NARLabs
國家實驗研究院

National SPace Organization

A center of innovation and excellence for space technology

Bo Chen

National Space Organization

Presented at JPTM 2014, Sentinel Asia
Yangon, Myanmar, 11/19-21

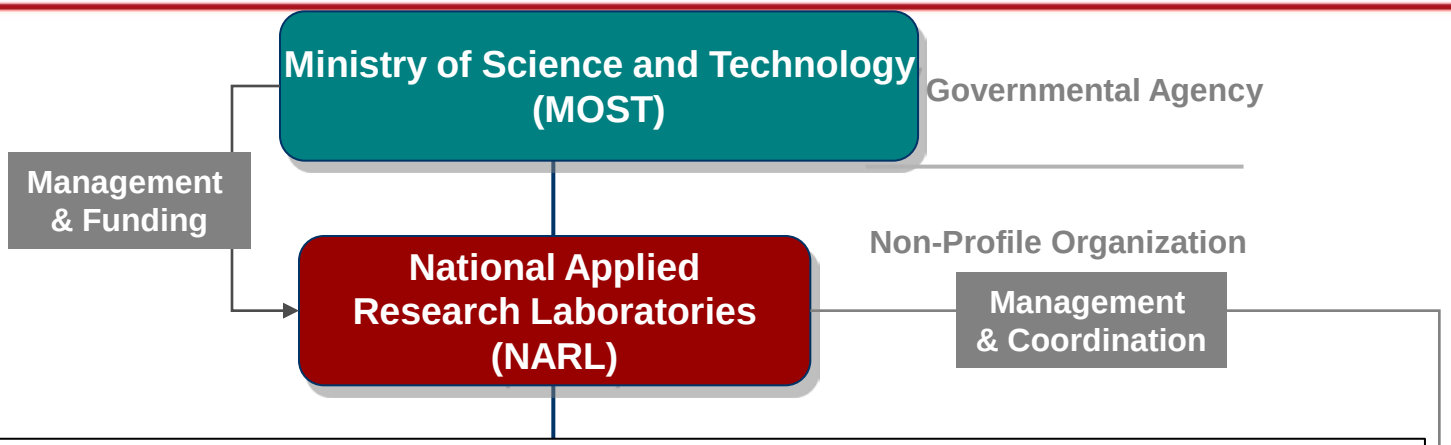
NARLabs
承諾·熱情·創新

NARLabs-NSPO
About Us

Organization

NARLabs

Commitment · Passion · Innovation



Earth sciences and environmental/ disaster mitigation technology

Electronics, information, communications

Biomedical technology

FORMOSAT Programs

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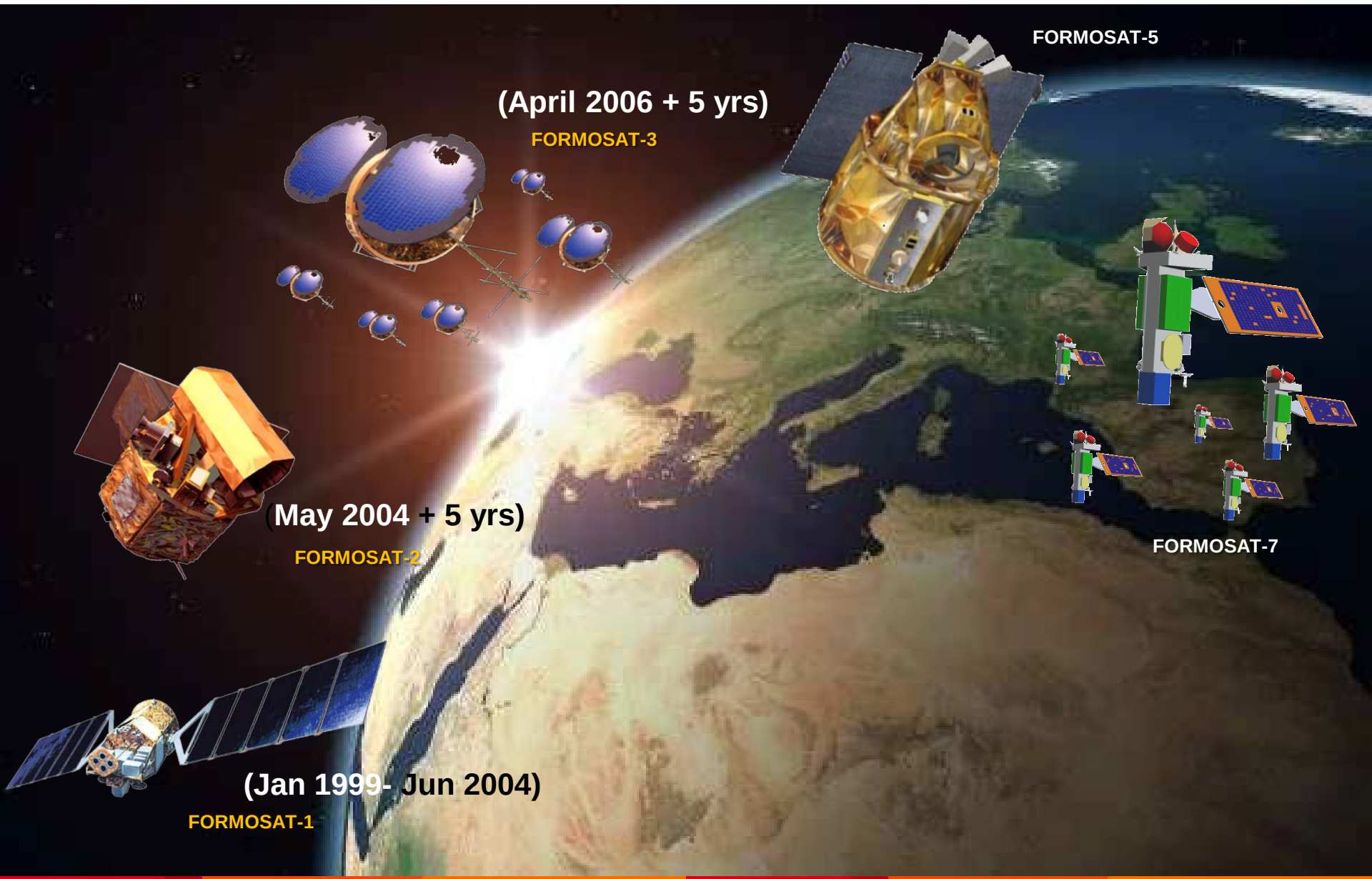

