

JAXA Earth Observation Program

The Coordination Group for Meteorological Satellites
CGMS-46 Plenary
7 June 2018

Akiko Suzuki

Associate Senior Chief Officer of Satellite Applications
Japan Aerospace Exploration Agency

GCOM-C/SGLI Acquired Images

Light blue color shows
snow cover areas

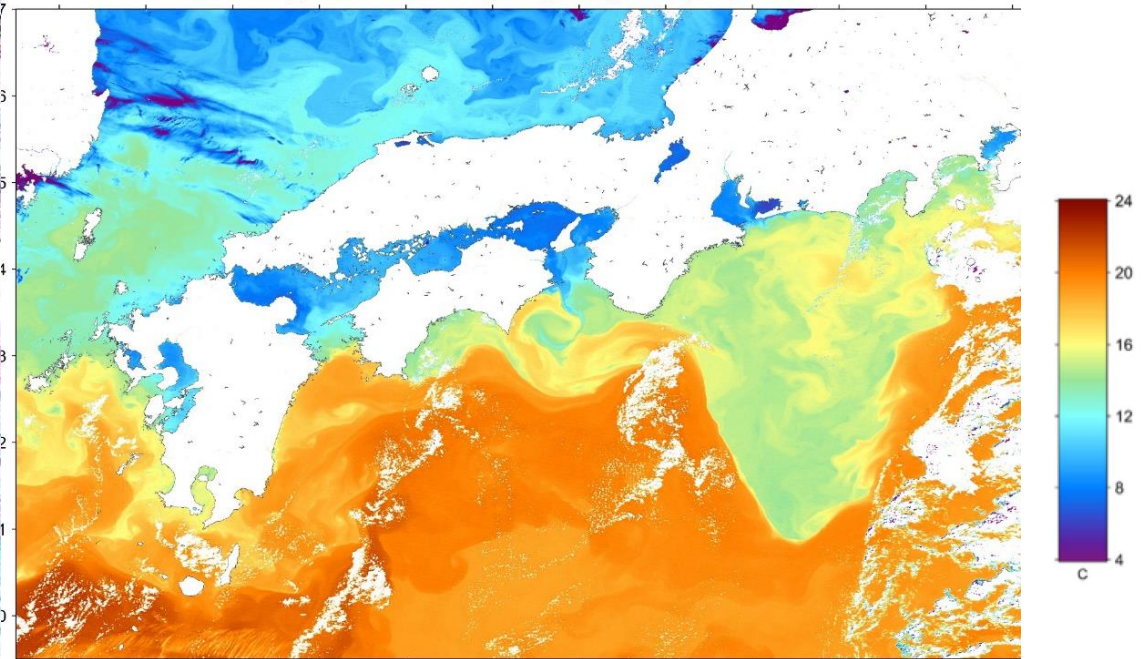
New York

Washington
DC

◀ East Coast of the USA
(Snow coverage on 1 Jan., 2018)

