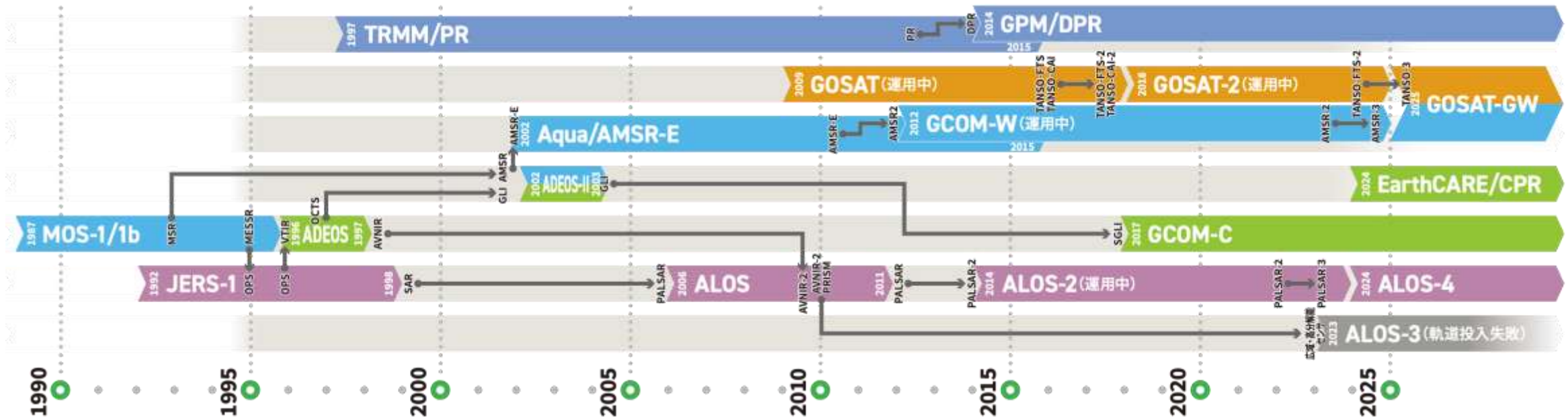


JAXA Earth Observation Programs

Osamu Ochiai
Director, Earth Observation Research Center
JAXA



30 Years of Continuous Global Observation



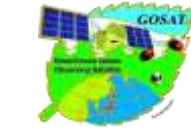
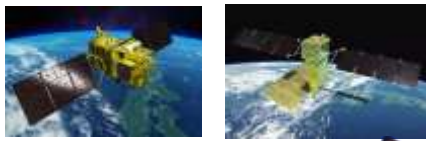
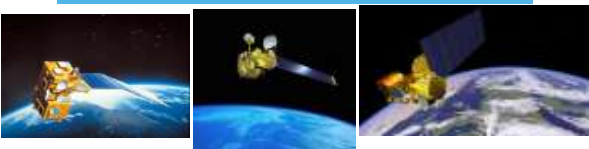
Water Cycle

Disaster and Land

Climate

Precipitation

GHG



GCOS Essential Climate Variables (ECVs) and JAXA Missions

Total Essential Climate
Variables (ECVs)

55

ECVs measured by JAXA
missions

27

GCOS-C

GCOS-W, GOSAT-
GW/AMSR3

GPM/DPR

GOSAT,
GOSAT-2, GOSAT-
GW/TANSO-3

ALOS-2,
ALOS-4

EarthCARE/
CPR

Atmosphere

Surface	Upper-air	Atmospheric Composition
Precipitation	Earth radiation budget	Aerosols
Pressure	Lightning	Carbon dioxide, methane & other greenhouse gases
Radiation budget	Temperature	Ozone
Temperature	Water vapour	Precursors for aerosols and ozone
Water vapour	Wind speed & direction	
Wind speed and direction	Clouds	

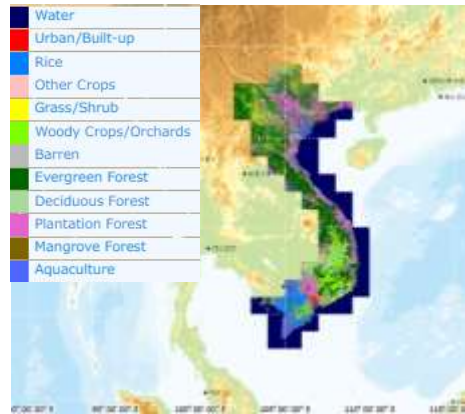
Land

Biosphere	Hydrosphere
Above-ground biomass	Groundwater
Albedo	Lakes
Evaporation from land	River discharge
Fire	Terrestrial water storage
Fraction of absorbed photosynthetically active radiation (FAPAR)	Anthroposphere
Land cover	Anthropogenic greenhouse gas fluxes
Land surface temperature	Anthropogenic water use
Leaf area index	Cryosphere
Soil carbon	Glaciers
Soil moisture	Snow
	Ice sheets and ice shelves
	Permafrost

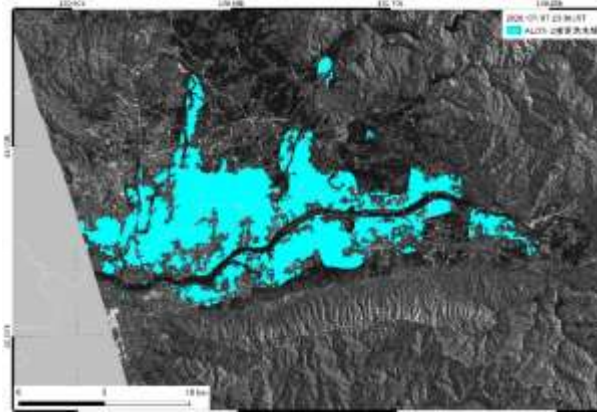
Ocean

Physical		
Ocean surface heat flux		
Sea ice	Sea level	Sea state
Sea surface currents		
Sea surface salinity		
Sea surface stress		
Sea surface temperature		
Subsurface currents		
Subsurface salinity		
Subsurface temperature		
Biogeochemical		
Inorganic carbon	Transient tracers	
Nitrous oxide	Nutrients	
Ocean colour	Oxygen	
Biological/ecosystems		
Marine habitat properties		
Plankton		

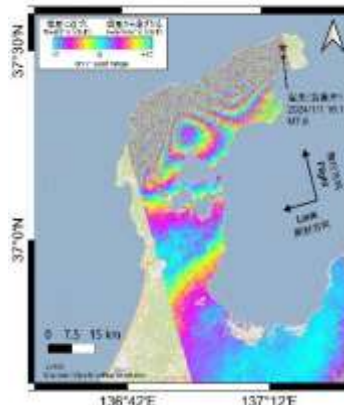
World's the Finest Resolution Phased Array Type L-band SAR



