

JAXA EO Program Updates

**CEOS LSI-VC-7 Meeting
VNSC, VAST, Hanoi, Vietnam**

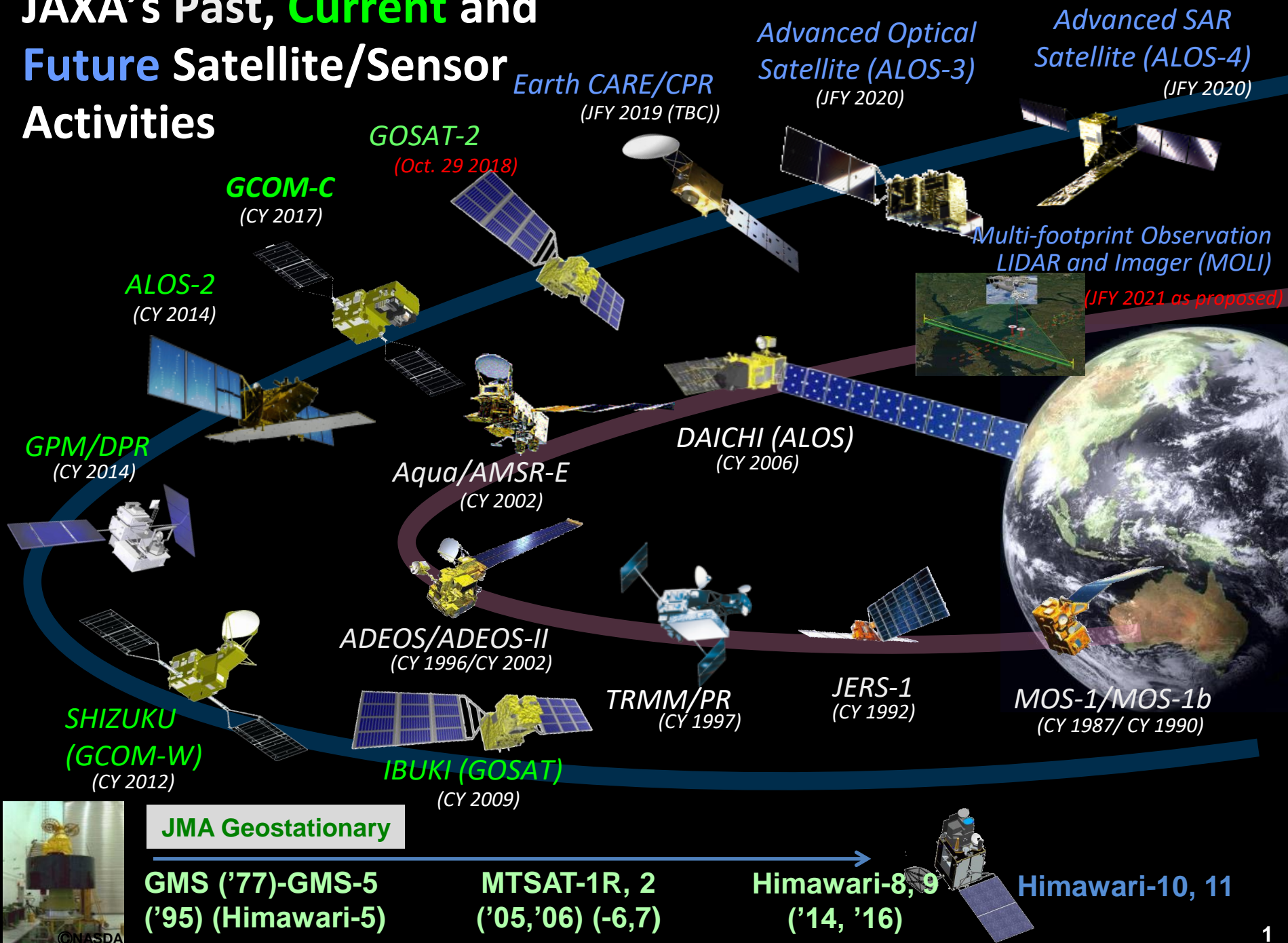
February 14-15, 2019

Takeo Tadono¹ and Ake Rosenqvist^{1,2}

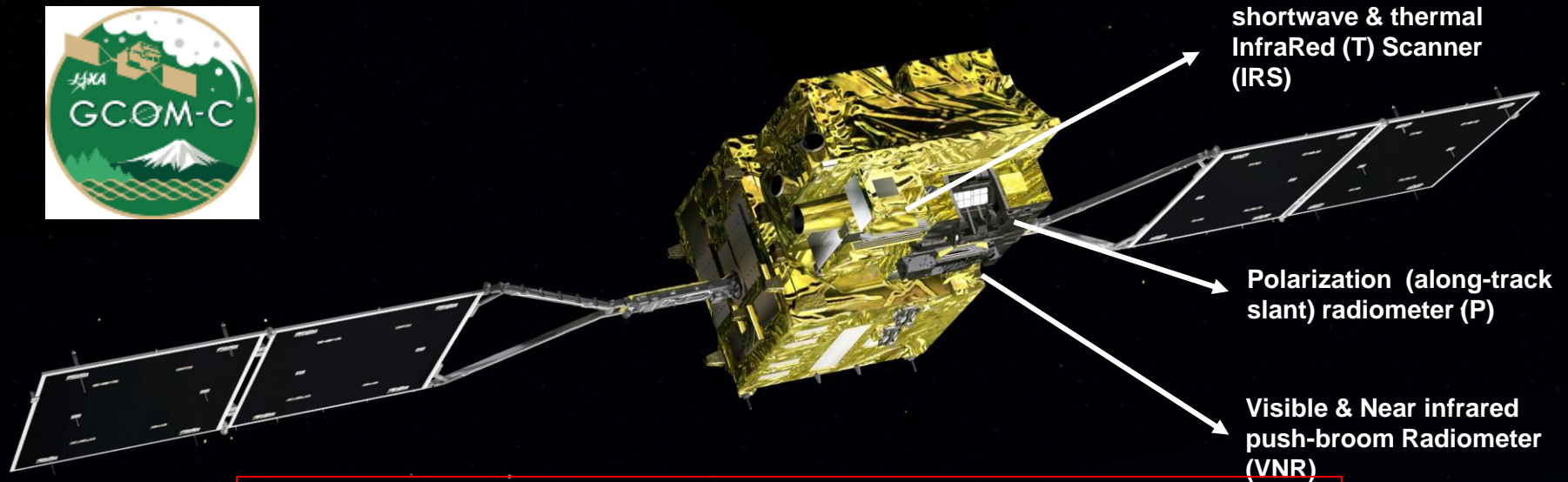
¹ Japan Aerospace Exploration Agency (JAXA)