NSPO Mid-term Plan

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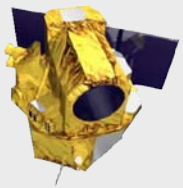
Self-reliant Spacecraft and Optic-Electric Remote Sensing Instrument Development



FORMOSAT-2

Remote Sensing Satellite Program

FORMOSAT-5

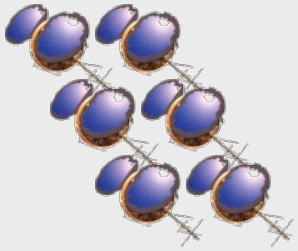
(Target Launch Date: 2015)

FORMOSAT-5 Follow-on (FORMOSAT-8)

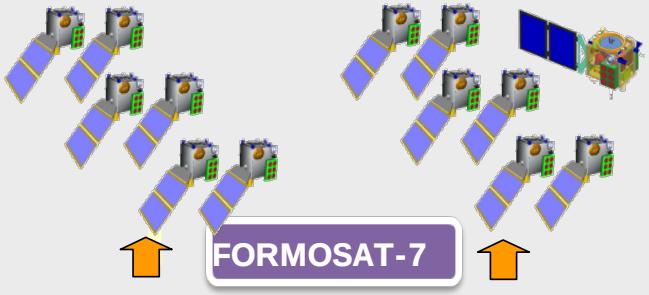
Earth Observations

- EV Monitoring
- Disaster Support
- Data Applications

GNSS RO Spacecraft and Constellation Operations Development



FORMOSAT-3



2016
1st Set Launch

2018
2nd Set Launch

Atmospheric Soundings

- Weather Predication
- Climate Research
- Space Weather

The Key System Specification

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Key Parameter	Specification
Orbit	SSO @ 720km/98.28˚
Revisit Period	2 days
Mission Life	5 years
GSD	PAN (2m) / MS (4m)
Swath	24 km
Spectral Bands	PAN + 4MS
RSI Image Sensor	CMOS Image Sensor
RSI duty Cycle	8%
Satellite Weight	525 kg

Formosat-5 & 8 Constellation

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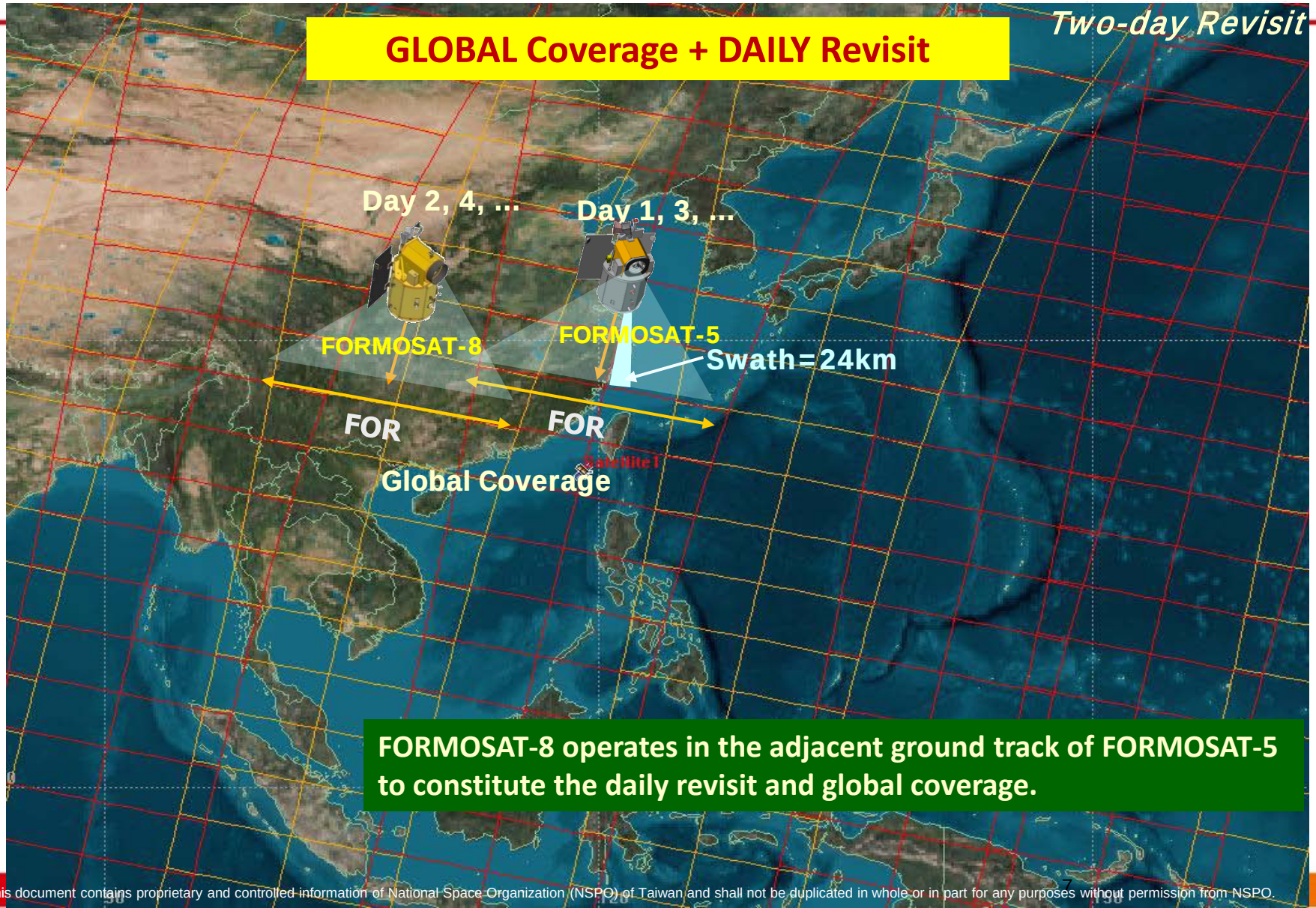

