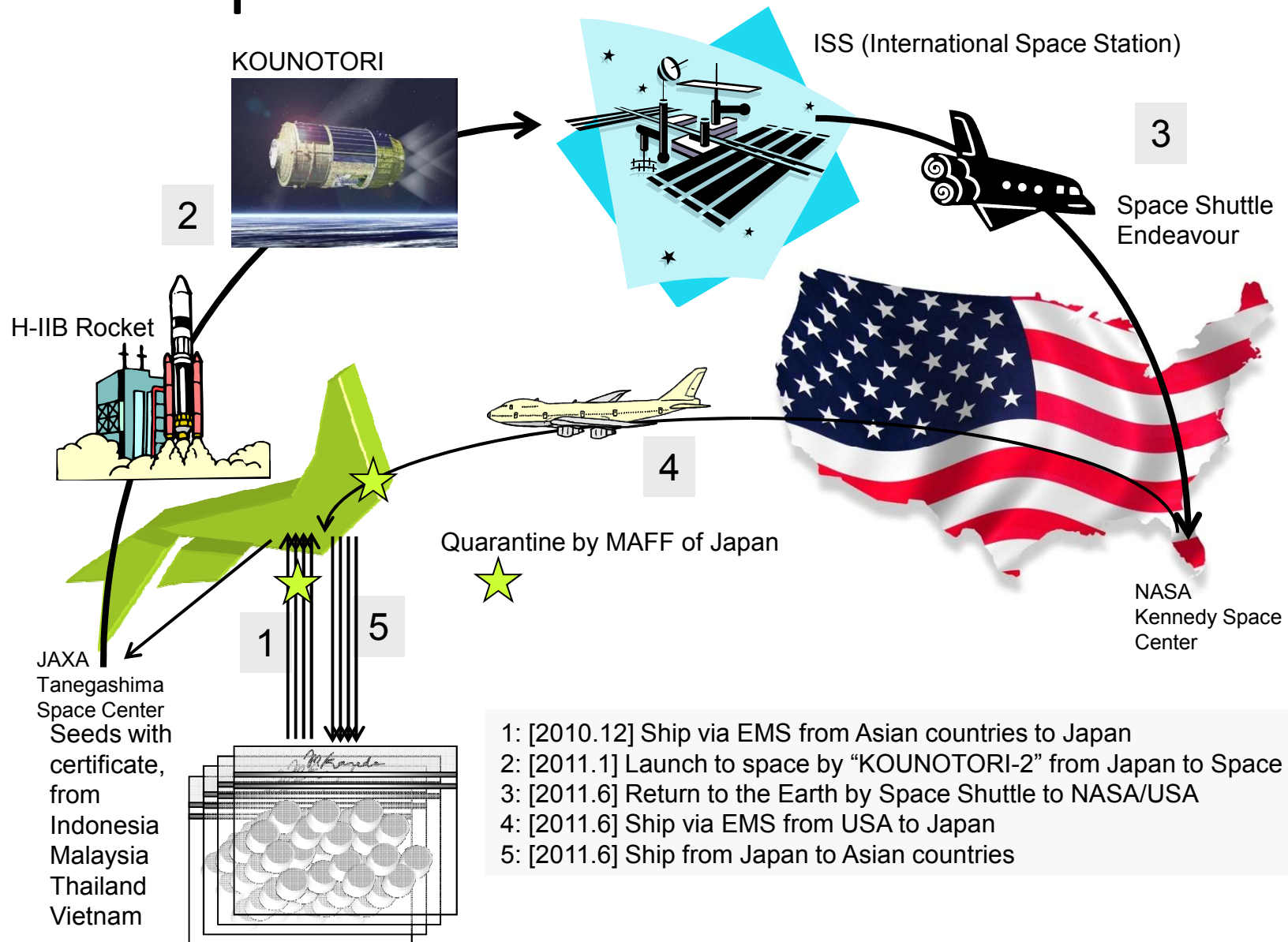
# Asian Seeds in Kibo



ISS027E008229

JAXA/NASA

# Transportation Route of Asian Seeds



- 1: [2010.12] Ship via EMS from Asian countries to Japan
- 2: [2011.1] Launch to space by "KOUNOTORI-2" from Japan to Space
- 3: [2011.6] Return to the Earth by Space Shuttle to NASA/USA
- 4: [2011.6] Ship via EMS from USA to Japan
- 5: [2011.6] Ship from Japan to Asian countries



# Lessons Learned from Space Seed

- Participants recognized the importance of *mission integration*, finding that sending plant seeds into space was neither simple nor easy.
- The mission contains components which require wide-ranging specialties, in addition to space technologies.
- The *mission integration* had to cover plant physiology, phytosanitary certification, CITES, import-export regulations, and many other specialties.