² soloEO, Japan

JAXA's Past, **Current** and **Future** Satellite/Sensor Activities



Global Change Observation Mission-Climate (GCOM-C)



The standard products are available from December 2018

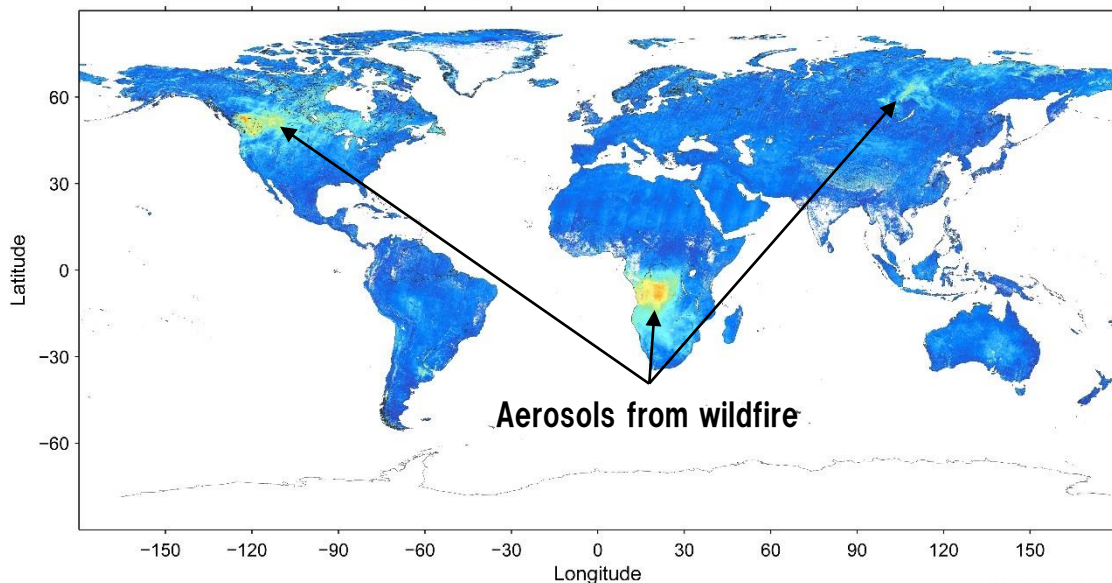
GCOM-C SGLI characteristics

Orbit	Sun-synchronous (descending local time: 10:30), Altitude: 798 km, Inclination: 98.6 deg
Launch Date	December 23, 2017
Mission Life	5 years
Scan	Push-broom electric scan (VNR: VN (11ch) & P (2ch)) Wisk-broom mechanical scan (IRS: SW (4ch) & T (2ch))
Scan width	1150 km cross track (VNR: VN & P) 1400 km cross track (IRS: SW & T)
Spatial resolution	250 m (land and coastal areas), 500 m, 1 km
Polarization	3 polarization angles for POL
Along track tilt	Nadir for VN, SW and TIR, & +/-45 deg for P



GCOM-C Satellite PFM @ JAXA Tsukuba Space Center

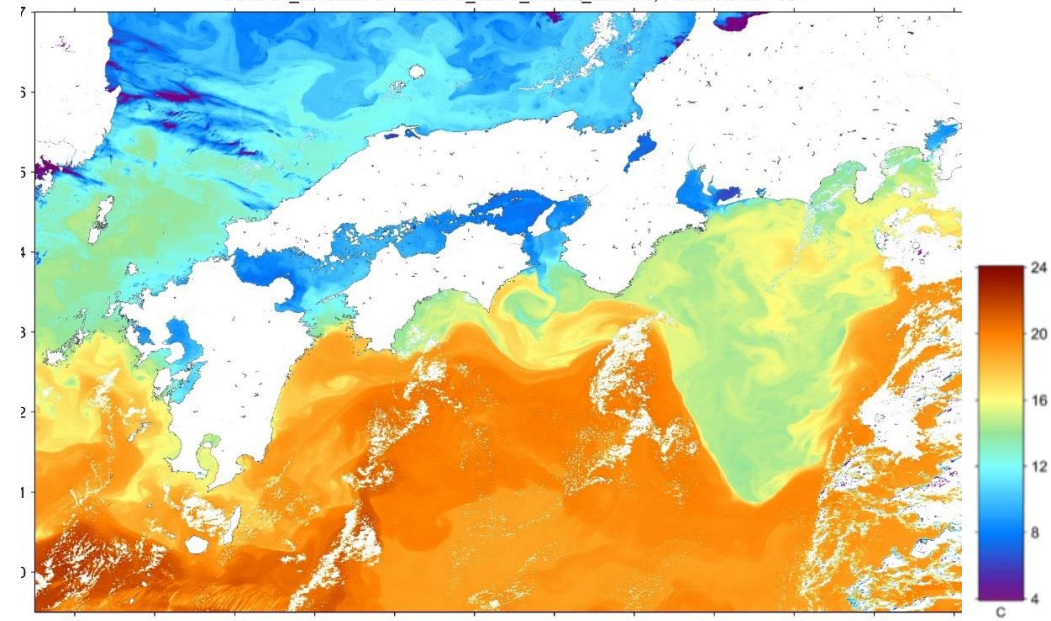
GC1SG1_20180812D01D_A0000_L2SG_LTOAF_0100.h5, Param Name= /Image_data/Lt_PQ02



◀ 8-day average (12-19 Aug 2018)
polarization radiance at 865nm

▼ Southwestern of Japan (Sea Surface
Temperature on Feb. 27, 2018)

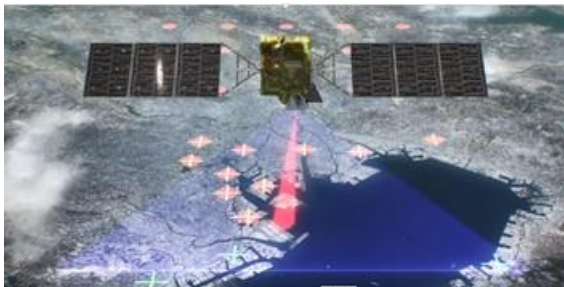
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GOSAT-2 Launch (Oct. 29, 2018)

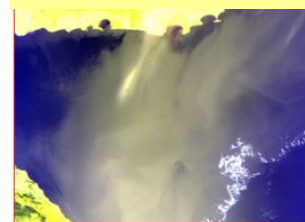


- TANSO-FTS-2 adds Carbon Monoxide (CO) measurement to identify CO₂ enhancement by combustion.
- Multi-viewing capability of TANSO-CAI-2 has improved aerosol detection capability.