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

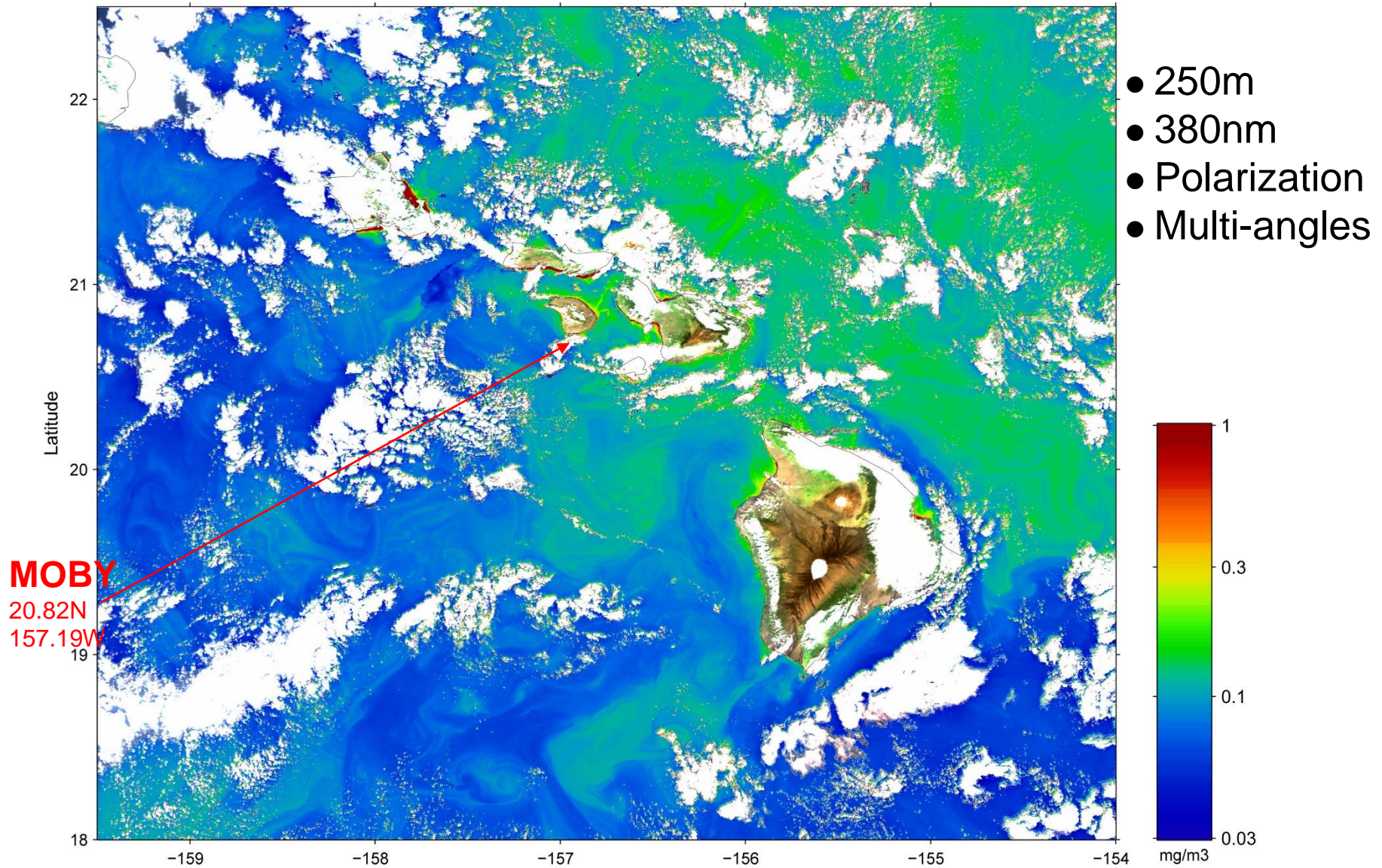
GC1SG1_201802270140L05610_1BSG_IRSDQ_E007.h5, Param Name= SST



R:1.6um,
G: 0.86um,
B: 0.67um

GCOM-C/SGLI acquired images

The Hawaiian Islands (250-m Chlorophyll-a concentration)



Chlorophyll-a concentration on 1 Jan 2018 (not validated)

Japanese Satellites

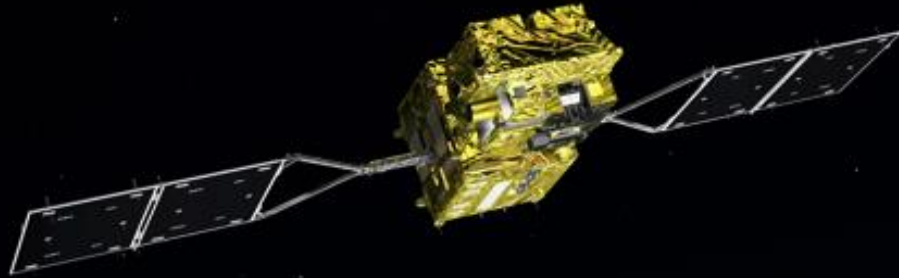
Contributing to Understanding Global Climate Change