Smart Agility Capability

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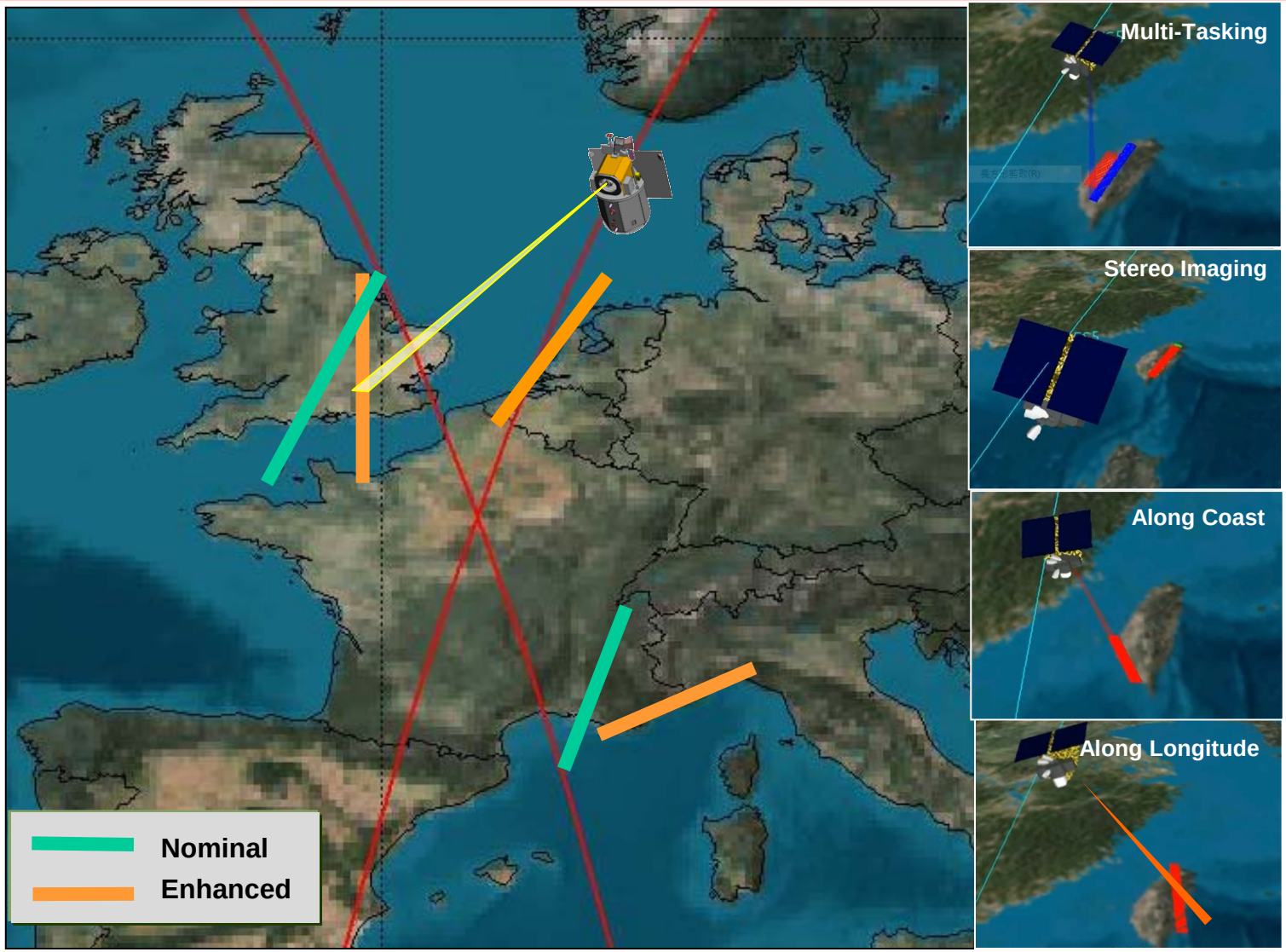
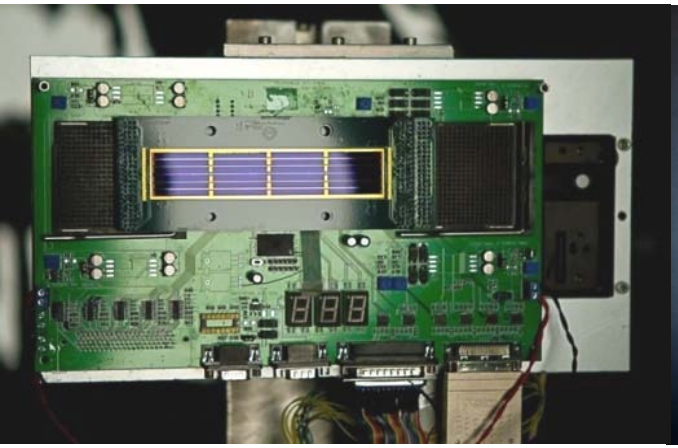
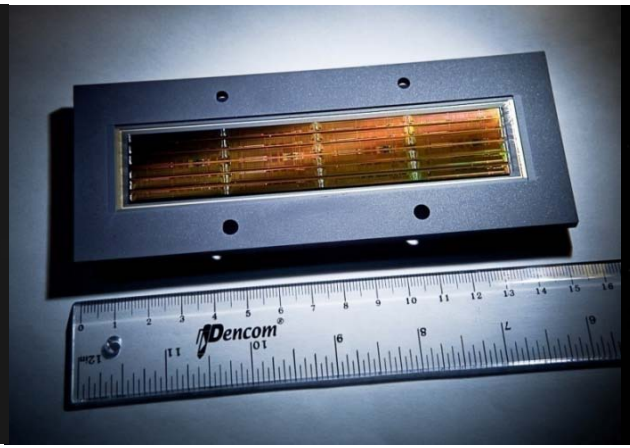
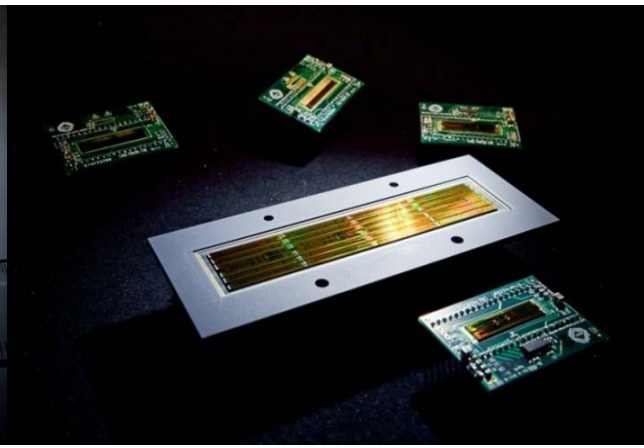