- (1) Wider pointing angles
- (2) Fully customized observation pattern
- (3) Cloud avoiding pointing

GOSAT-2 CAI-2-forward



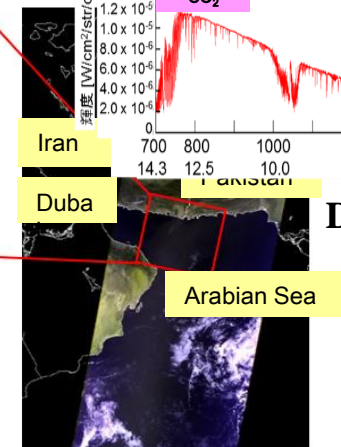
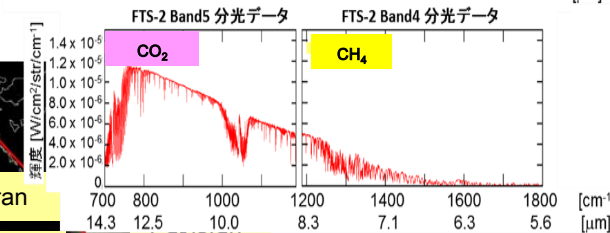
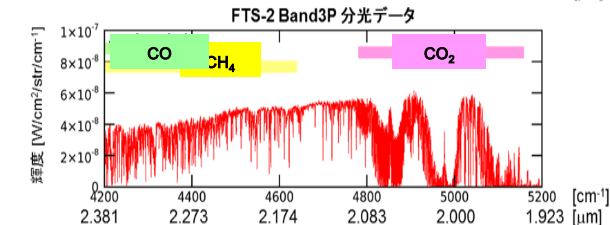
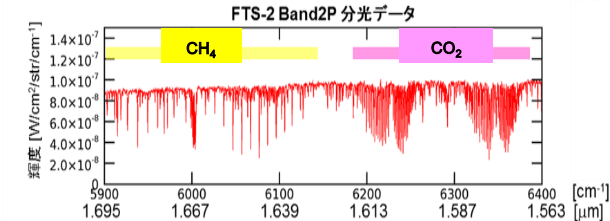
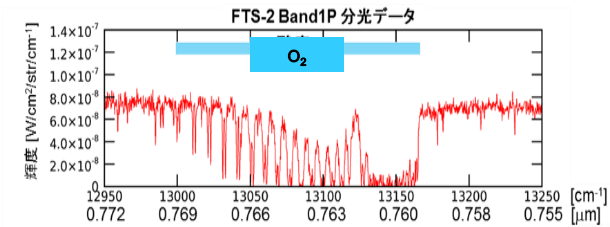
GOSAT-2 CAI-2-Backward



GOSAT CAI Nadir



TANSO-CAI-2
first light
(Nov. 5, 2018)



Dec. 13 2018, Nagoya

ECVs measured by GCOMs & GOSAT



ECVs measured by GCOM-C



ECVs measured by GCOM-W



ECVs measured by GOSAT

Atmospheric		
Surface	Upper-air	Composition
Air temperature	Temperature	Carbon dioxide
Wind speed & direction	Wind speed & direction	Methane
Water vapour	Water vapour	& other long-lived GHGs *
Pressure	Cloud properties	Ozone & Aerosol
Precipitation	Earth radiation budget (including solar irradiance)	supported by their precursors **
Surface radiation budget	* including N2O, CFCs, HCFCs, SF6, PFCs ** in particular NO2, SO2, HCHO, CO	







Terrestrial
River discharge
Water use
Groundwater
Lakes
Snow cover
Glaciers and ice caps
Ice sheets
Permafrost
Albedo
Land cover (including vegetation type)
Fraction of absorbed photosynthetically active radiation (FAPR)
Leaf area index (LAI)
Above-ground biomass
Soil carbon
Fire disturbance
Soil moisture

Oceanic	
Surface	Sub-surface
Sea-surface temperature	Temperature
Sea-surface salinity	Salinity
Sea level	Current
Sea state	Nutrients
Sea ice	
Surface current	
Ocean colour	
CO2 partial pressure	CO2 partial pressure
Ocean acidity	Ocean acidity
Phytoplankton	
	Oxygen
	Tracers

<u>Total Essential Climate Variables (ECVs)</u> (ECVs largely dependent on satellite observations identified by CEOS and GCOS are shown in bold .)	50
ECVs measured by GCOM-W, GCOM-C and GOSAT	23

[In past] Schedule of ALOS/ALOS-2 Data Processing and Open Free Access

As of August 2018

		2018				2019			
		1Q Jan Mar	2Q Apr Jun	3Q Jul Sept	4Q Oct Dec	1Q Jan Mar	2Q Apr Jun	3Q Jul Sept	4Q Oct Dec
 ALOS	AVNIR-2 (10 m)	 Japan Area			 ±60 Degree Area		 Global		
	PALSAR (10 m)				 Japan Area	Under negotiation with METI			
 ALOS-2	ScanSAR (100 m)	Under negotiation with PD							
	Fine Mode (10 m)	Under negotiation with PD							










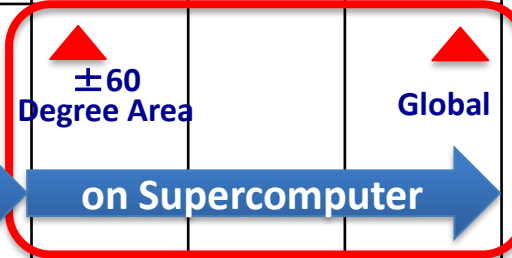




Data Processing

Under negotiation with METI

Data Processing

Updated Schedule of ALOS/ALOS-2 Data Processing and Open Free Access

As of February 2019

		2018				2019			
		1Q Jan Mar	2Q Apr Jun	3Q Jul Sept	4Q Oct Dec	1Q Jan Mar	2Q Apr Jun	3Q Jul Sept	4Q Oct Dec
	AVNIR-2 (10 m)	 Japan Area				 ±60 Degree Area			 Global
	 Data Processing								
	PALSAR (10 m)			 Japan Area		 ±60 Degree Area		 Global	
	 Data Processing		  on Supercomputer						
	ScanSAR (100 m)	 JICA-JAXA JJ-FAST intermediate products (ARD) processing							
	Fine Mode (10 m)	 Data Processing							
		Under negotiation with PD							

Agreement between VNSC and JAXA

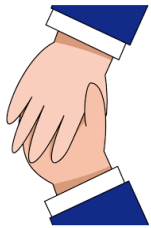
Purpose:

To set forth cooperation between the Parties for satellite data exchange to support the DataCube Program in Vietnam in order to promote practical use of satellite data (e.g. on Rice, Forests etc.) by the Vietnam government.