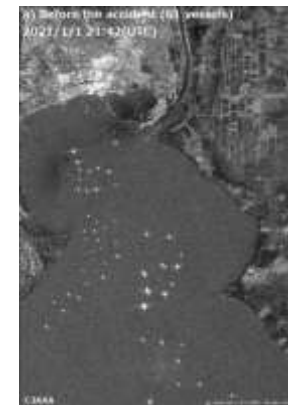
Land-Use and Land-Cover Map



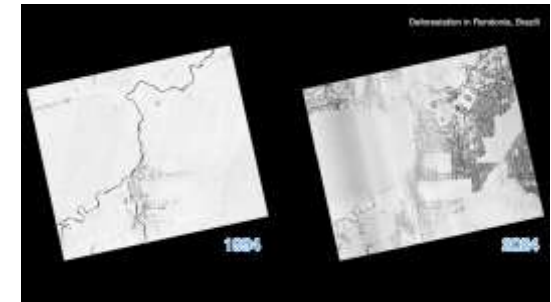
Flood Area Analysis



Earthquake deformation



MDA



Forest Monitoring

Addressing Multiple Societal challenges

Agricultural Monitoring



Volcano Monitoring



Hurricane, Flood



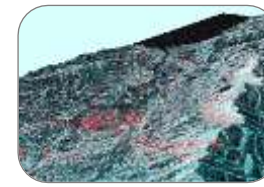
Climate Change



MDA



Land Deformation



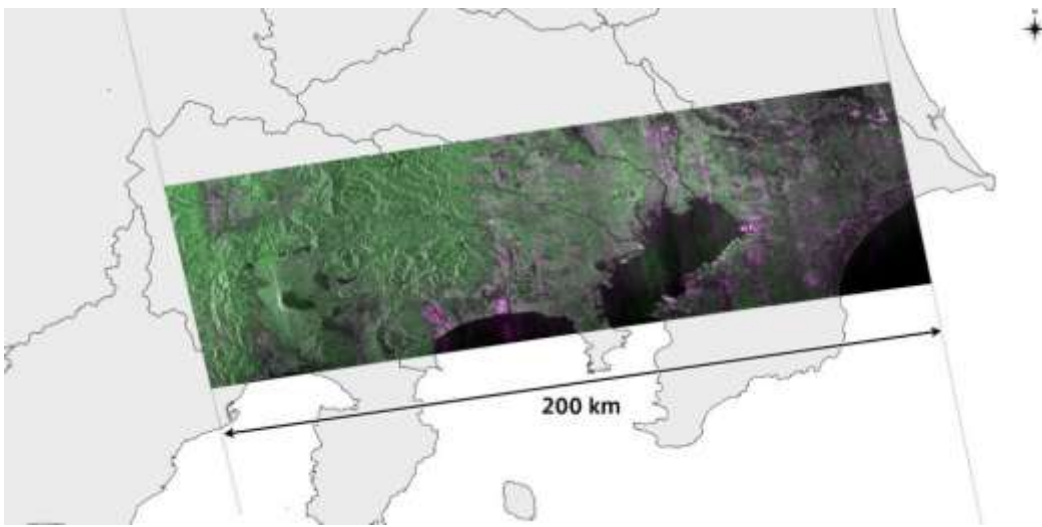
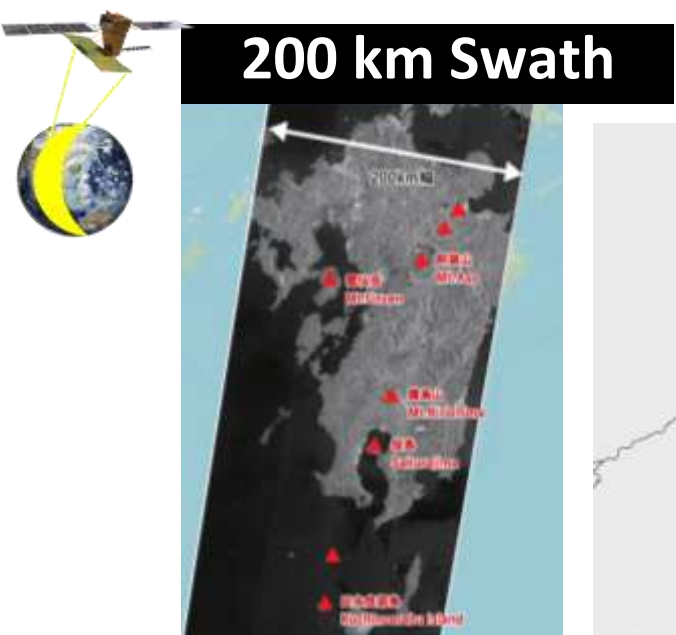


4× Wider Coverage with ALOS-4

Spotlight
©PALSAR-2/JAXA

Stripmap
©PALSAR/JAXA, METI

ScanSAR
©PALSAR/JAXA, METI



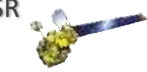
Mode	ALOS-2 Swath	ALOS-4 Swath
Spotlight (1 m × 3 m)	25 km × 25 km	35 km × 35 km
Stripmap (3 m/6 m/10 m)	50 km 70 km	200 km
ScanSAR (25 m)	350 km 490 km	700 km

Understanding Earth's Water in Various Form (Advanced Microwave Radiometer)

Precipitation/ Water Cycle



ADEOS-II
AMSR



2002-2003

Aqua
AMSR-E



2002-2015

GCOM-W
AMSR-2

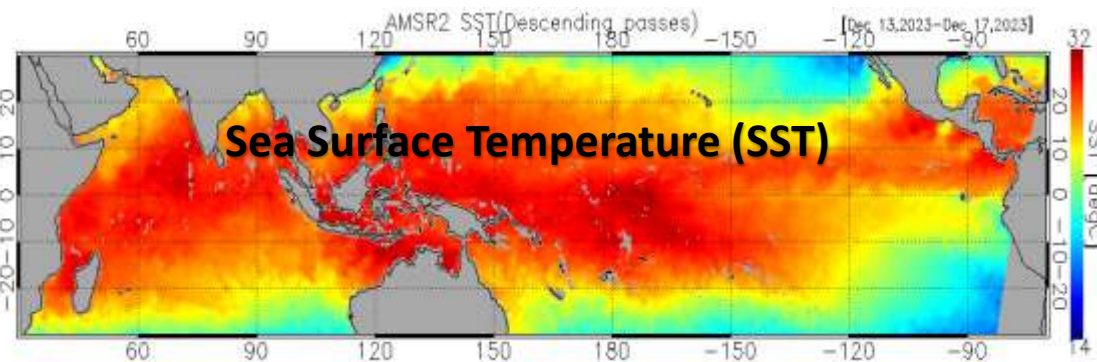
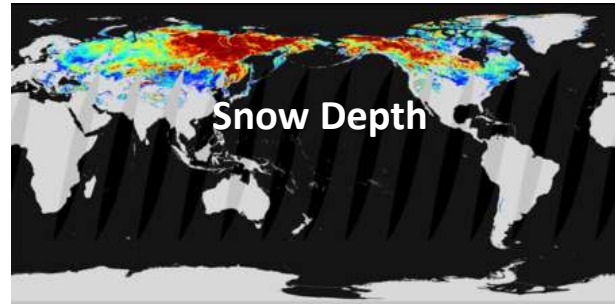