**SHIKISAI
(GCOM-C)**

Cloud • Aerosols
Vegetation

Launched:
23 December 2017



**IBUKI
(GOSAT)**

Launched: 2009

**IBUKI-2
(GOSAT-2)**

To be Launched:
JFY2018

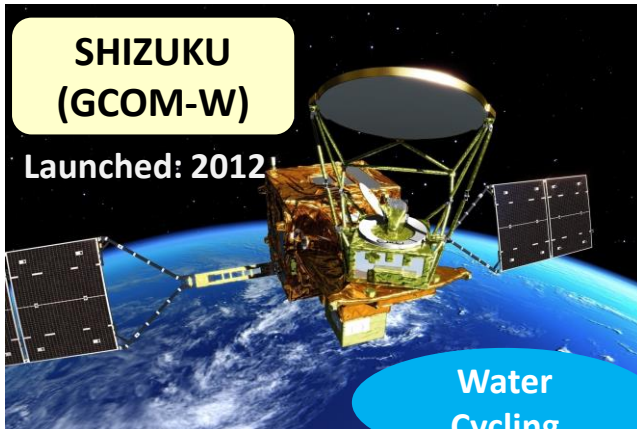
Greenhouse Gases



**SHIZUKU
(GCOM-W)**

Launched: 2012

Water
Cycling



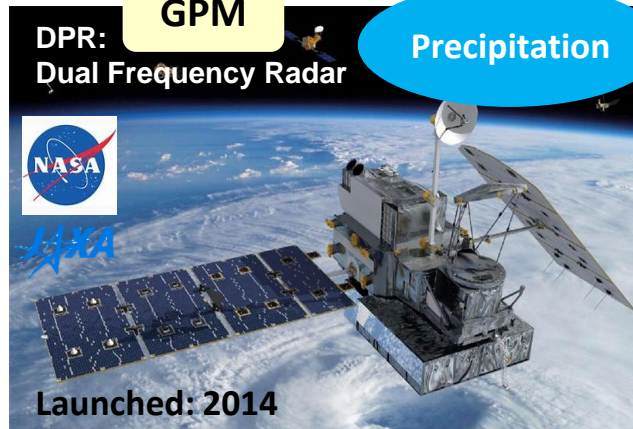
GPM

DPR:
Dual Frequency Radar

Precipitation



Launched: 2014



Courtesy of NASA

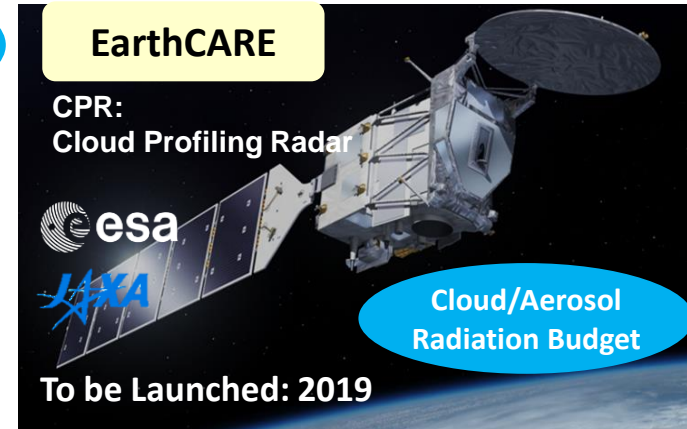
EarthCARE

CPR:
Cloud Profiling Radar



To be Launched: 2019

Cloud/Aerosol
Radiation Budget



Courtesy of ESA

Essential Climate Variables measured by GCOM-C & W, GPM/DPR, GOSAT

 Measured by GCOM-C
 Measured by GCOM-W
 Measured by GPM/DPR
 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

Total Essential Climate Variables (ECVs)

(ECVs largely dependent on satellite observations identified by CEOS and GCOS are shown in **bold**.)