Responsibilities

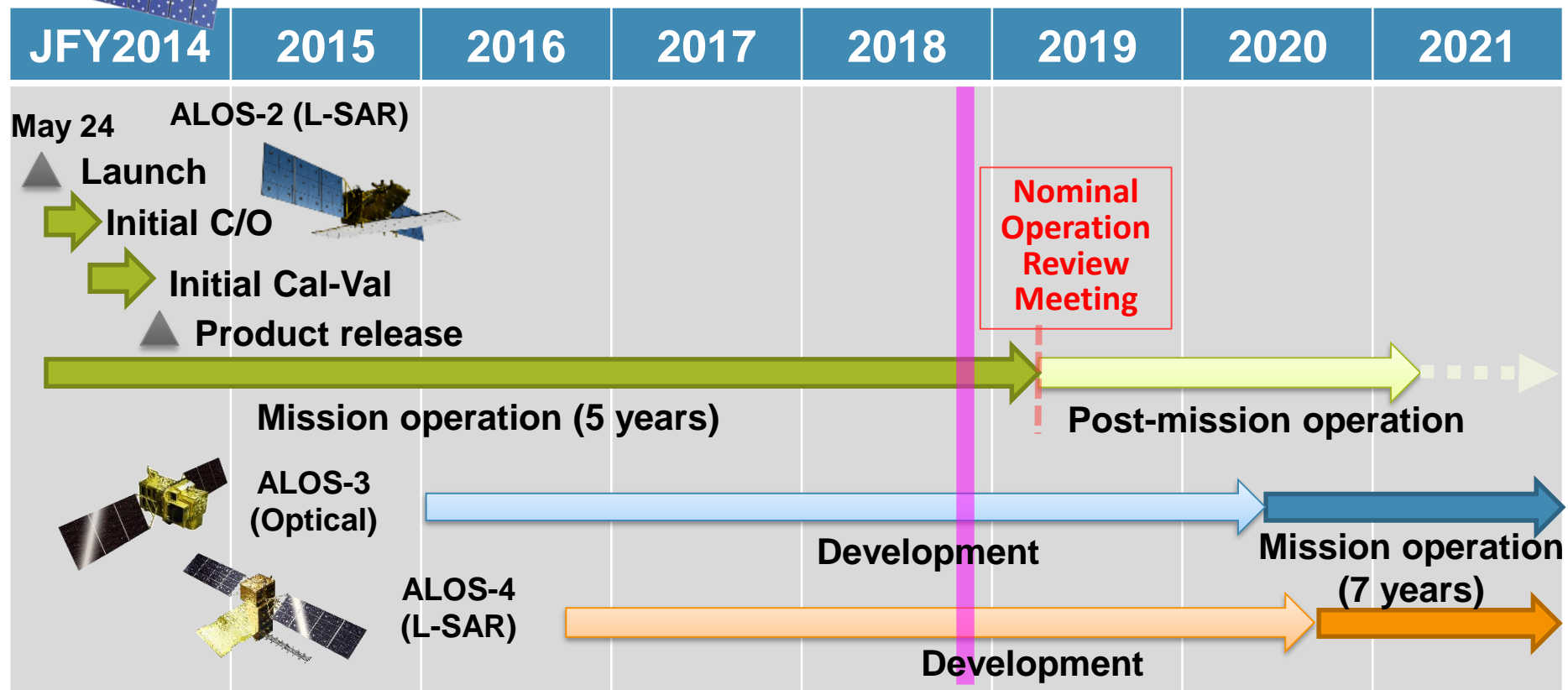
- To develop, operate and maintain DataCube to archive ALOS-2 ScanSAR data and promote practical use of ALOS-2 data in the Vietnam government.
- To implement research, application development and promotion using EO products, including Japanese L-band and other satellite data and ground data, in the DataCube environment for Vietnam government use, in cooperation with JAXA and related Vietnam organizations
- To send JAXA annual report on the governmental use of data and accomplishment of ALOS-2 with providing a feedback of ALOS-2 data usage.

- To provide ALOS-2 ScanSAR product of Vietnam area in order to support the implementation of DataCube Program in Vietnam and for government use. The product will be derived from JJ-FAST.
- To provide ALOS-2 standard products up to 50 scenes per year for each research theme that are mutually agreed by JAXA and VNSC.
- To cooperate in research, application development using EO products, including Japanese ALOS-2 and other satellite and ground base data, in the DataCube environment for Vietnam government use.



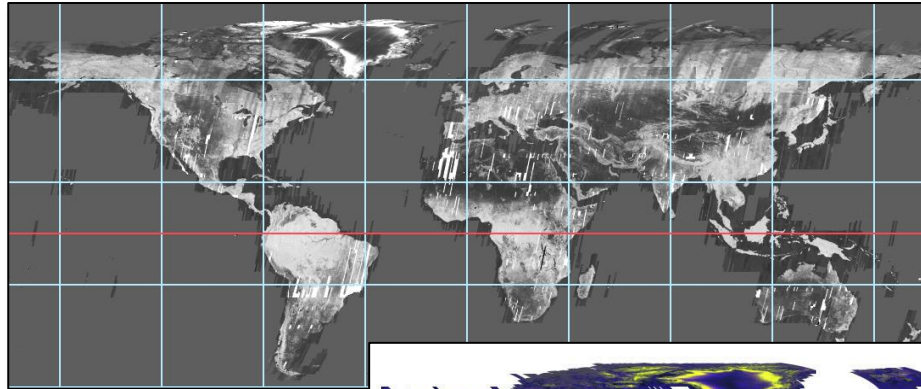
ALOS F/O Missions

- Continuous observations successor “*Daichi*” (ALOS) from 2006 to 2011
 - Contribute to ensure the safety and security of citizens, i.e. **disasters monitoring and management**, land deformation monitoring, national developing management, foods and natural resources, environmental issues in global etc. as common issues.
 - Contribute to industrial development based on Earth observation data i.e. National Spatial Data infrastructure (NSDI) and **new applications**.