# Documentation on Seeds

GOVERNMENT OF MALAYSIA PHYTOSANITARY CERTIFICATE		CUSTOMER COPY Siri 523640
FAO International Plant Protection Convention		Certificate Number: B.81/03.03/101.396
To: The Plant Protection Organization(s) of <b>JAPAN</b>	Place of Issue <b>KUALA LUMPUR</b>	
DESCRIPTION OF CONSIGNMENT		
1. Name and address of exporter <b>MHD FAIROZ ASILLAM</b> Agensi Angkasa Negara, 53, Jalan Perdana, 50480 Kuala Lumpur	2. Declared name and address of consignee <b>DR. MUNEO TAKAGI</b> Kibo Utilization Office, Utilization Centre, Jember, Jember 50500, Indonesia	
3. Number and description of packages 1 Box (100 gm)	4. Distinguishing marks Address of Consignee	
5. Place of origin Peninsular Malaysia	6. Declared means of transport By Air	
7. Declared point of entry Japan		
8. Name of produce and quantity declared Capsicum annum Seeds - for Research Purposes		
No. Name of produce <b>Capsicum</b>	Botanical Name <b>Capsicum annum</b>	

BUKTI TERIMA KIRIMAN

JENIS KIRIMAN: KEPERLUAN  
KANTOR KIRIM: KANTOR TUJUAN

Penama: MHD TAKAGI KIBO UTILIZATION OFFICE FOR ASIA SPACE ENVIRONMENT AND RESEARCH CENTER JAWA BENGKAL ZILTERKUN TERAKKI  
Kota: KEMANG  
Tempo / fax: 031-7394633  
Penerima: DR. MUNEO TAKAGI  
Alamat: LAPAN, JL. DR. SUKOWATI 133, JEMBER, JAWA TENGGA, INDONESIA

berat: Volume: P, L, T, Cm  
Bisa Kirim: Rp  
(3) Dikirim: Rp  
Netto: Rp  
PPH 1%: Rp  
HTH 8: Rp  
Jumlah: Rp

1. Selesai dengan ketentuan pengiriman di balik Bukt Terima Kiriman ini  
2. Isikirimkan  
3. Nilai Perlanggangan di kirimkan Rp.

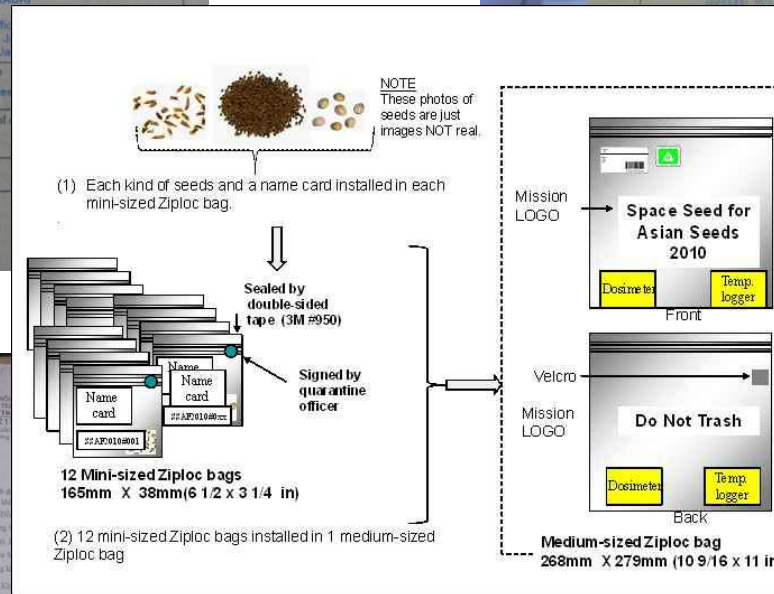
Dewasman (g): pat  
Penerima:

No. bukti diri: Nama Penerima:

Harap dilacak, melalui :  
sila.co.id  
nomor barcode, kirim ke 8161

Pat : 094  
Barcode : EE137466544ID  
No. IS : No. 0-000

Printed by: PETRACO, Jakarta



VFC  
VIETNAM FUMIGATION COMPANY  
NORTHERN BRANCH

CERTIFICATE OF FUMIGATION

No. IN-2003-VFC-219

We hereby certify that the cargo with following details:

Name of the commodity: **ASPIRINS BALSAMIA AND FENIBEROL BALSAM SALVIA SPLENDENS**

Weight: **0.10 30.00 GRAM (32.00 GRAM / 1 BAG)**

Quantity: **09 BAGGS**

Shipping Marks:

Means of conveyance: **BY AIR**

Has been fumigated with: **ALUMINUM PHOSPHIDE**

Charge: **60 GRAM ABOVE OF PHO PER CUBIC METER**

Duration of exposure: **96 HOURS**

Place of fumigation: **HA NOI - VIETNAM IN SHIPPERS WAREHOUSE UNDER TARP-AULIN**

Date fumigated: **NOV 18<sup>th</sup> 2010**

CONSIGNEE: **JAPAN AEROSPACE EXPLORATION AGENCY (JAXA)**

HANOI NOV 23<sup>rd</sup> 2010  
Fumigation Manager

APPROVED  
PHU DINH QUANG

PHU DINH QUANG

Place of issue: **KUALA LUMPUR**

Name of authorized officer: **AISHAH JAFAR**  
Aishah Jafar  
Crop Protection & Plant Quarantine  
Services Division  
Department of Agriculture,  
Kuala Lumpur, Malaysia.

Date: **11/11/2010**

Signature: *[Signature]*

No financial liability with respect to this certificate shall attach to:  
..... (Name of Plant Protection Organization) or to any of its officers or representatives.\*

festations and/or Disinfection treatment

Treatment: sodium hypochlorite solution  
5 min and ambient temperature

use with sterile distilled water and dry in the laminar air flow.

# Malaysian Protein Crystal Experiments

## General Objective

- To obtain high quality proteins crystals of industrially important enzymes under a microgravity environment for more precise protein 3D structure.

## Specific Objective

- To study the crystal growth behavior of industrially important enzymes on earth.
- To study the effect of microgravity on the crystal growth behavior of industrially important enzymes.
- To solve the 3D structure of selected enzymes
- To integrate the 3D crystal structures obtained on earth and in space

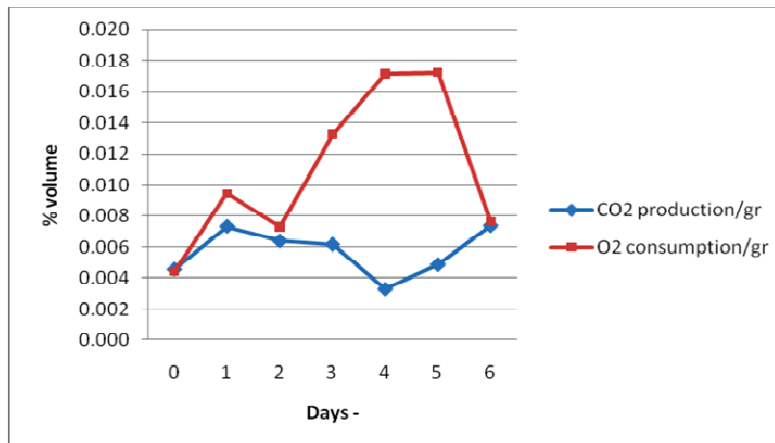
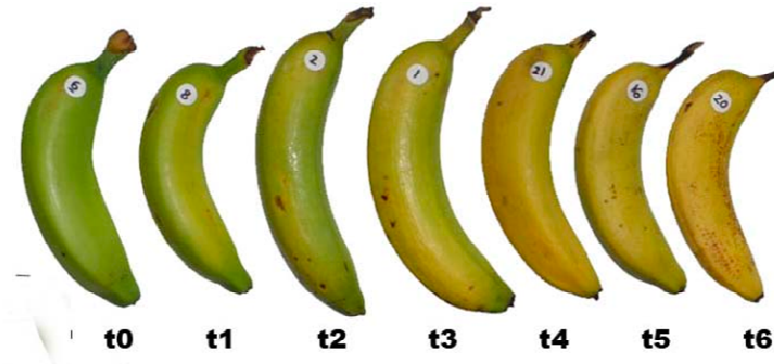
# Joint Feasibility Studies

- The Korean space agency, KARI, invited space experiment proposals.
- JAXA and KARI are conducting a joint feasibility study to develop experiment hardware which will be utilized by researchers from both countries
- JAXA and LAPAN are conducting a joint study to develop an idea into a feasible space experiment proposal.