First HR EO Satellite Utilizing CIS

- Largest CMOS Single Chip in the World
  - 12 cm x 2.4 cm chip
  - PAN+4 MS bands
  - 12,000 10μm pixels (PAN); 6,000 20μm pixels (MS)
- FORMOSAT-5 will become the first high-resolution EO satellite utilizing CMOS-type image sensor.







Highlights on FORMOSAT-5

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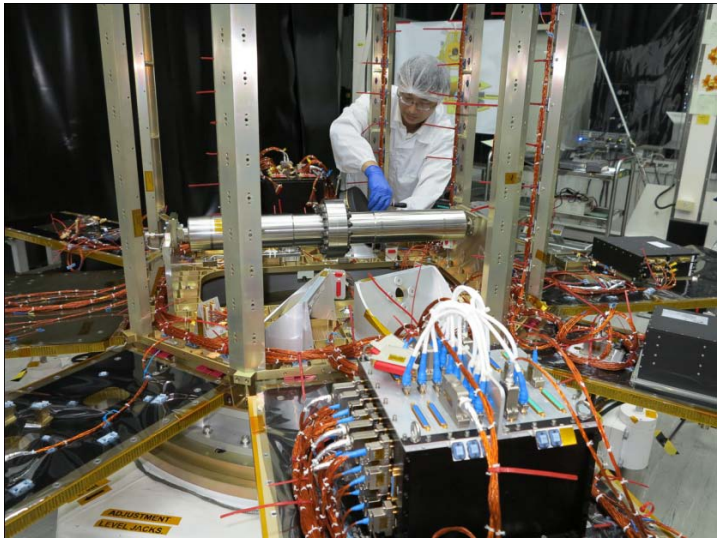

Highlights on FORMOSAT-5

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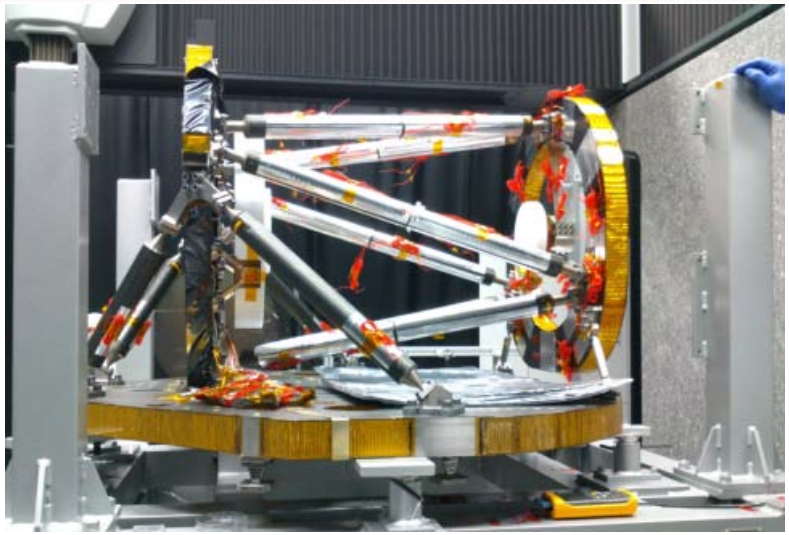