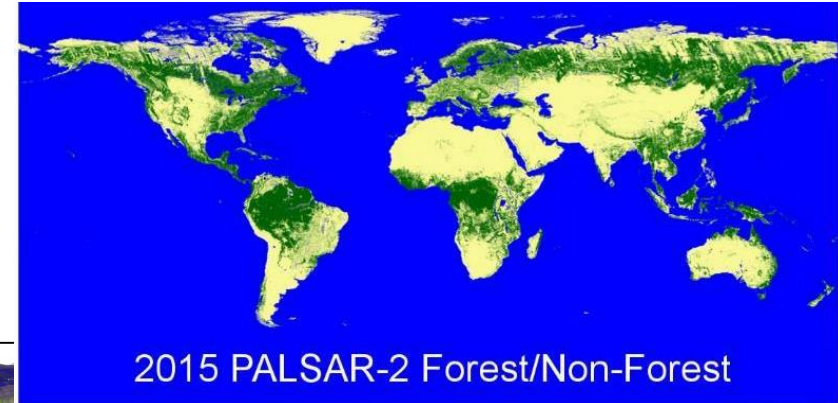


SAR Global Mosaic & Forest/Non-Forest (FNF) Map

- ✓ JAXA released annual global mosaic and Forest / Non-Forest (FNF) map by SARs
- ✓ JERS-1 (1996) ~ ALOS (2007-2010) ~ ALOS-2 (2014-2017) > Over 20 years changes

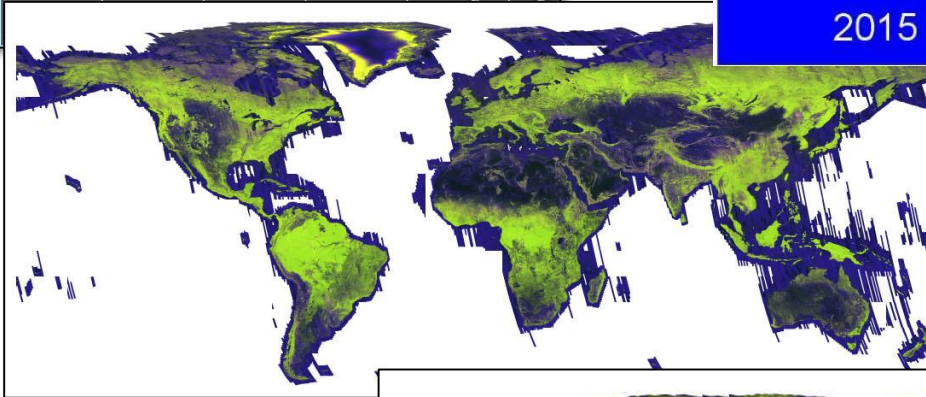


1996 JERS-1
(only HH-pol.)

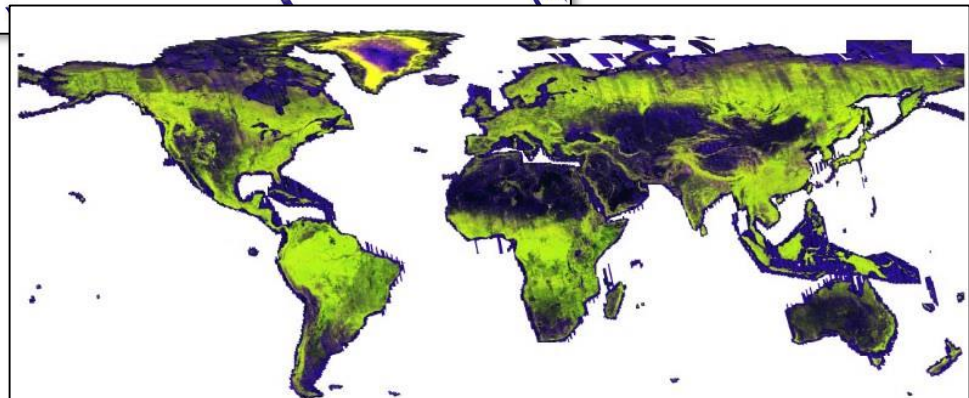


2015 PALSAR-2 Forest/Non-Forest

2007-2010
ALOS

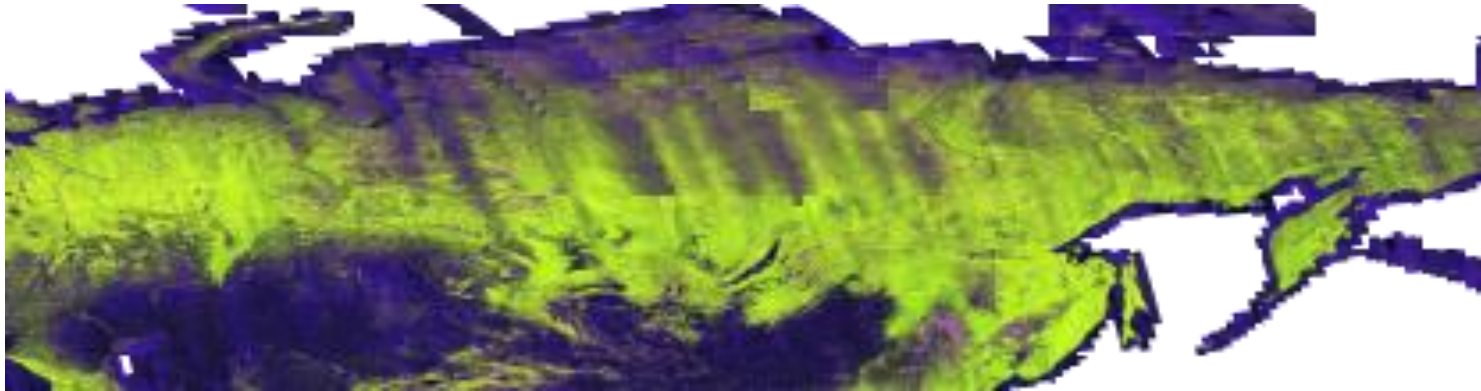


2015-2017
ALOS-2



SAR Global Mosaic Status

- Issue: Discontinuity of mosaic image in 2017



2017 mosaic

- Solutions:
 1. To use only summer season data from 2014 to 2018 as “MASTER”.
 2. To widen the width of Path Ortho data.