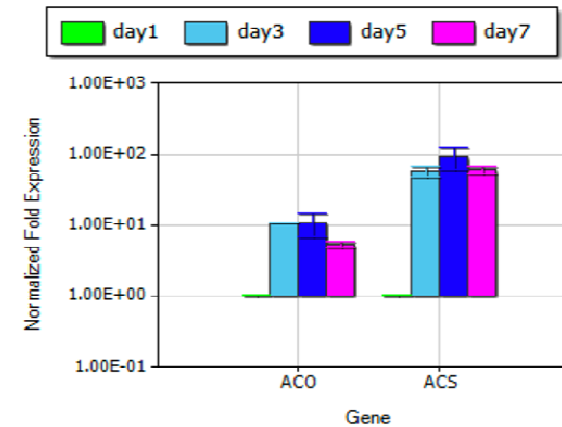
# Joint Feasibility Studies

- Refinement of the experiment plan to demonstrate:
  - Justification for the experiment purpose
  - Necessity for implementation in space
  - Hypothesis and validation methodology
  - Requirements for experimental equipment in orbit
- Selection of a candidate experiment based on the results of the feasibility study..
- Establishment of the framework, implementation plans, roles and responsibilities.

# Do Fruits Ripen Differently in Space?



CO<sub>2</sub> production and O<sub>2</sub> consumption during fruit ripening



Normalized MaACS and MaACO genes fold expression during fruit ripening using qPCR

by Dr. Fenny M. Divan, ITB



2-meter/0.6-second drop test tower  
constructed by JAXA



*by Prof. Khairurrijal, ITB*

3D Clinostat by LAPAN/ITB

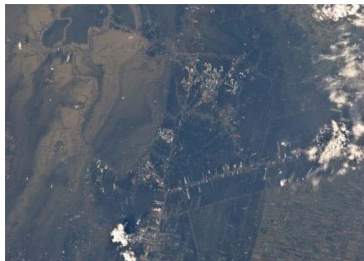
## ISS will contribute the earth observation as well.

Earth observation missions aiming to resolve global environmental and climate change issues using external sites of ISS such as Kibo Exposed Facility.

Live broadcasting from astronauts onboard ISS

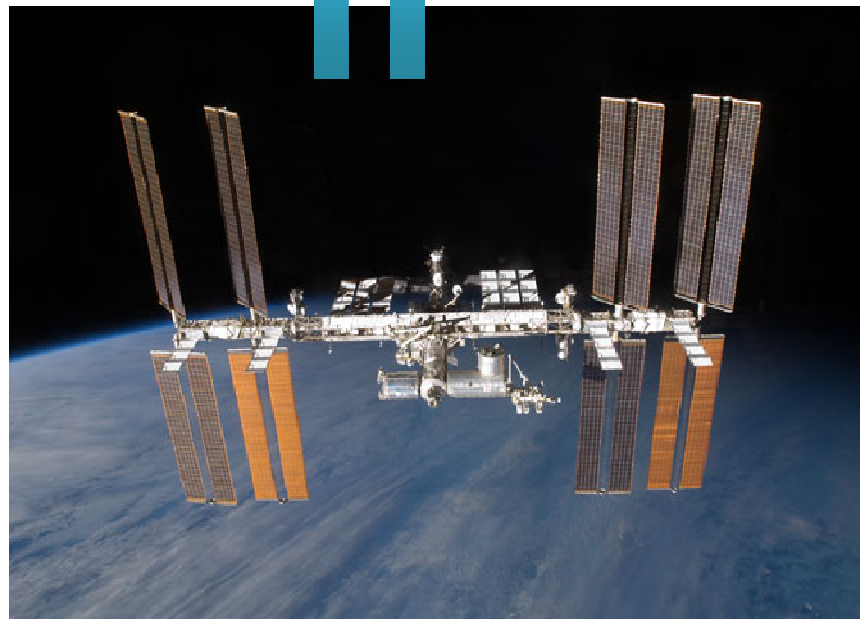


Eruption of a volcano in Russia (taken by Astronaut Wakata)