2012-

GOSAT-GW
AMSR-3



JFY2025 -



Addressing Multiple Societal challenges

Weather
Forecasting



Hurricane,
Flood



Polar Sea Ice
Monitoring



Water Resource
Management



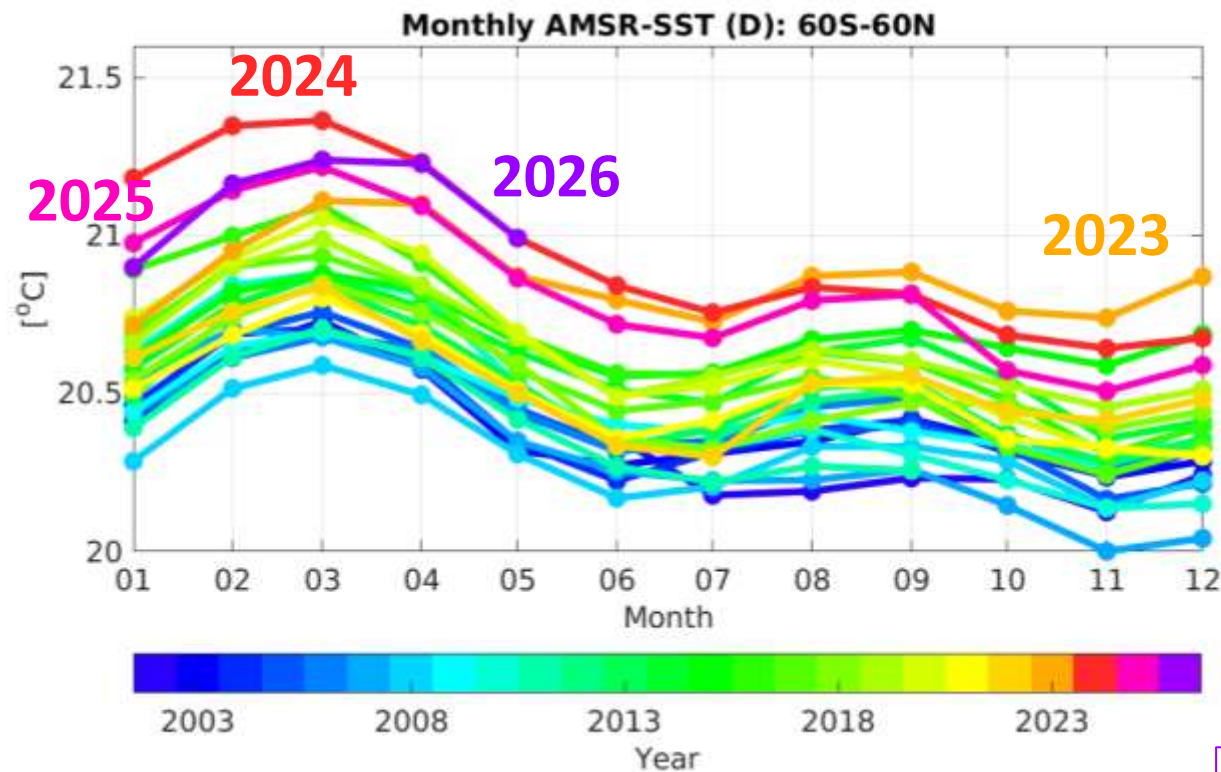
Fisheries
Oceanography



Recent Ocean Heatwave and Impacts to Japan

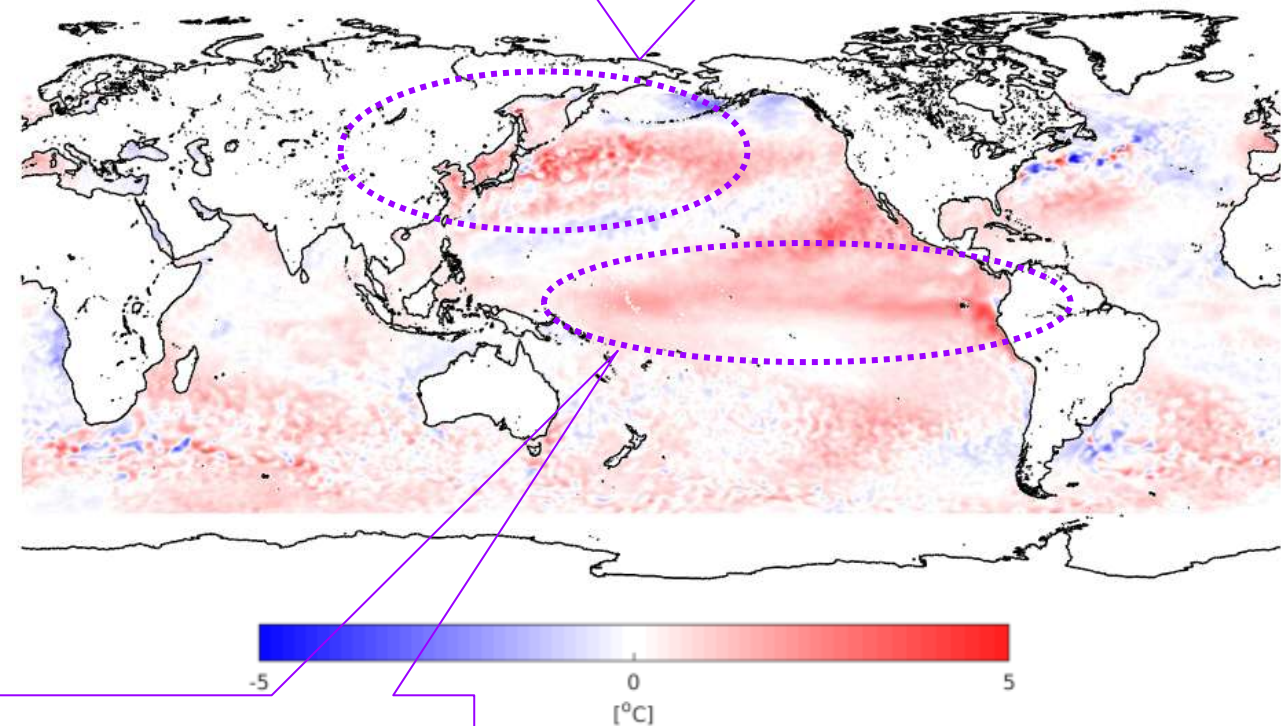
- Since Mar. 2023, monthly global mean SST has recorded the highest value during the AMSR observations.
- After Mar. 2024, higher trends are moderated due to the end of El Niño in the tropics

Monthly global mean (60S-60N) by
AMSR-E/AMSR2 SST during 2002-2026



SST near Japan shows higher SST than usual partly
due to northward shift of the Kuroshio current

Monthly anomaly: 2026/05(D)



El Nino since Apr. 2026

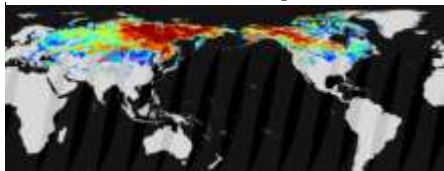
What's new for AMSR3 ?

AMSR Products at glance

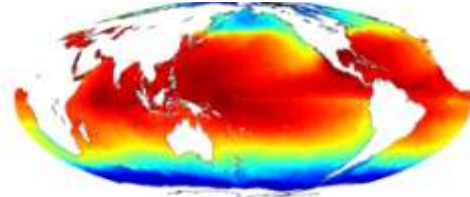
GCOM-W
AMSR2



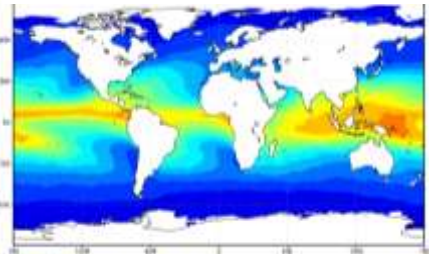
Snow Depth



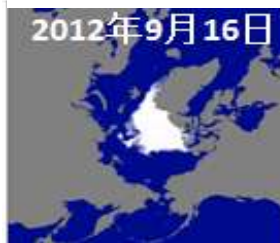
SST



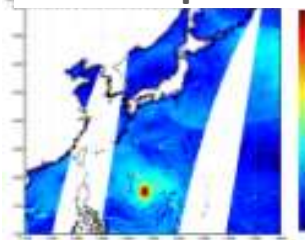
Water Vapor



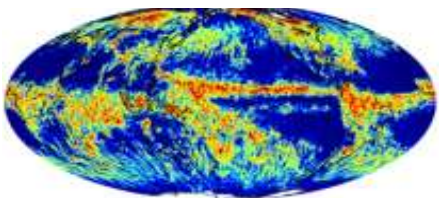
Sea Ice



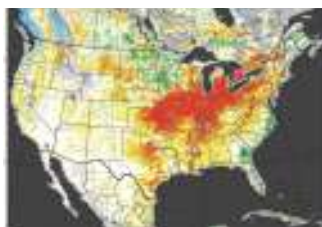
Wind Speed



Rainfall



Soil Moisture

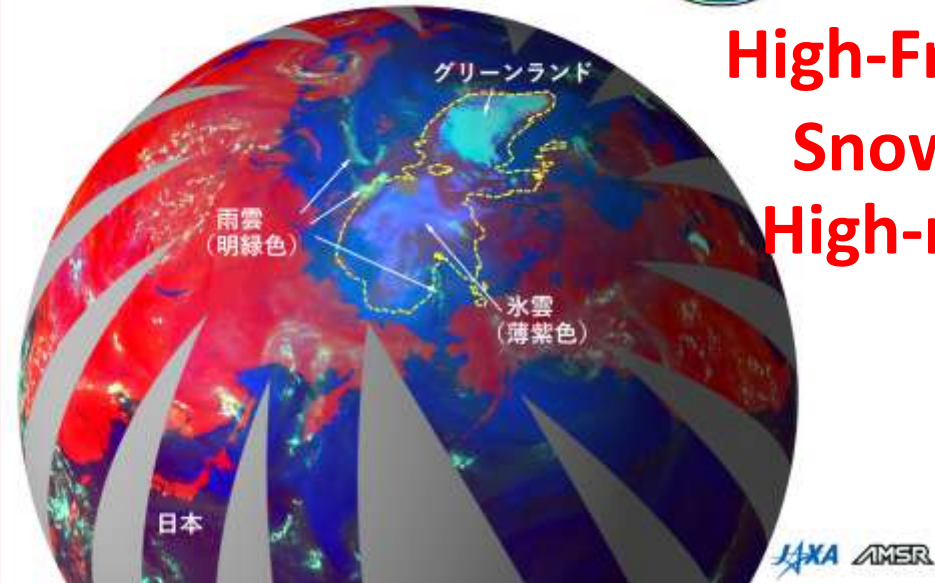


+

GCOM-GW
AMSR3



High-Freq. CH
Snowfall
High-res. SST



Water Cycle Variation

- Model prediction
- Extreme weather

With AMSR3, we improve...