Solution 1: To generate MASTER mosaic from only summer season data

For making Master mosaic, JAXA/EORC set the rule.

◆ In the “2017 mosaic”, the rule of path selection was as following.

2017 Summer (from May to Aug)

→ 2017-Winter (the other month)

→ 2016 Summer → 2016 Winter → 2015 Summer → 2015 Winter

◆ The rule of “Master mosaic” is as following.

Monthly priority; Jul → Aug → Sep → Jun → May → Oct

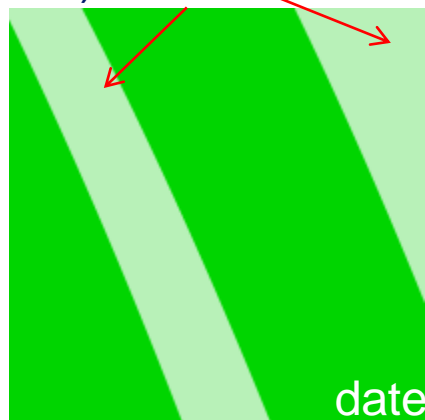
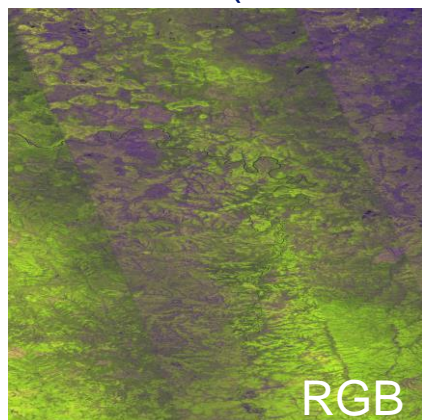
Yearly priority; 2018 → 2017 → 2016 → 2015 → 2014

SAR Global Mosaic Status

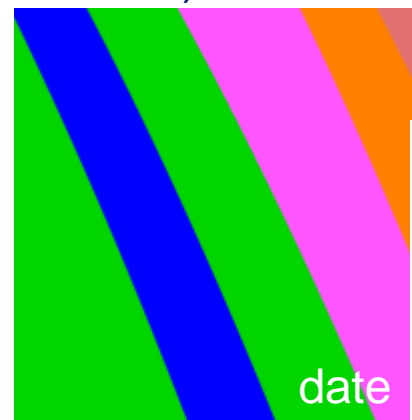
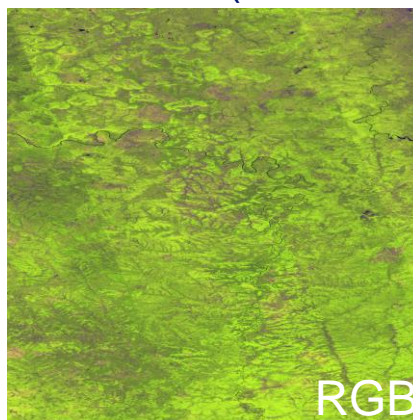
Solution 1: To generate MASTER mosaic from only summer season data

- ◆ 2017 mosaic appeared the seasonal efficient because it is used the Jan-Feb data.
- ◆ MASTER mosaic uses only summer season data.
→ Backscatter is smoothly.

N65E105 (2017 mosaic) **Jan-Feb**



N65E105 (MASTER mosaic)

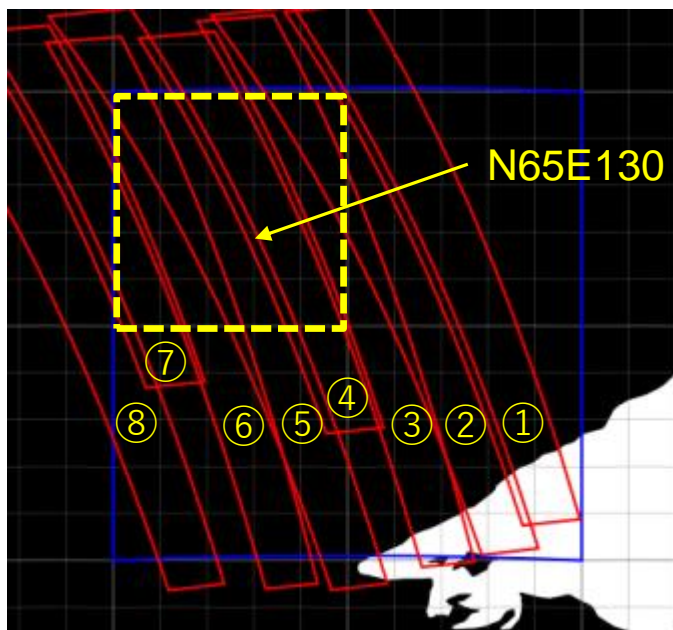


#Light Color in the date image indicates the early phase of the year.



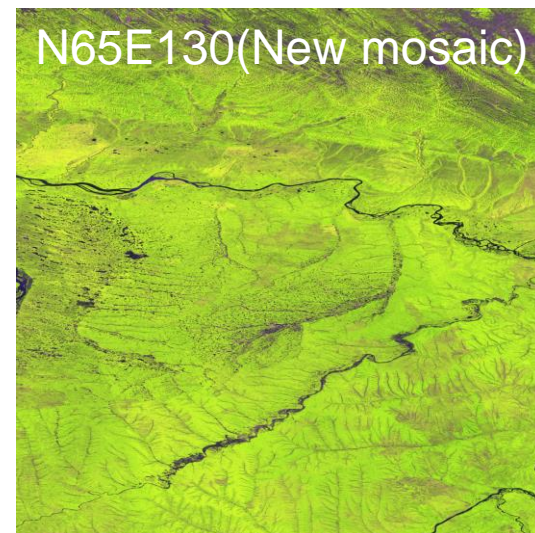
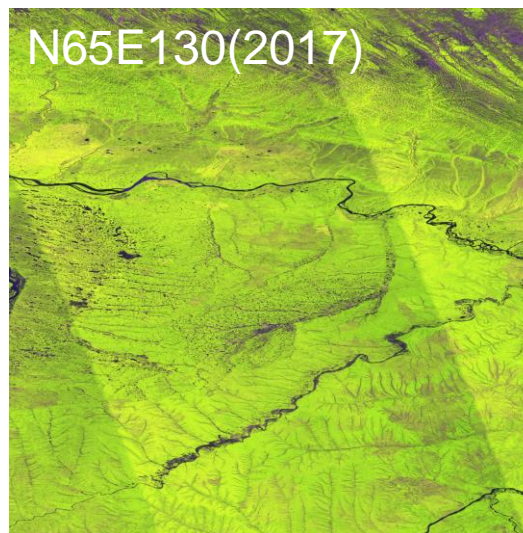
SAR Global Mosaic Status