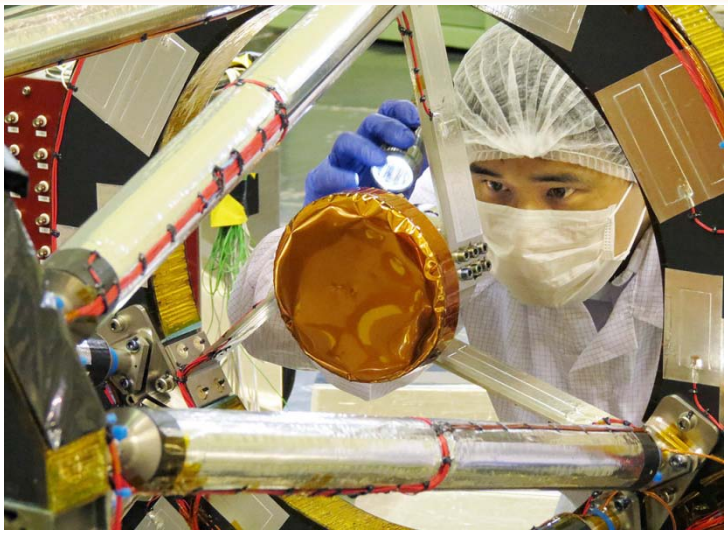

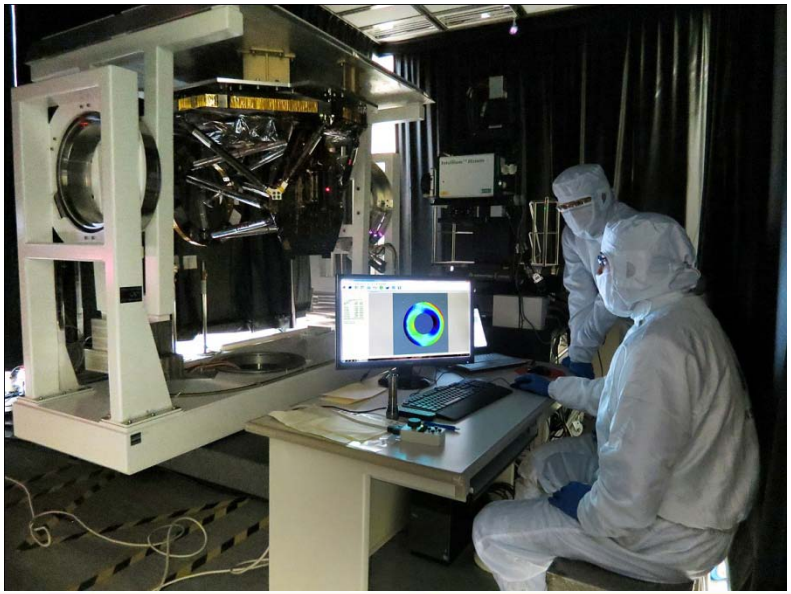

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NARLabs-NSPO
supports to
Sentinel Asia

NARLabs-NSPO Supports to SA

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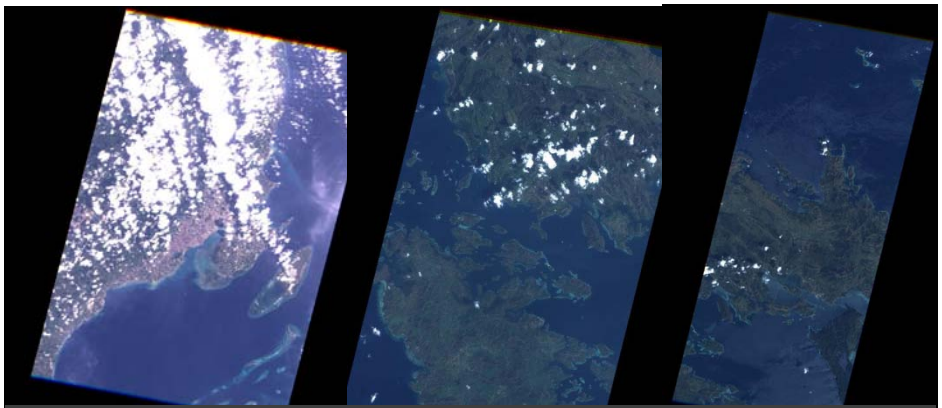
Disaster Type	2010	2011	2012	2013
Earthquake	0	5	3	0
Landslide	2	0	1	3
Tsunami	1	0	0	0
Volcano eruption	2	1	0	1
Flood	5	16	4	5
Flash flood	2	3	0	2
Others	1	0	7	2
Total	13	25	15	13