Operation Utilization

- Weather Forecast
- Fishery
- Polar ocean navigation

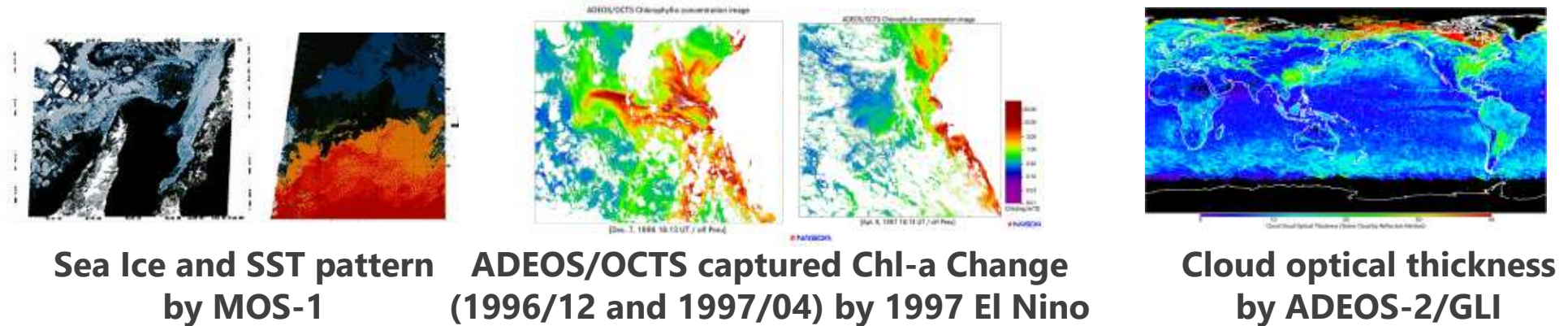


Reveal the Impact of Climate Change with Various Geophysical Parameters (Global Imager)



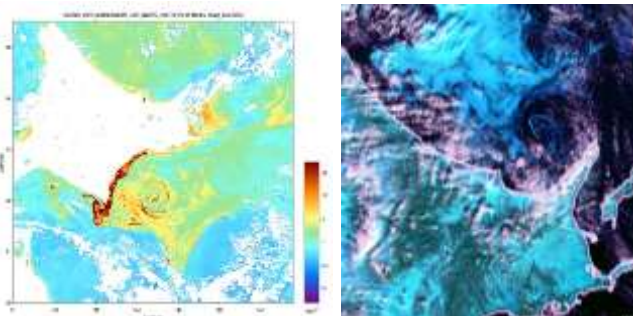
What we observe

GCOM-C:
Clouds, Aerosols,
Land/Ocean Vegetation
and temperatures



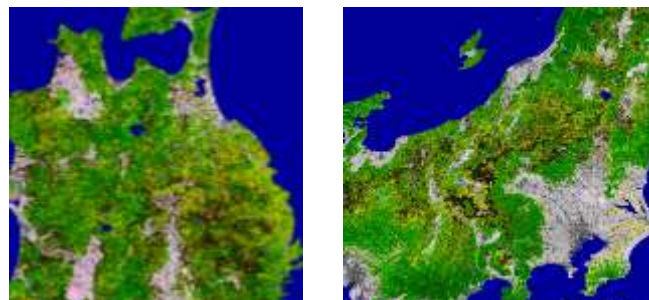
250m resolution (GCOM-C)

Vegetation, Phytoplankton, Sea ice



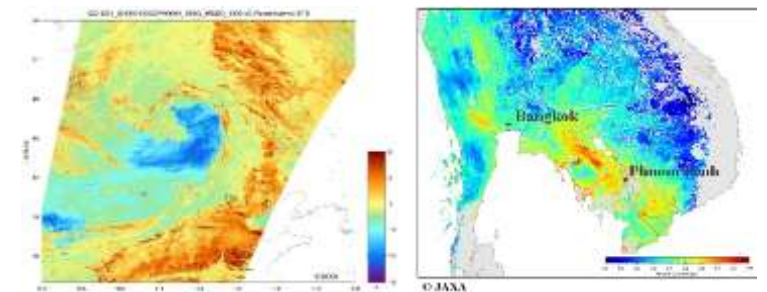
Along-track slant view (GCOM-C)

Biomass, Land cover



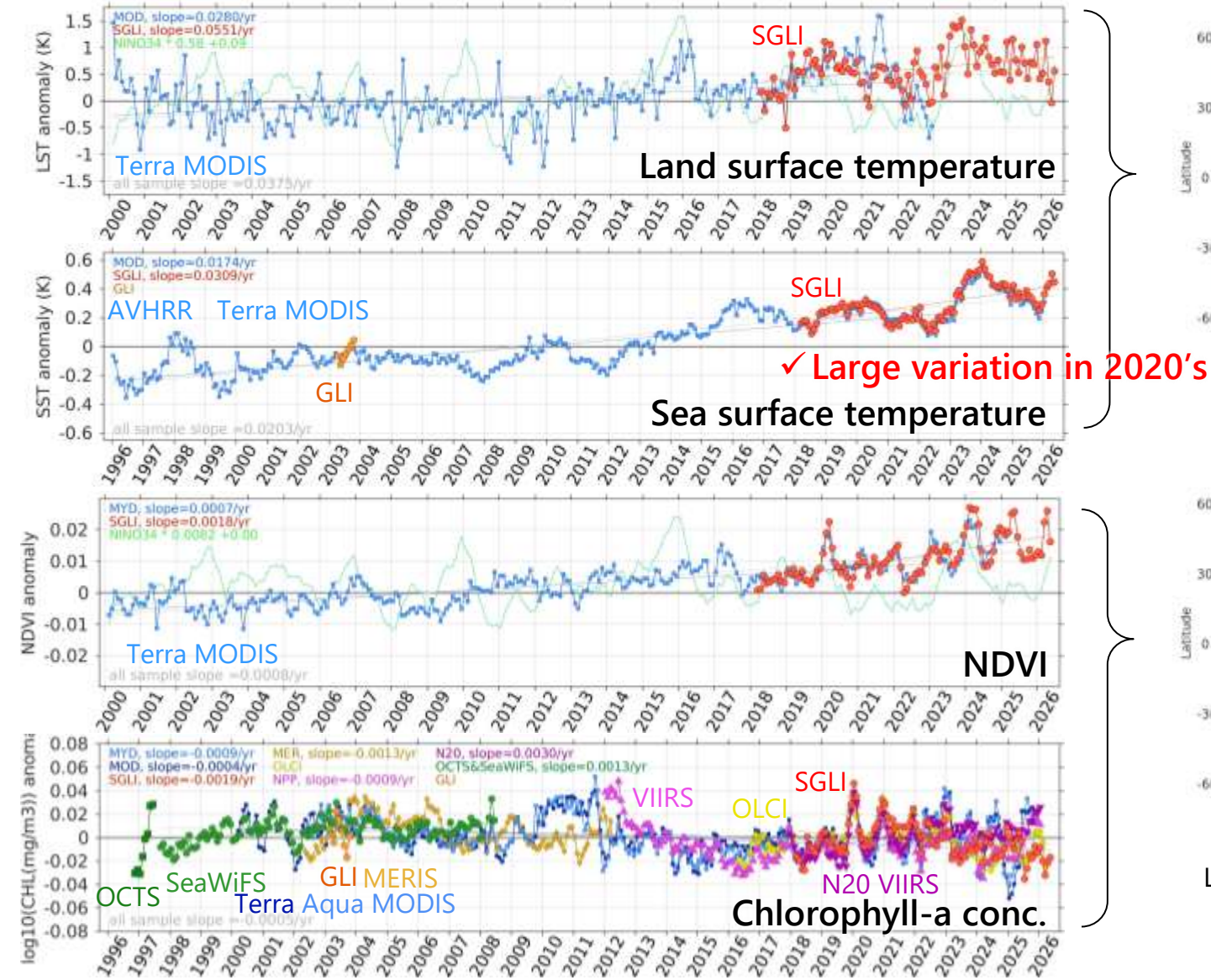
Polarization (GCOM-C)