Solution 2: To widen the width of Path Ortho data



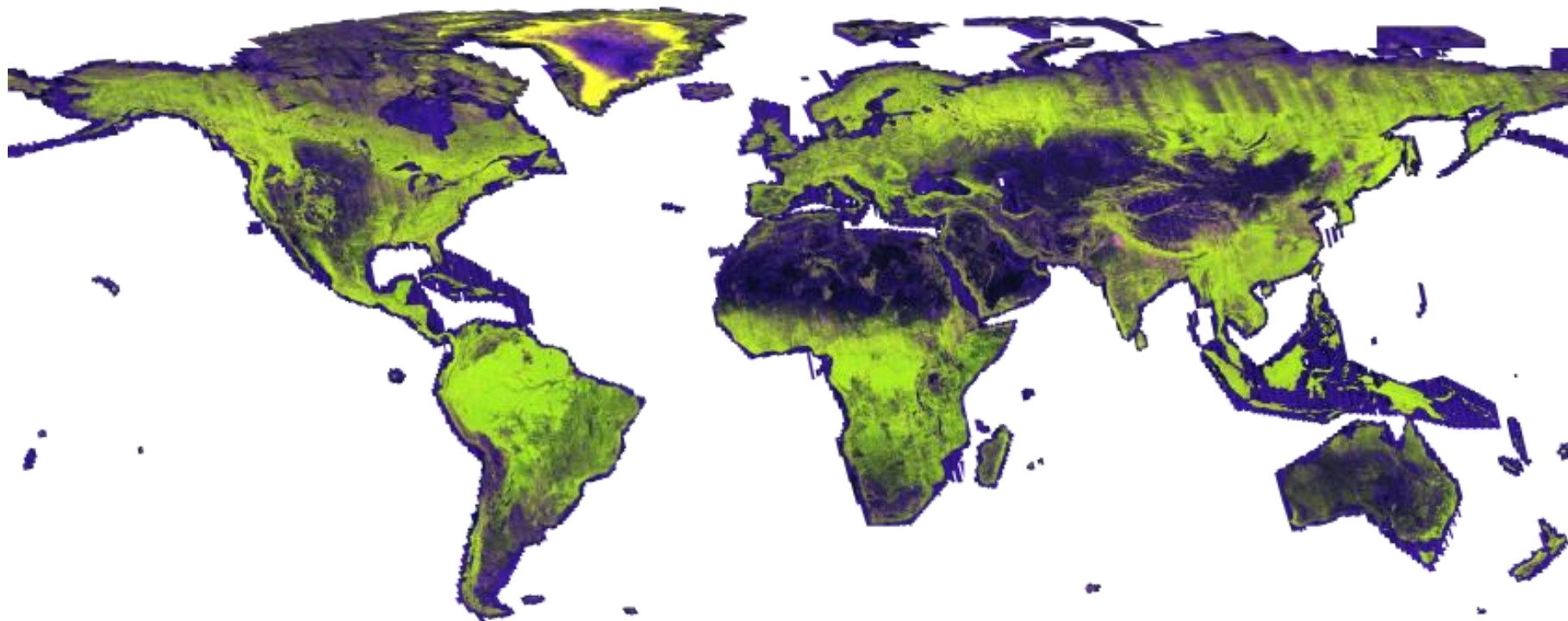
- ① Jun-17, 2017, ② Sep-05, 2017
- ③ Sep-05, 2017, ④ Jul-24, 2017
- ⑤ Sep-19, 2017, ⑥ Sep-01, 2017
- ⑦ Sep-29, 2017, ⑧ Sep-15, 2017

Though most of path data are observed on September, there are some stripes in the 2017 mosaic.
→ New processor makes spread the width of path ortho. So New mosaic image has no stripe.