ECVs measured by GCOM-W, GPM/DPR and GOSAT

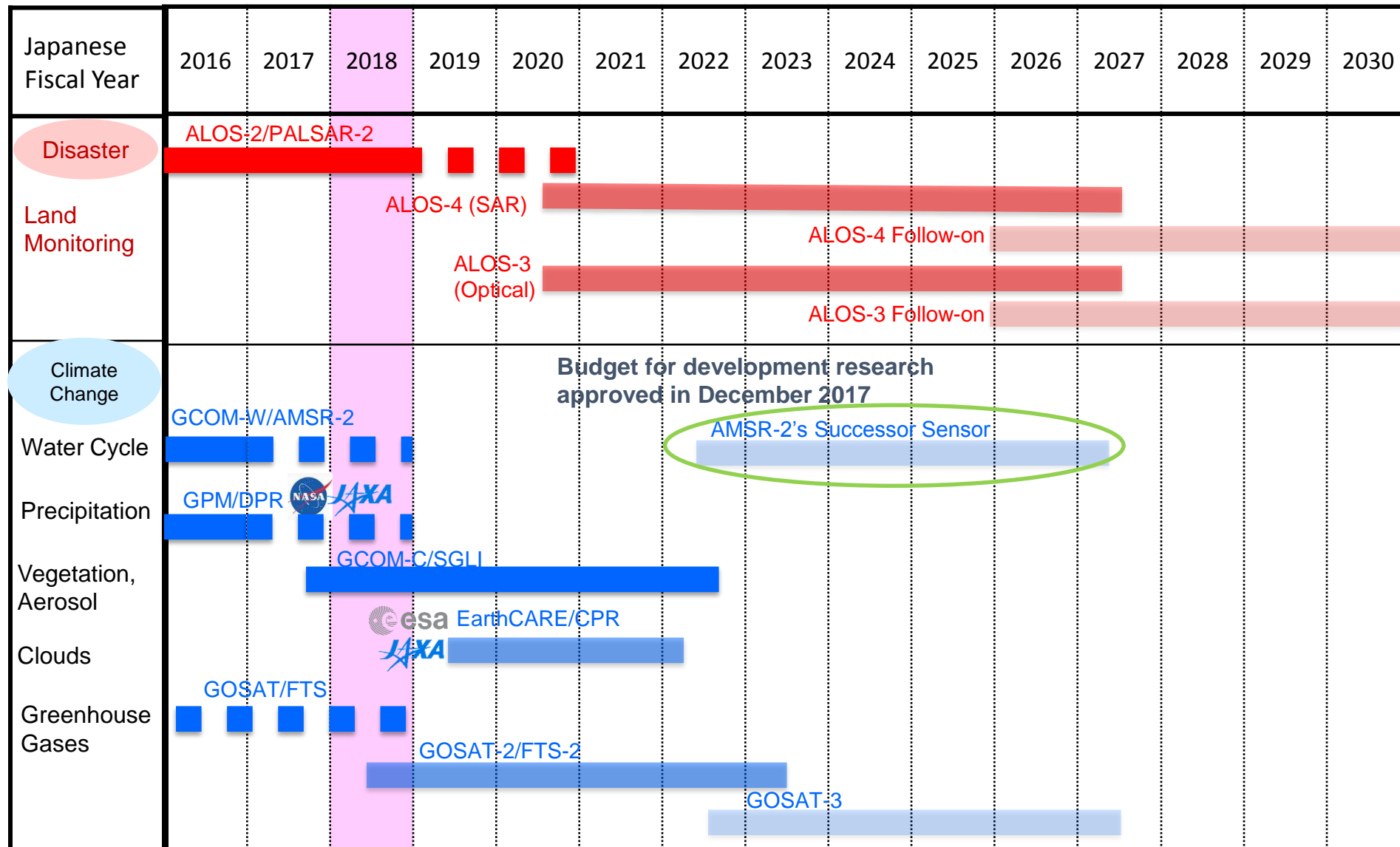
ECVs measured by GCOM-C

50

11

15

Japan's Earth Observation Program



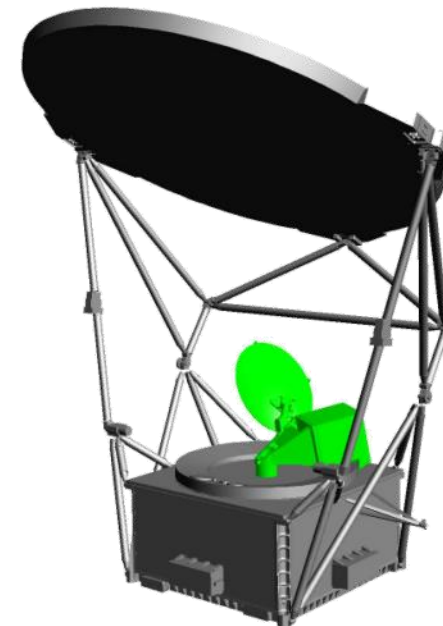
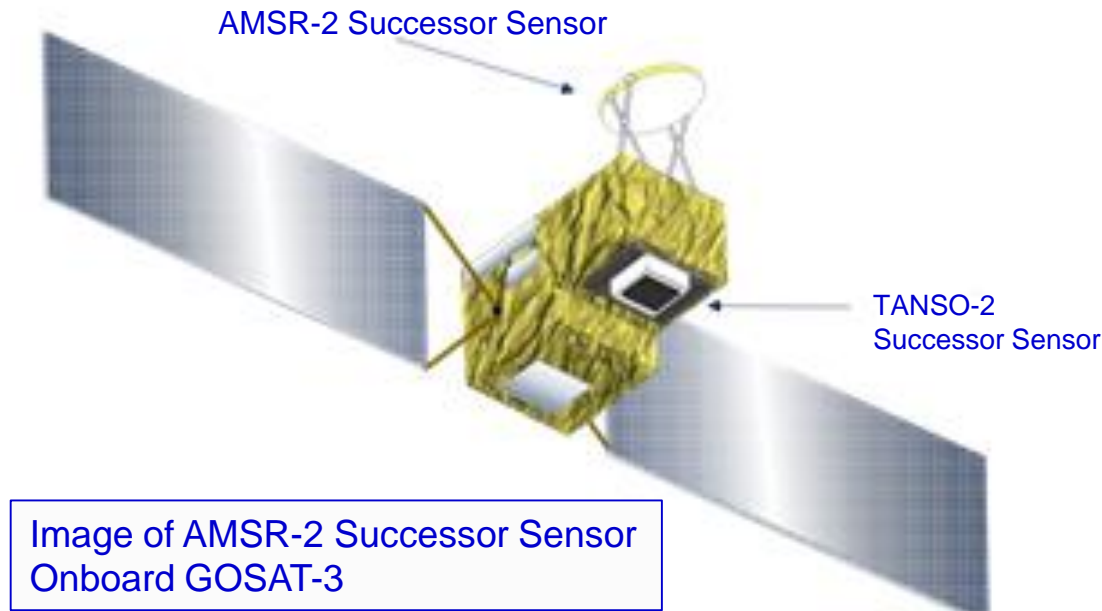
- The GCOM-W follow-on mission is currently under study based on “The Roadmap for the Japanese Basic Plan on Space Policy”.

✓ JFY2017

Research on the hosted payload capability of AMSR2's successor sensor with the Greenhouse Gases Observing Satellite 3 (GOSAT-3).

✓ JFY2018

Trial test for some key technical items of AMSR2's successor sensor on the assumption of hosted payload on GOSAT-3.