Flood in Thailand

Earth observation data broadcasted from ISS to the world



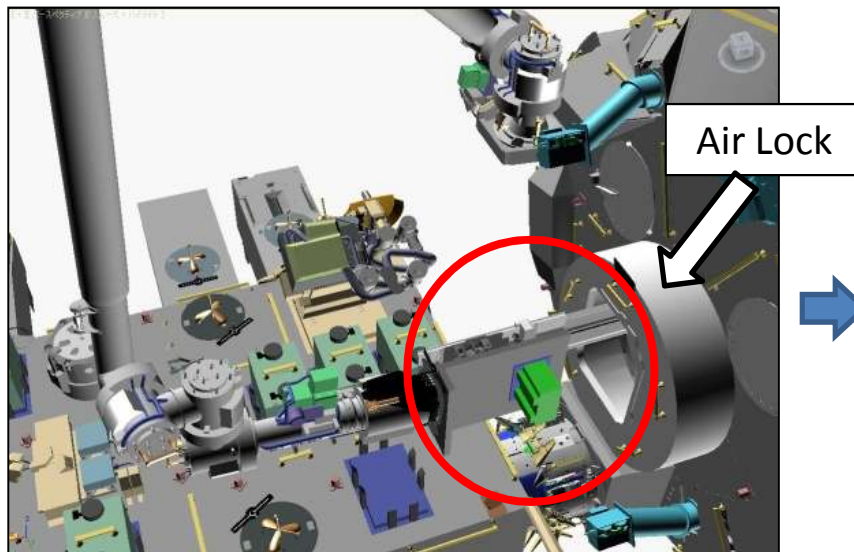
“Geosphere observation and diagnosis station”



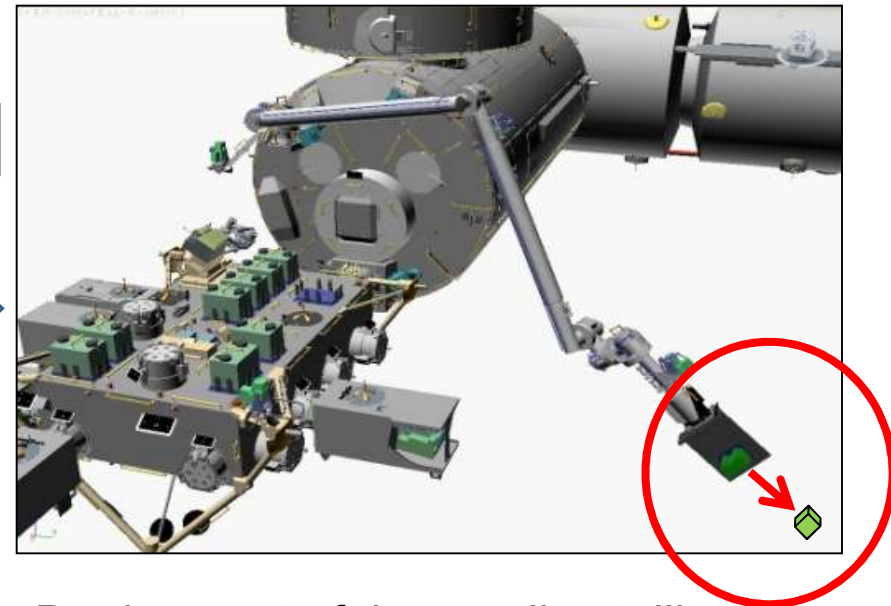
# Small Satellite Deployment from Kibo

**JAXA is now developing a new system to deploy some small satellites by KIBO Robotic Arm. This system will be demonstrated in 2012.**

- (1) The small satellite will be launched with pressurized payload contained in the soft bag. This will relieve the satellite launch condition.
- (2) The small satellite will be checked by crew and transferred through the air lock to the outside.
- (3) The Kibo Robotic Arm will take and deploy it to the planned trajectory to space.



Transfer through the Air Lock



Deployment of the small satellite

# Promotion of the User Community

- The first Japan-Korea Joint Seminar on Space Environment Utilization Research was held in 2004 at the Tsukuba Space Center.
- Annual meetings have since been held alternately in Japan and Korea.
- The Malaysian space agency has held microgravity science workshops.
- JAXA has sent experts to Indonesia, Malaysia, Thailand and Vietnam to deliver lectures

# Toward Future Cooperation



- Space utilization is a synthetic project. Even a simple experiment requires extensive efforts, especially in *mission integration*.
- Experiencing space utilization promotes human capital development in the relevant field.
- The introduction of innovative concepts from an Asian cultural background is expected.
- JAXA anticipates friendly rivalry with its Asian counterparts to optimally exploit the Kibo potential.