Aerosol

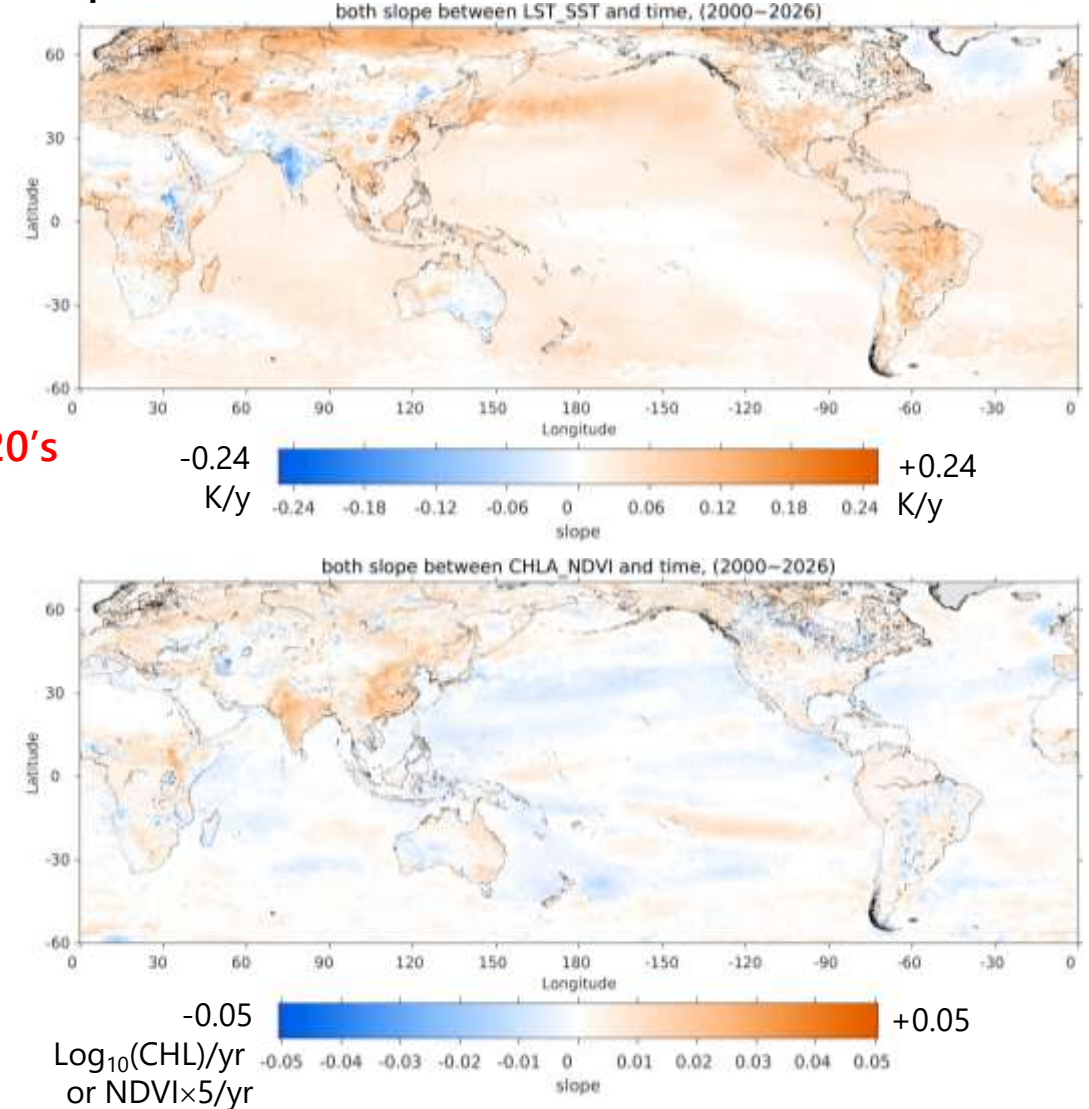


Timeseries of Global Environment by GCOM-C/SGLI

Timeseries of global (60°N~60°S) average monthly anomalies



Spatial Distribution of Linear Trends (2000–2026.5)



✓ Spatial heterogeneity in decadal trend

Decade-Long Global GHG Observation

Greenhouse Gases



GOSAT
TANSO-FTS



GOSAT-2
TANSO-FTS-2



GOSAT-GW
TANSO-3



環境省
Ministry of the Environment

国立研究開発法人
国立環境研究所
National Institute for Environmental Studies



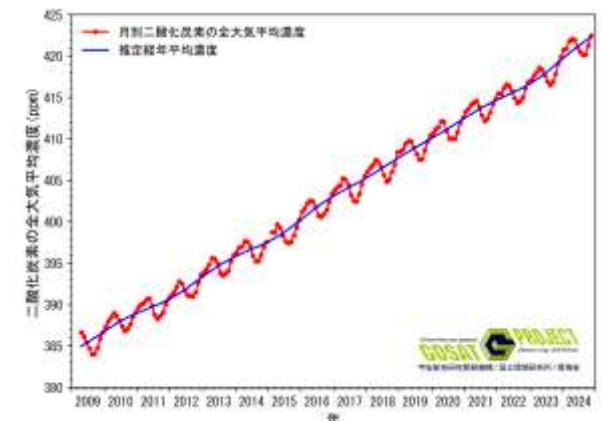
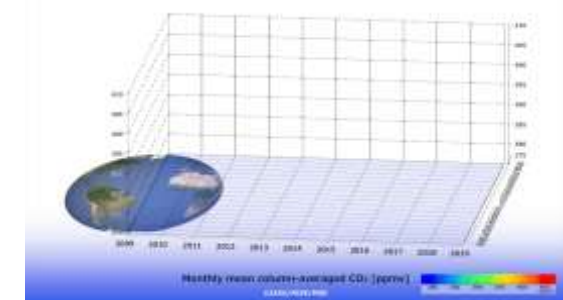
Global CO₂ and CH₄ distribution measurements of lower and upper atmosphere with the world highest spectral resolution instrument

What we observe:

CO₂
CH₄
CO



56,000 observation points
all over the worlds

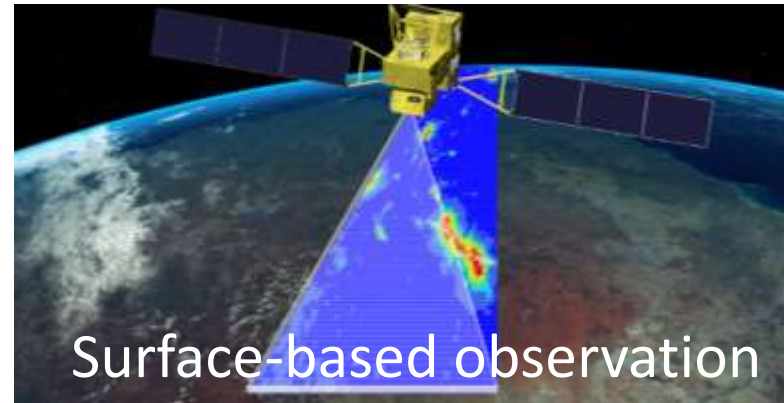


Wider-Area and Higher-Precision GHG Observation

GOSAT-2



GOSAT-GW



What we observe:

CO₂

CH₄

NO₂ ← NEW

Wide Mode

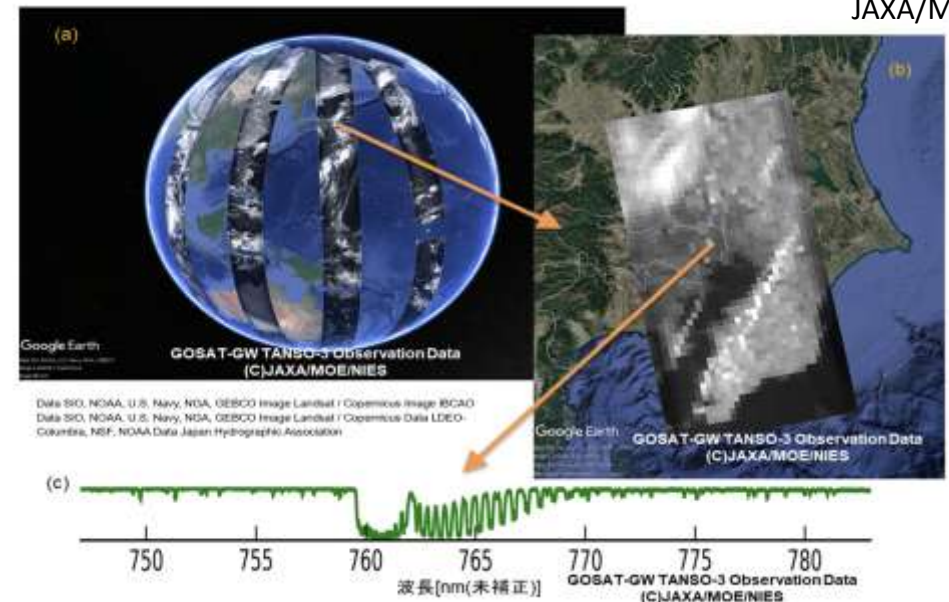
Focus Mode



Spatial resolution of **10 km**
over a swath at least 911 km
wide.



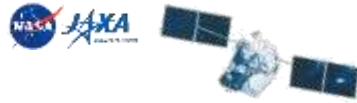
Spatial resolution of **3 km**
over a swath at least 90 km
wide.