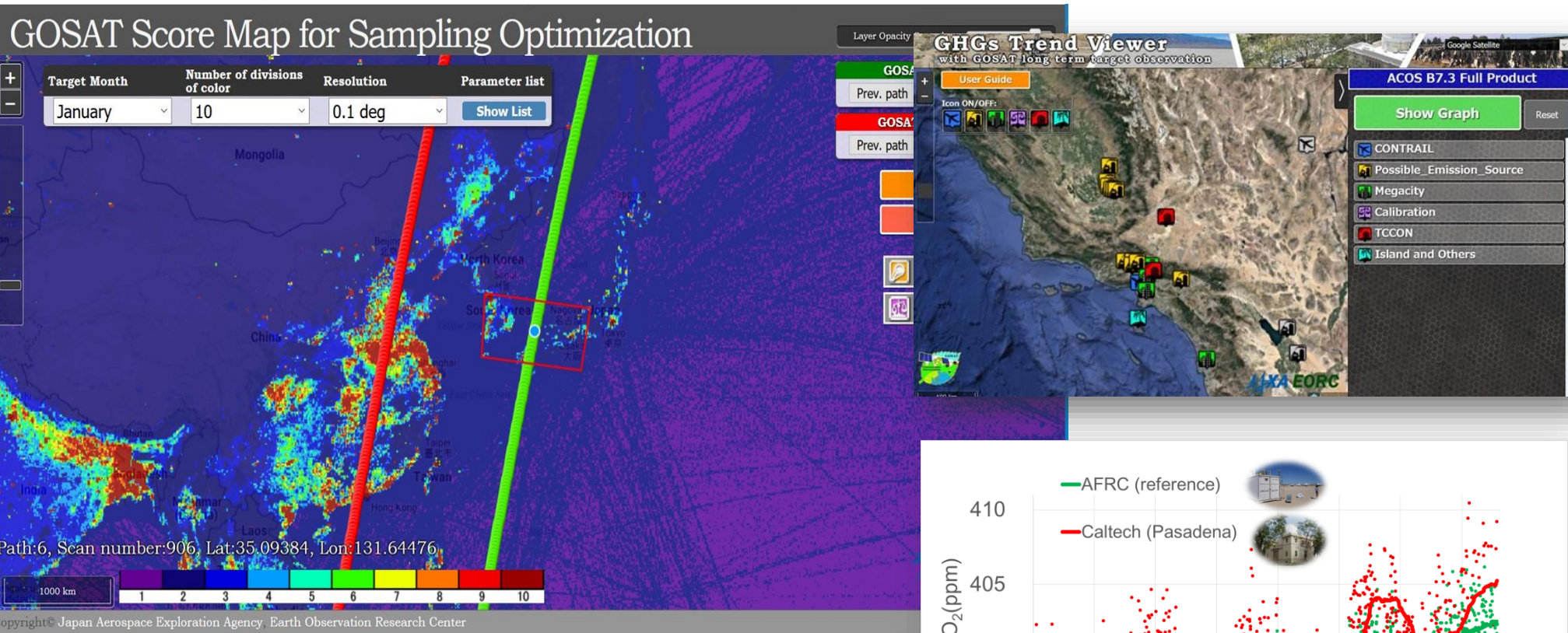


- ✓ Coordination on orbit with GOSAT-3 and its on-board AMSR-2 follow-on
 - ✓ The best choice for AMSR2 follow-on is entering into A-Train constellation. (Same as that of GCOM-W)
 - ✓ GOSAT-3 mission prefers the orbit of GOSAT to the orbit of GOSAT-2.
- ✓ **Welcome CGMS agency's opinion.**

	GCOM-W*	GOSAT	GOSAT-2
MLTAN	1:30pm	1:00am	1:00am
Altitude	Approx. 700 km	Approx. 666 km	Approx. 613 km
Repeat cycle	16 days Sub-cycle 2 days	3 days	6 days

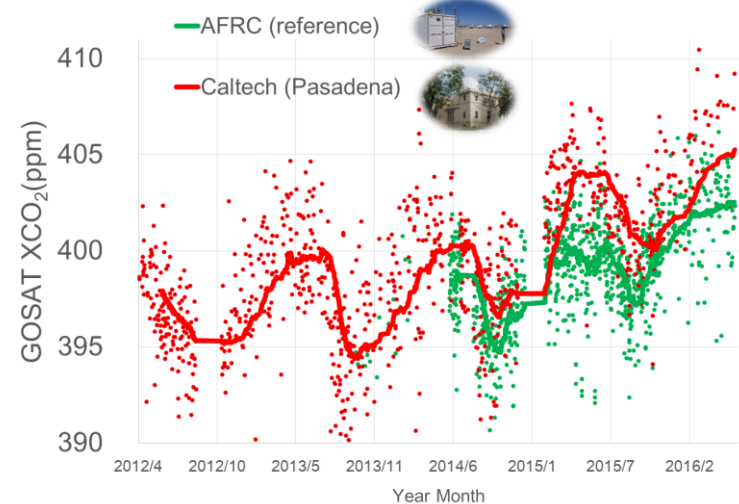
*Mission requirement of GCOM-W

To observe more than 95 % of area on the equator in two days for each ascending pass and descending pass.