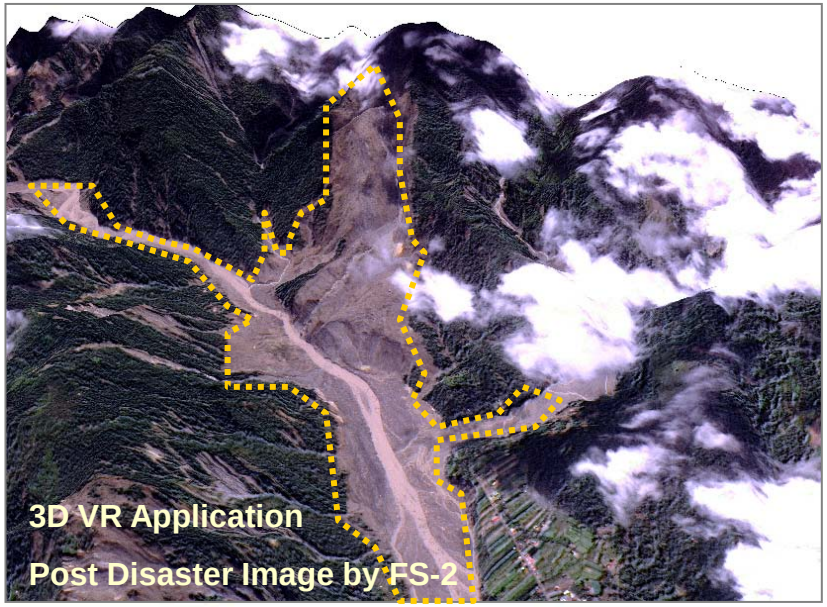


FS-2 Images on 11/13, 17, 18 after Haiyan Hit the Philippines

SENTINEL ASIA Sentinel Asia

Environmental Monitoring for Asia

Is being proposed to contribute to Platform for Image and Applications Services under SA umbrella



2014 Sentinel Asia EO Responses

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Place Name Of EO	Period
Mount Sinabung, Indonesia	2014/2/7~2014/2/13
Brunei	2014/1/18~2014/1/24
Tonga	2014/1/19~/2014/1/25
Jakarta, Indonesia	2014/1/22~2011/1/28
Inawashiro	2014/2/17~201/2/27
mount kelud, indonesia	2014/2/16~2014/2/23
Honiara, Solomon	2014/4/9~2014/4/16
Landslide, Tajikistan	2014/4/21~2014/4/27
Nagano prefecture, Japan	2014/7/12~2014/7/17
Kochi prefecture ,Japan	2014/8/5~2014/8/12
Takayama city, Japan	2014/8/19~2014/8/21
Hiroshima City, Japan	2014/8/21~2014/10/10
Flood, Vietnam	2014/8/22~2014/8/24
Flood_Dhemaji, Assam, India	2014/8/29~2014/9/4
Flood_Lakhimpur, Assam, India	2014/8/29~2014/9/4
Mt. Ontake, Japan	2014/10/1~2014/10/19
Sri Lanka	2014/11/1~2014/11/7

Total 17 Responses

Step-3 Activities

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- **Pre-disaster monitoring**
  - Heavy rainfall in Kochi prefecture ,Japan (08/03/2014)
  - Heavy rainfall in Gifu prefecture ,Japan (08/18/2014)
- **Extended EO**
  - Land-slide in Hiroshima City, Hiroshima prefecture ,Japan (08/20/2014)
  - Volcano Eruption at Mt.Ontake in Nagano Prefecture, Japan (09/30/2014)

Hiroshima City, Japan
(Period 2014/08/21~2014/10/10)

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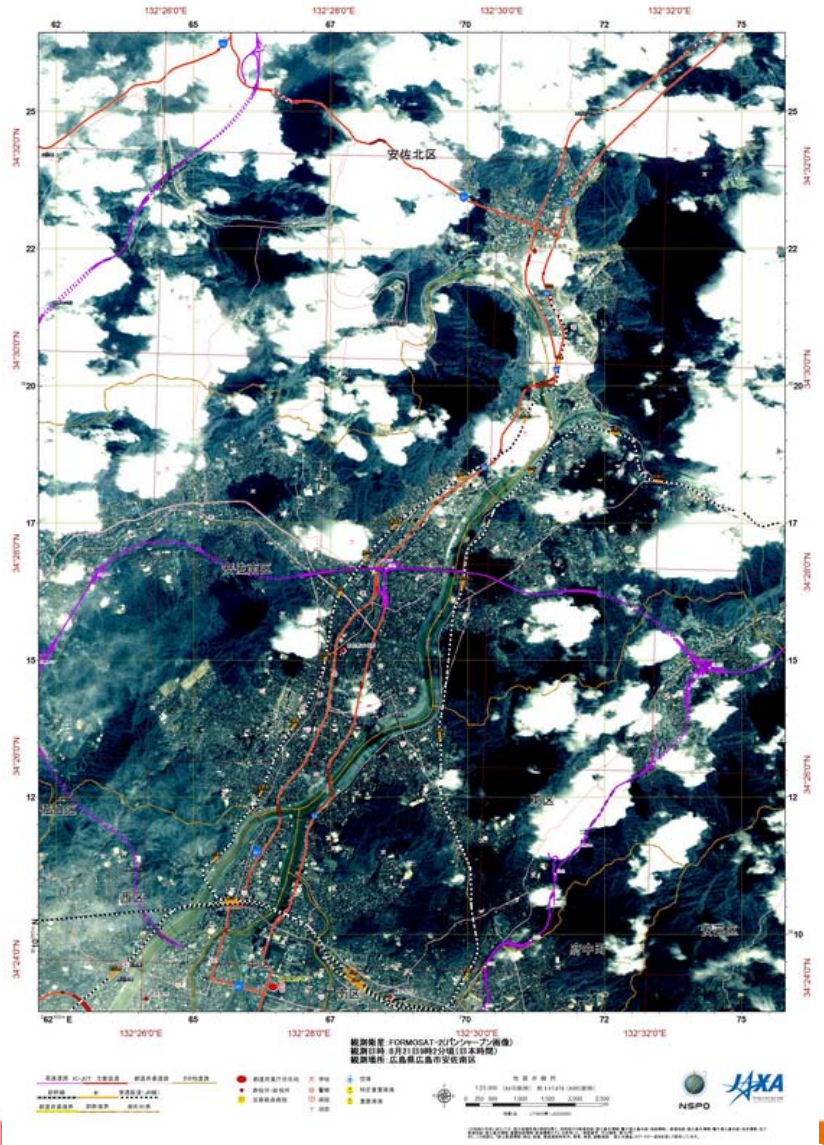