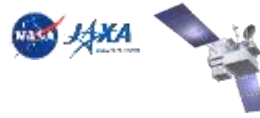
JAXA/MOE/NIES

Precipitation Monitoring (Rain Radar): Measure the 3D structure of rain

Precipitation/ Water Cycle



1997 - 2015



GPM/DPR
Ku-band (13.6GHz)
Ka-band (35.5GHz)

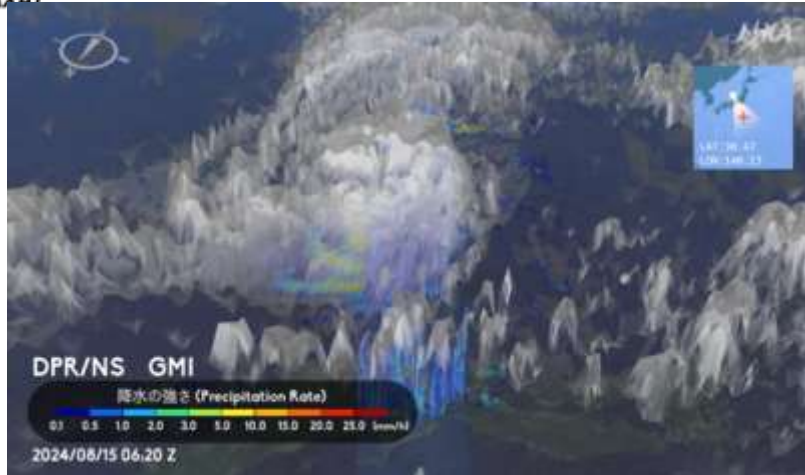


**JAXA PMM is
Joining NASA's AOS**

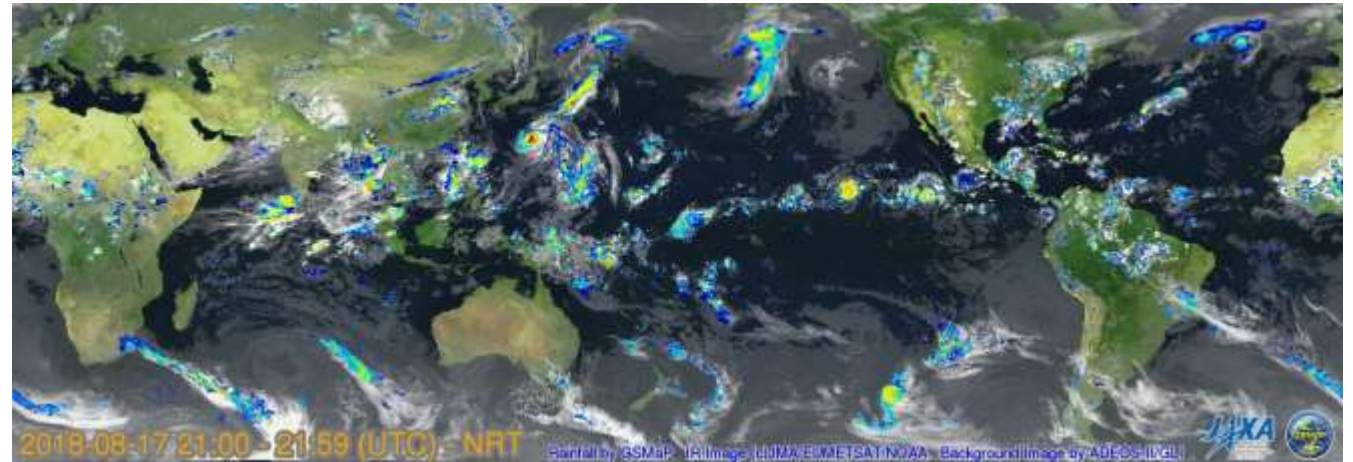
2014 -

2028 -

JAXA 3D Rainfall Watch



JAXA GSMaP



Addressing Multiple Societal challenges

Climate/ Weather
monitoring



Agriculture



Water-related
disaster



Water resource
management



Energy

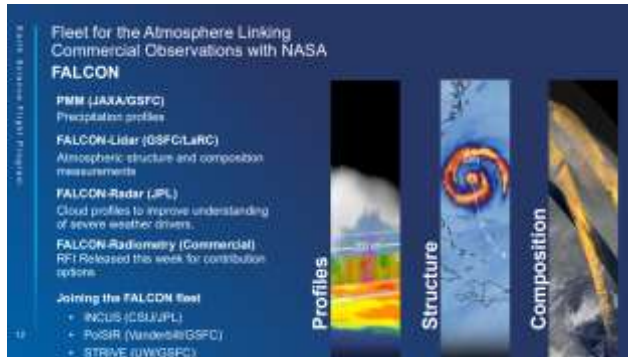


Public health
Educations



Next-generation Precipitation Radar mission in Synergy with Aerosols and Cloud Science

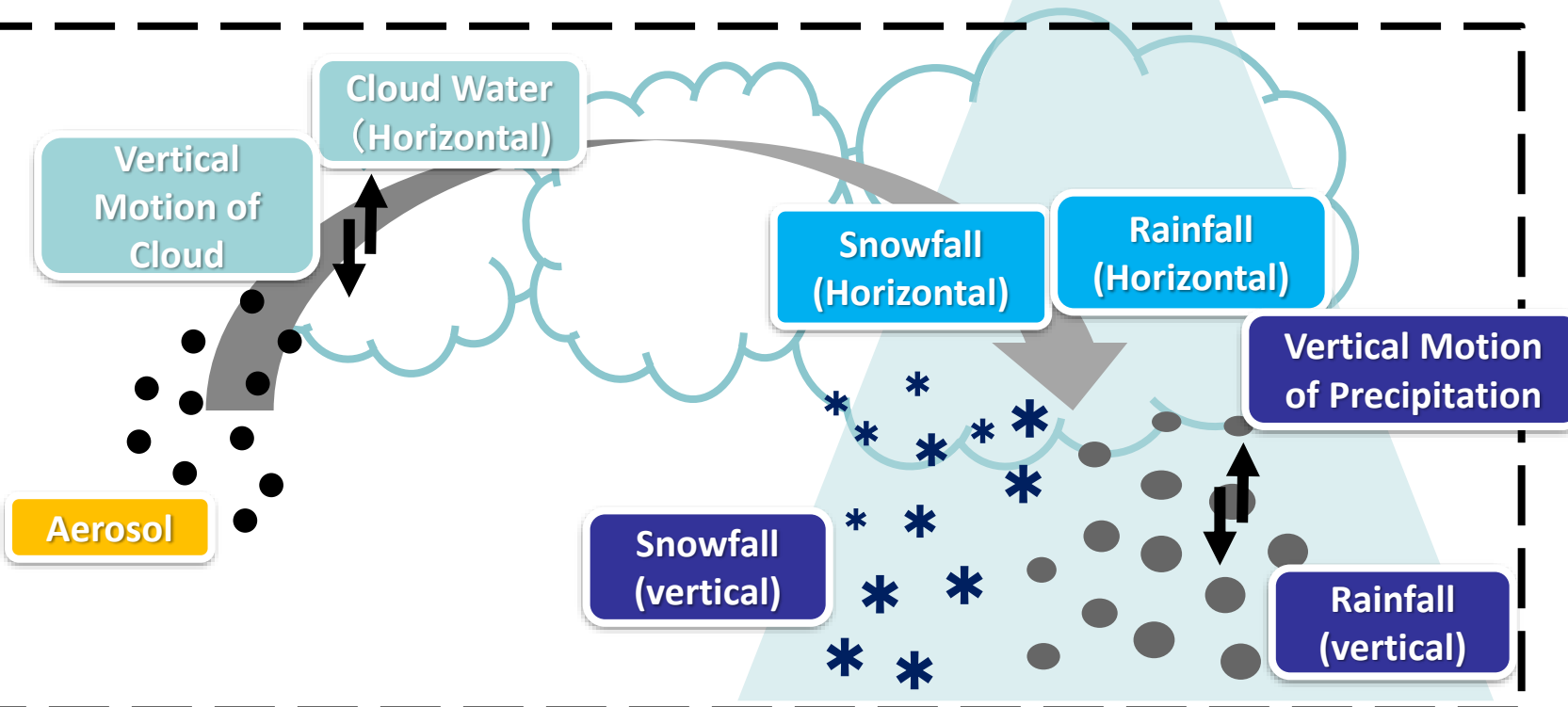
NASA FALCON



JAXA PMM KuDPR



- Ku-band Doppler Precipitation Radar (KuDPR)
 - Doppler velocity obs.
 - High sensitivity
- Collaboration with NASA FALCON for understanding of Aerosol~Cloud~Precipitation processes
- Improving weather/climate models



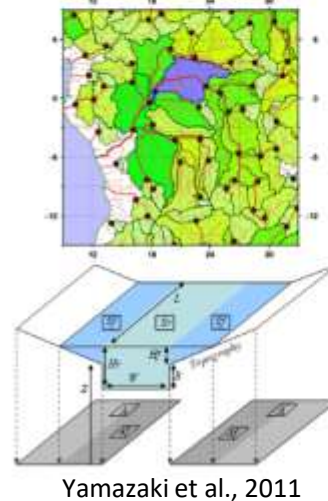
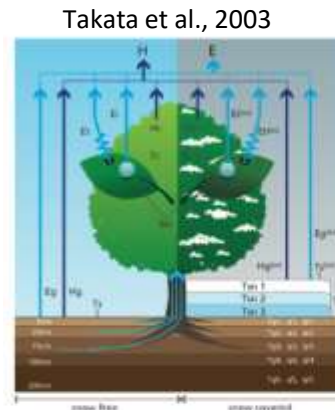
From Observation to Prediction: Digital Hydrology Platform

- **Global terrestrial hydrological simulation system**
- Collaborative research of JAXA and the University of Tokyo
 - <https://www.eorc.jaxa.jp/water/>
- Estimating/Predicting the water-related physical value and providing them.