The maps of possible emission sources, vegetation, GOSAT observation results, and successful retrieval are available at:

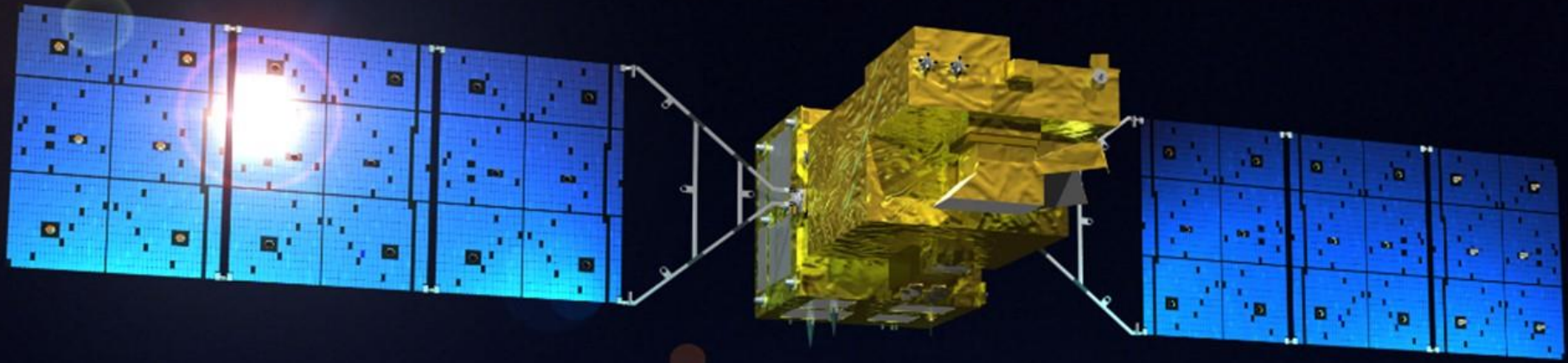
- ❑ http://www.eorc.jaxa.jp/GOSAT/CO2_monitor/index.html
- ❑ http://www.eorc.jaxa.jp/GOSAT/GOSAT_Optimization/index.html



Contents: Long term

CO₂, CH₄, SIF, AOD measured by GOSAT

Solar-Induced chlorophyll Fluorescence (SIF), Aerosol Optical Depth (AOD), Population density



- ◆ Continuous Observation of CO₂ & CH₄ by GOSAT/GOSAT-2 for Long Period
- ◆ More Accurate Estimation of CO₂ Emissions by Measuring CO

- Launch: JFY2018
- Gases: CO₂, CH₄ and CO
- Accuracy: 0.5 ppm (CO₂) and 5 ppb (CH₄) at 500-km mesh over earth's surface
- Nominal Operation Period: 5 years
- Mass: Approx. 2,000Kg
- Launch Vehicle: H-IIA