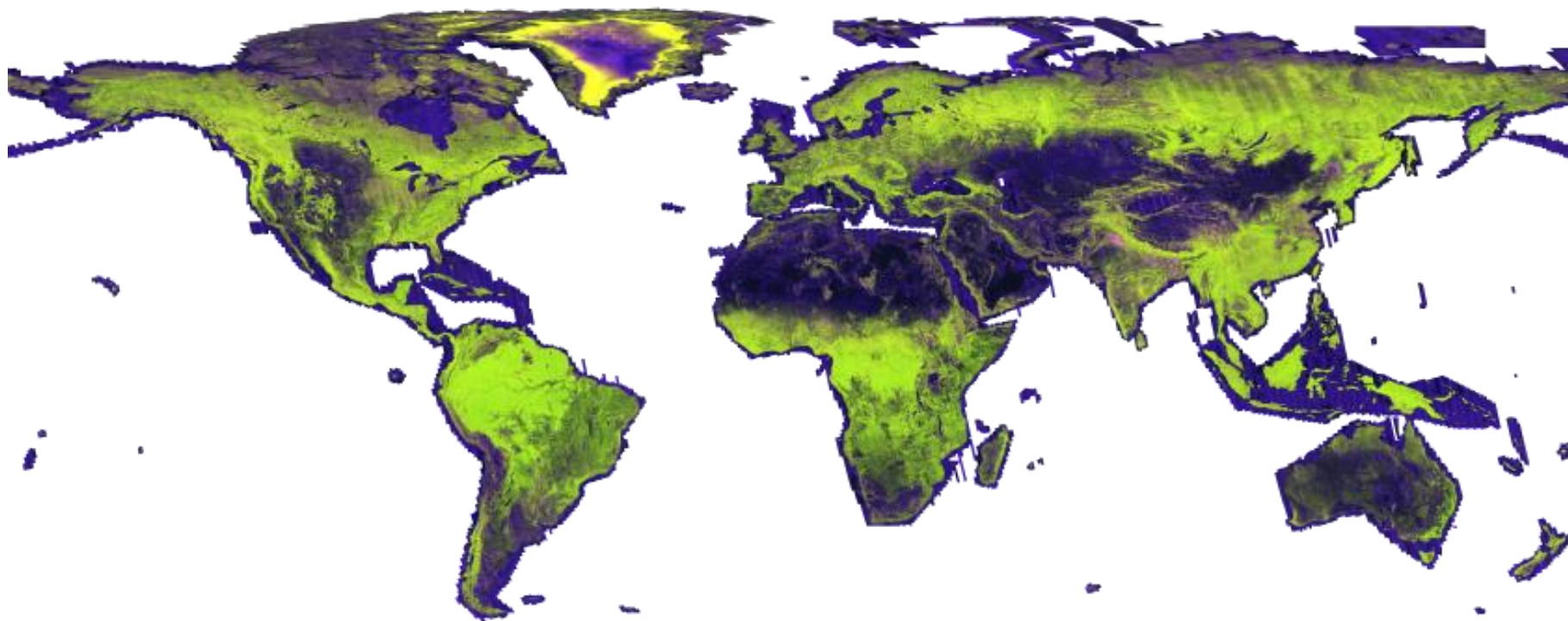
SAR Global Mosaic Status

2017 Global mosaic



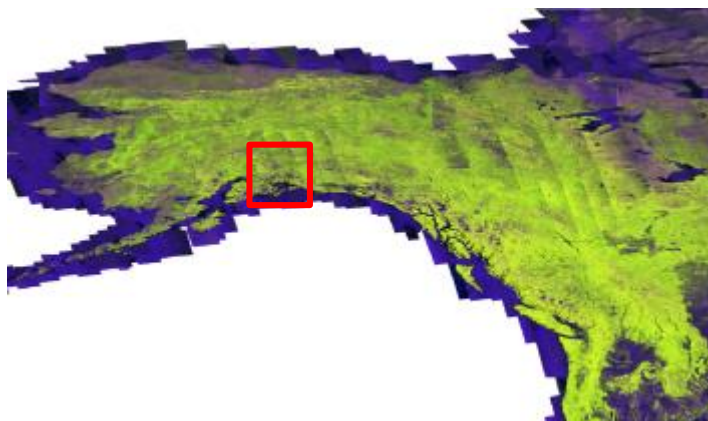
SAR Global Mosaic Status

MASTER Global mosaic

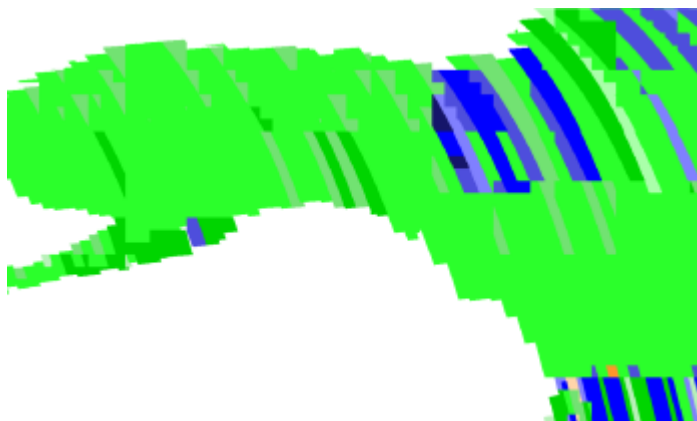


Ex. Alaska

Specially, Alaska mosaic has changed smoothly.



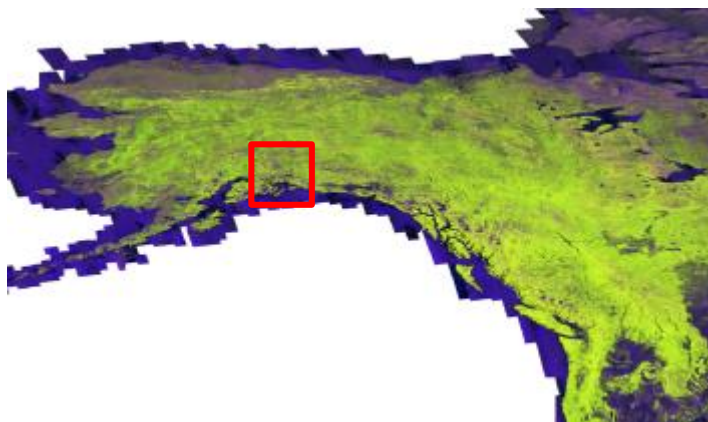
2017 RGB



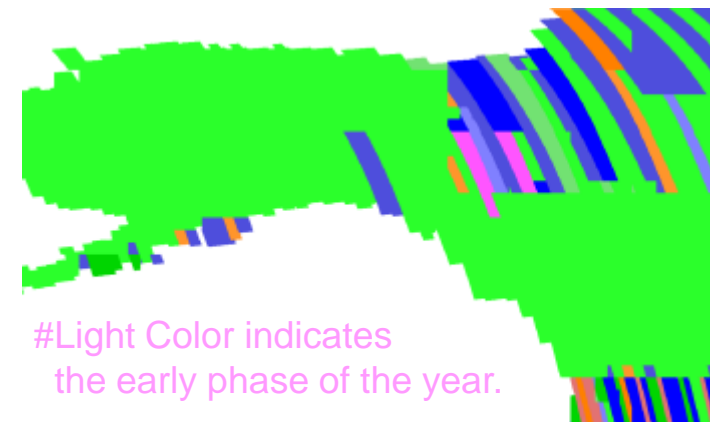
2017 date



2017 N65W150

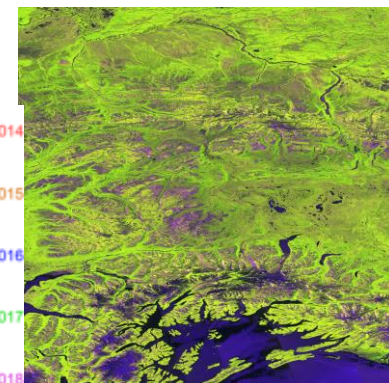


MASTER RGB



#Light Color indicates the early phase of the year.

MASTER date



MASTER N65W150

- JAXA's EO program and status updated:
 - ✓ GCOM-C standard products release from Dec. 2018
 - ✓ GOSAT-2 launched successfully, and
 - ✓ ALOS-2 is working well that facing end of nominal operation at May
 - ✓ ALOS-3/-4 are under development in phase C.
- CEOS ARD for Land (CARD4L):
 - ✓ “Master Mosaic” processing (~March),
 - ✓ “2018 Global Mosaic” start to generate from Apr. 2019, and
 - ✓ Reprocessing AVNIR-2, PALSAR, and PALSAR-2 are ongoing.
- IGARSS 2019 held in Yokohama, Japan <https://igarss2019.org/>
 - ✓ > 3,000 abstracts submitted and acceptance inform on March.