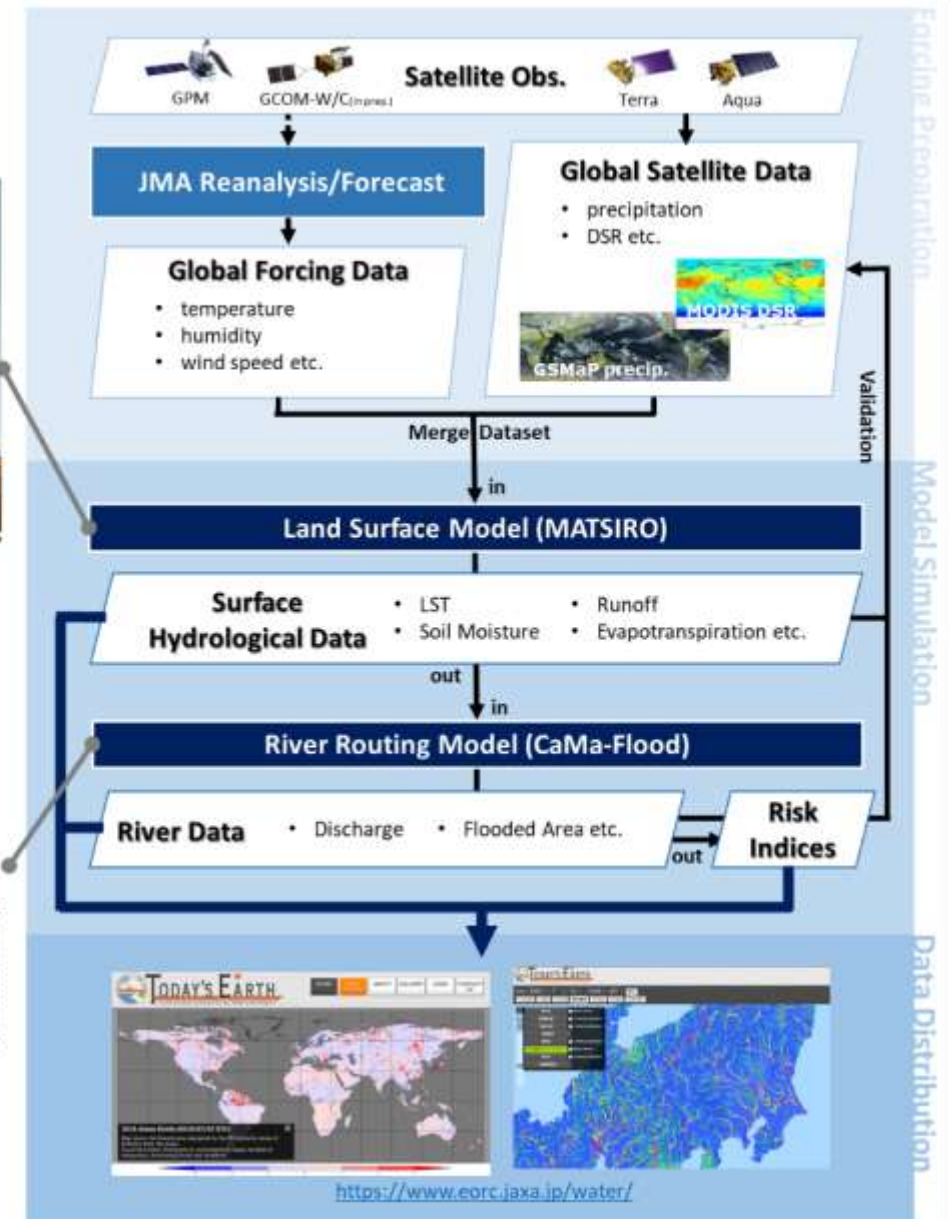
Long-term global land surface water dataset

Predicting extreme events such as floods and droughts.