Upgrade from GOSAT to GOSAT-2

Launched in 2009



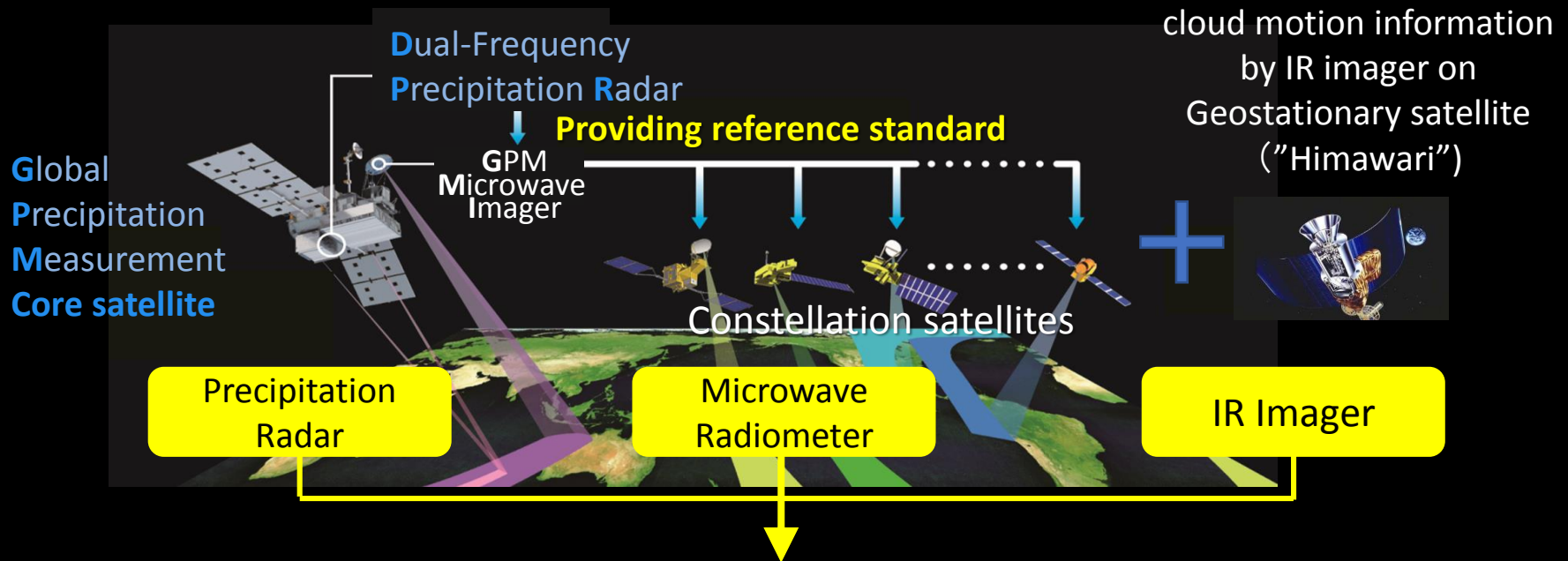
To be Launched in 2018

	GOSAT	GOSAT-2
Improvement Concentration Measurement Precision	4 ppm (CO ₂) 34 ppb (CH ₄) per 3 months at 1,000km mesh (land)	0.5 ppm (CO ₂) 5 ppb (CH ₄) per 1 month at 500 km mesh (land) at 2,000 km mesh (ocean)
Improvement Estimation Accuracy of Flux	Reduce the annual estimation error to half compared with the existing estimation error -sub-continental scale	Estimate the monthly net fluxes with the accuracy of $\pm 100\%$ at 1,000 km mesh (land) at 4,000 km mesh (ocean) ($>\pm 0.2 \text{ GtC/area/year}$)
New Estimation of Anthropogenic Emission	-----	Examine the feasibility of the estimation of the anthropogenic emission with the observation of CO which is the correlated matter
New Monitoring Aerosols in the Atmosphere	-----	Calculate the optical thickness of the aerosols at 550nm and 1.6 μm with 0.1 accuracy (for estimation of the moving state of the PM _{2.5})