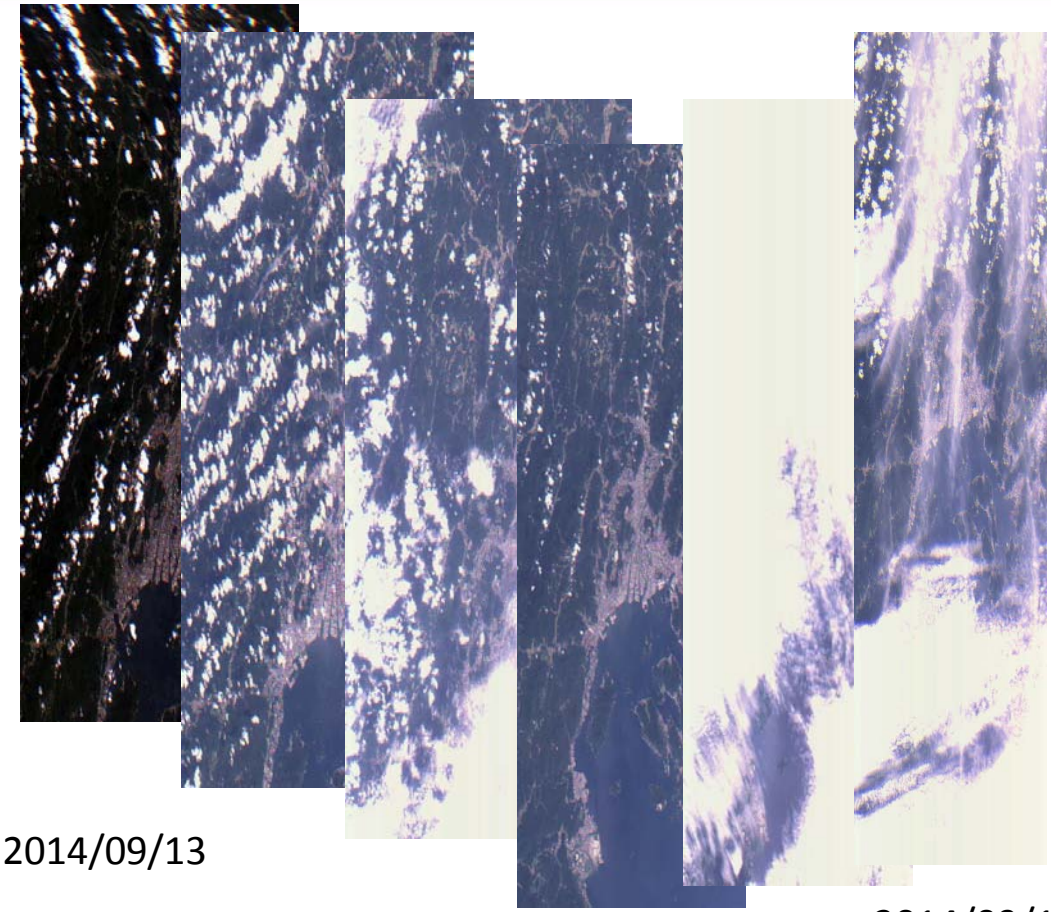

2014/09/13

2014/09/14

2014/09/15

2014/09/16

2014/09/17

2014/09/18

Mt. Ontake, Japan
(Period 2014/10/3~2014/10/19)

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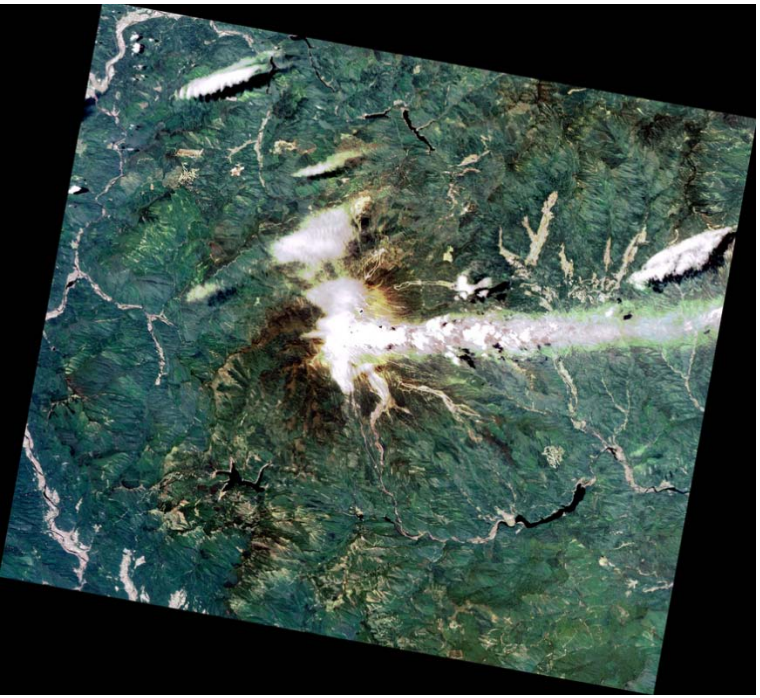