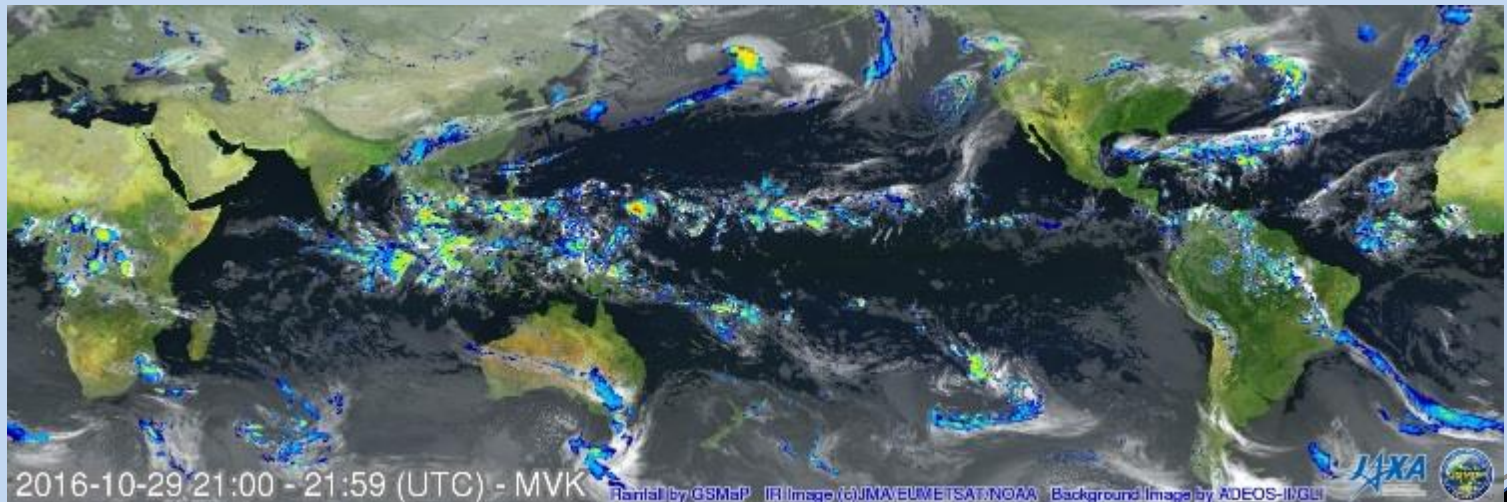
GSMaP

Global Satellite Mapping of Precipitation



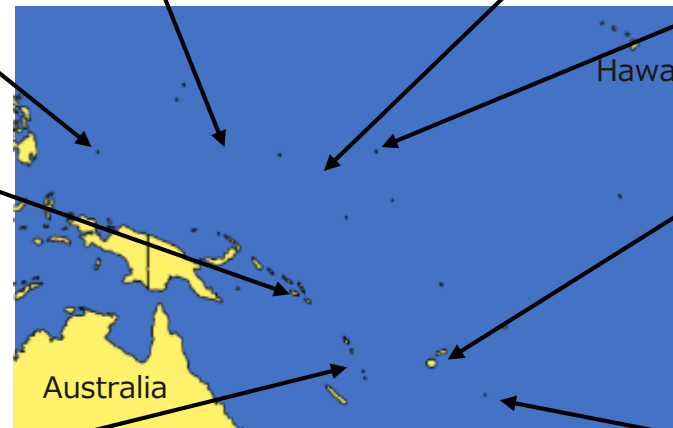
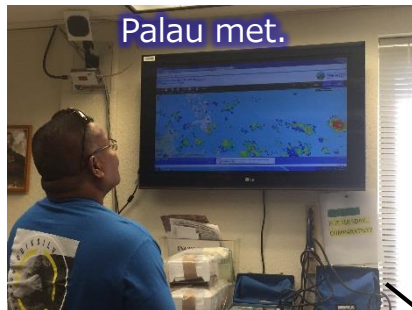
Multi-satellite Rainfall Product: GSMaP

- hourly global rainfall data
- 0.1x0.1deg. lat/lon
- In near real time



Rainfall Monitoring in Pacific

- ✓ Customized GSMaP NOW (**realtime**) website is provided for each island.
- ✓ Pacific meteorological agencies use GSMaP for **realtime rainfall monitoring** around their island **including oceanic area**.



- No need to set up any special computer equipment
- Free and open
- Accessible to the GSMaP Website via internet access



JAXA-ISRO collaboration:

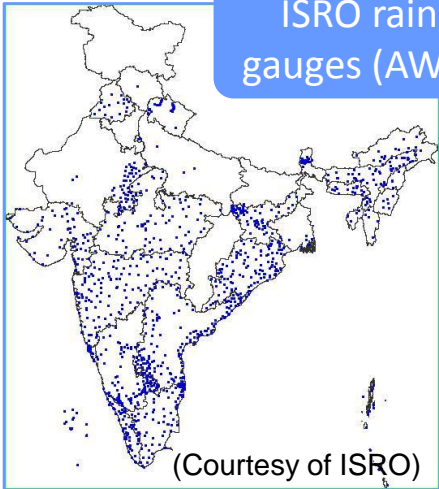


Contributing to more accurate weather forecast

- ✓ JAXA-ISRO will cooperate on:
 - ✓ Validation/improvement of GSMaP by in-situ precipitation data owned by ISRO
 - ✓ Improvement of GSMaP application technology and enhancement utilization by meteorological agencies in Asian countries.

Ground instruments

ISRO rain gauges (AWS)

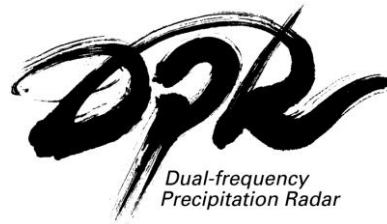


validation/
improvement

Satellite rainfall products



GSMaP

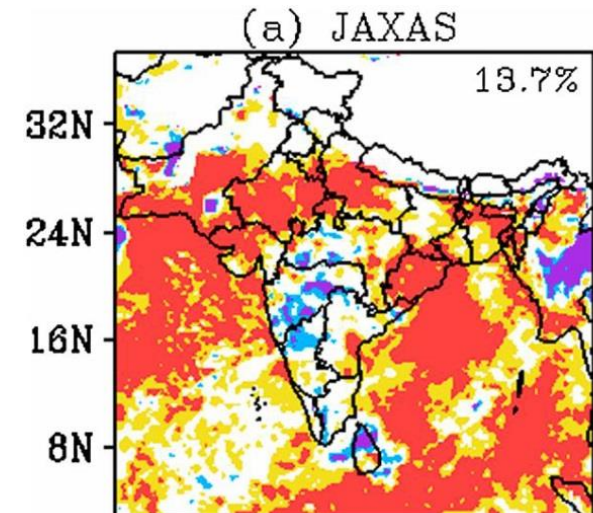


→ More accurate
satellite rainfall products
over the humid Asian
countries

Application

Enhancement of activities in
improved weather forecasts using
the GSMaP
(Kumar et al. 2014, *JGR*)

ISRO ground
weather radar



A wide-angle photograph of Earth from space, showing the curvature of the planet and the blue atmosphere. The surface is covered in clouds and landmasses. A small satellite is visible in the upper center of the frame. The text "Thank you for your attention." is overlaid in the center.

Thank you for your attention.

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