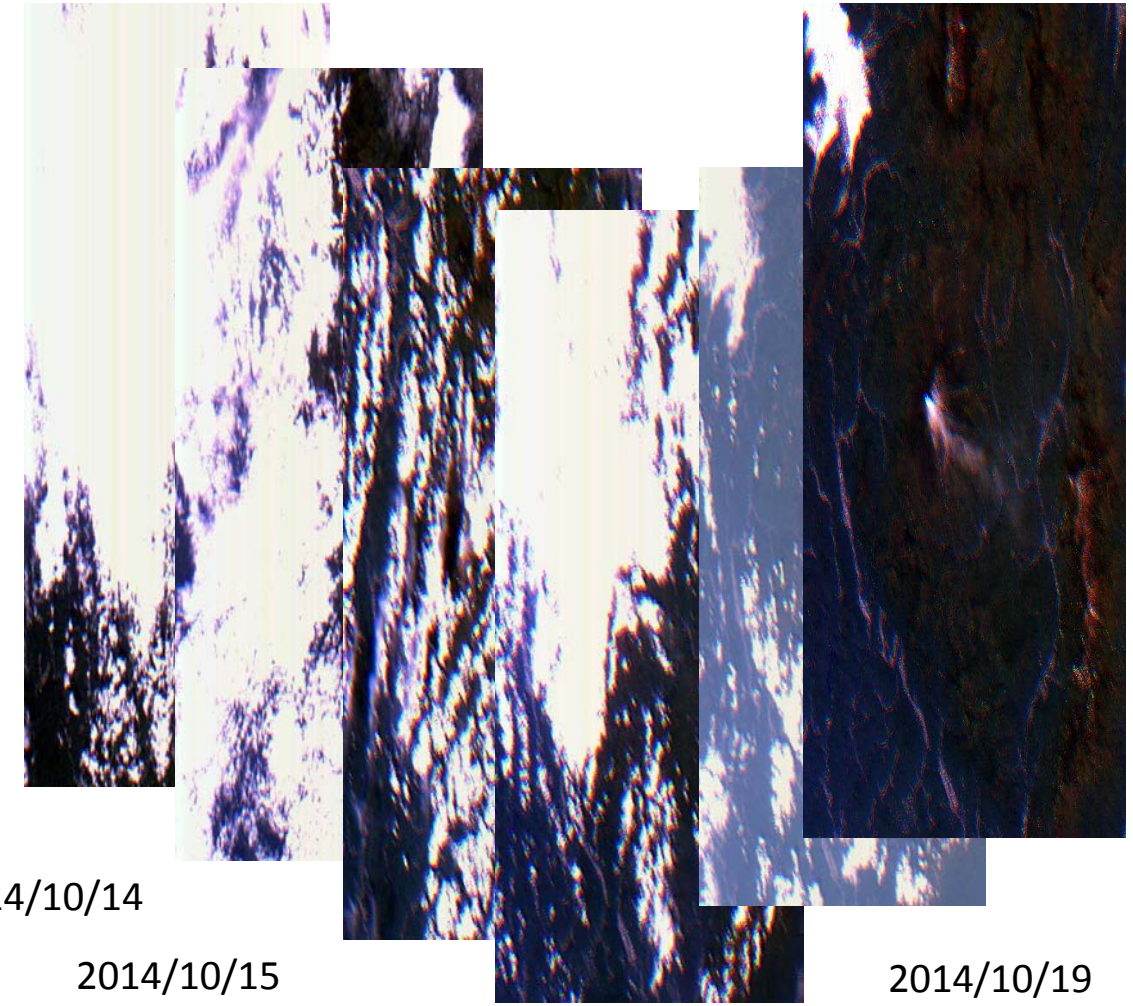

2014/10/14

2014/10/15

2014/10/16

2014/10/17

2014/10/18

2014/10/19

Good reasons to support step-3

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- **Sentinel Asia Success story with JAXA and NARLabs/NCU Collaboration**
  - Kick-off meeting in JAXA (07/11/2014).
  - Complementary utilization of SAR (ALOS-2) and Optical (FORMOSAT-2) data.
  - Rapid response
    - ALOS-2: accept EO request until one hour before observation, and provide data one hour after observation.
    - FORMOSAT-2: accept EO request until 13:00 (JST), 16:00 if use dedicated scheduling tool via internet, on the previous day of observation, and provide data on that evening.
  - FORMOSAT-2 rapid processing streaming
    - We can now match the performance of ALOS-2 by providing data one hour after downlink.
- **Embedded in a commercial activity**
  - NARLabs and RESTEC entered into a commercial agreement to sell FORMOSAT-2 Japan data, all data taken to support step-3 can also become products on the shelf.

Conclusion Remarks

- NARLabs / NSPO is committed to continuously support of disaster reduction efforts and environmental observation for better living.
- Before high-levels endorse the free data policy, the Taiwan – Japan experience could be a good approach for Sentinel Asia Step-3 to move forward.