Water resource management and monitoring and predicting water-related disasters

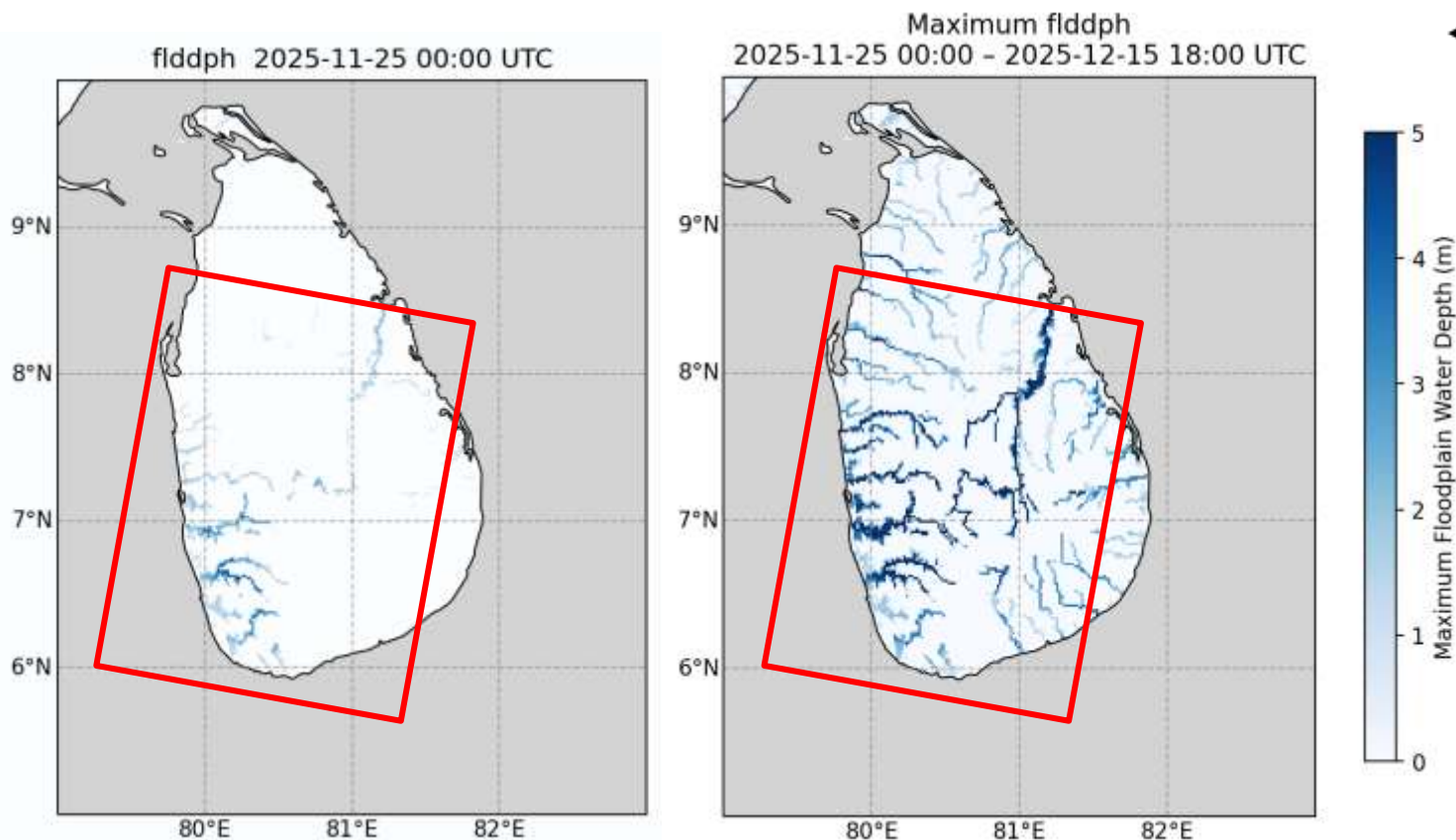


Yamazaki et al., 2011



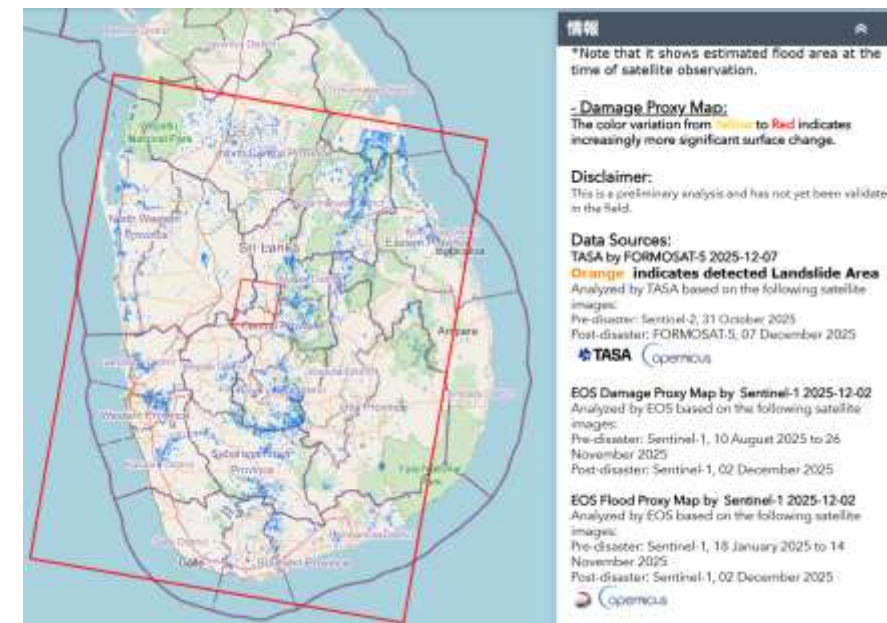
Real-World Impact: Flood Prediction in Sri Lanka (2025)

◆ Flood in Sri Lanka Nov. 2025



Observed flooded area ▶
By Sentinel Asia

◀ Estimated floodplain water depth by TE-Global (originally 0.1 deg., downscaled to 1/60 deg.)



<https://storymaps.arcgis.com/collections/8acb5761eefd4816bbb99f1e7146e6a2?item=1>

Reducing Uncertainty in Climate Prediction (Doppler Radar)

Cloud/Aerosol/Vegetations

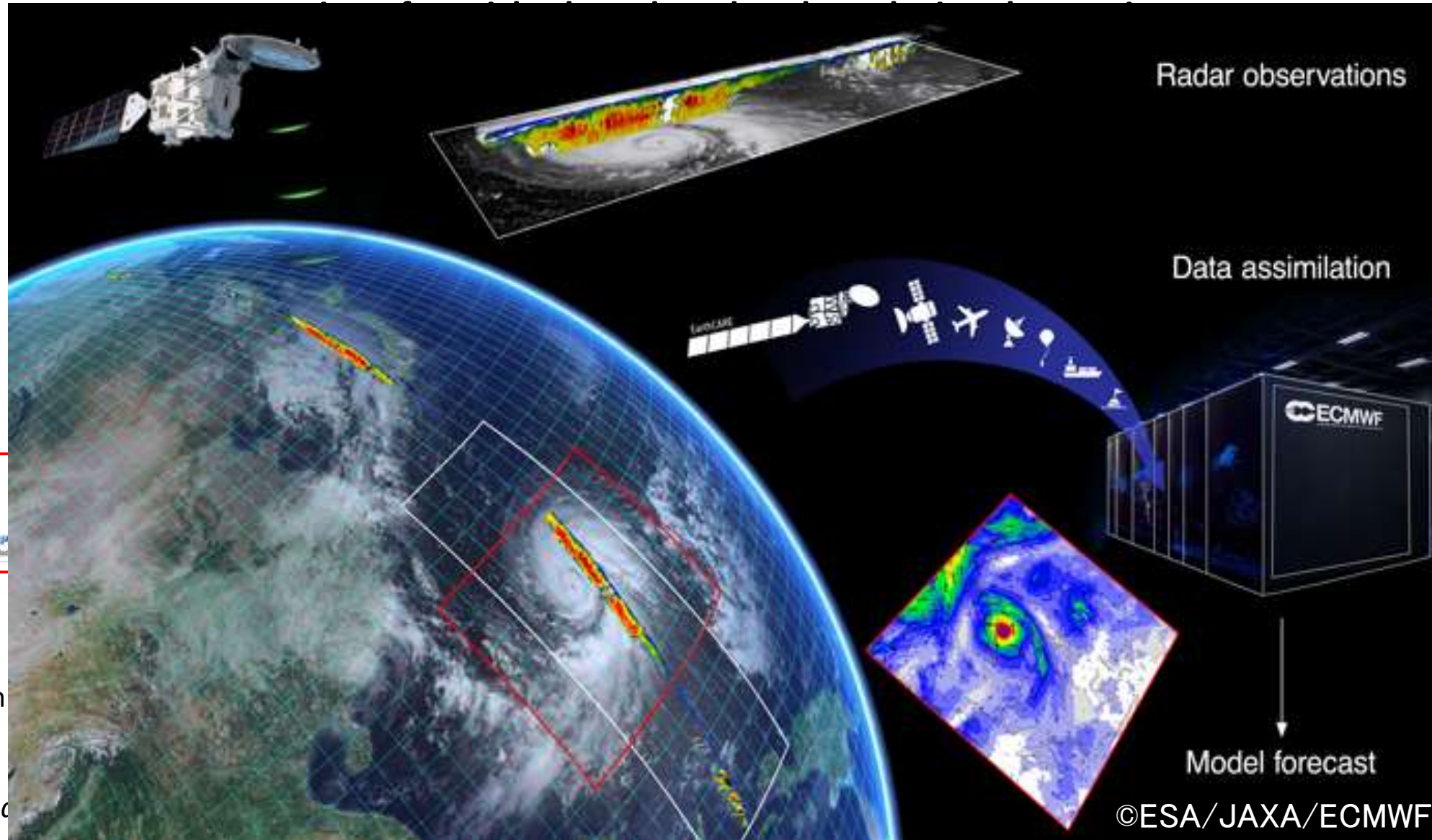


What we observe

EarthCARE:
Clouds and Aerosols



Japan-European cooperation
JAXA-ESA cooperation,
JAXA-DLR cooperation,
and so on with many European
scientists..



Reducing Uncertainty in Climate Prediction (Doppler Radar + High Spectral Resolution Lidar)

Cloud/Aerosol/Vegetations



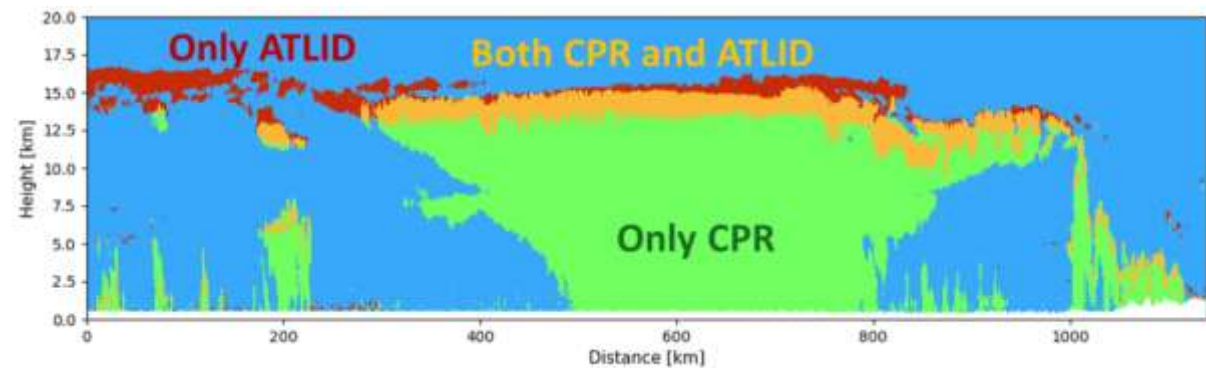
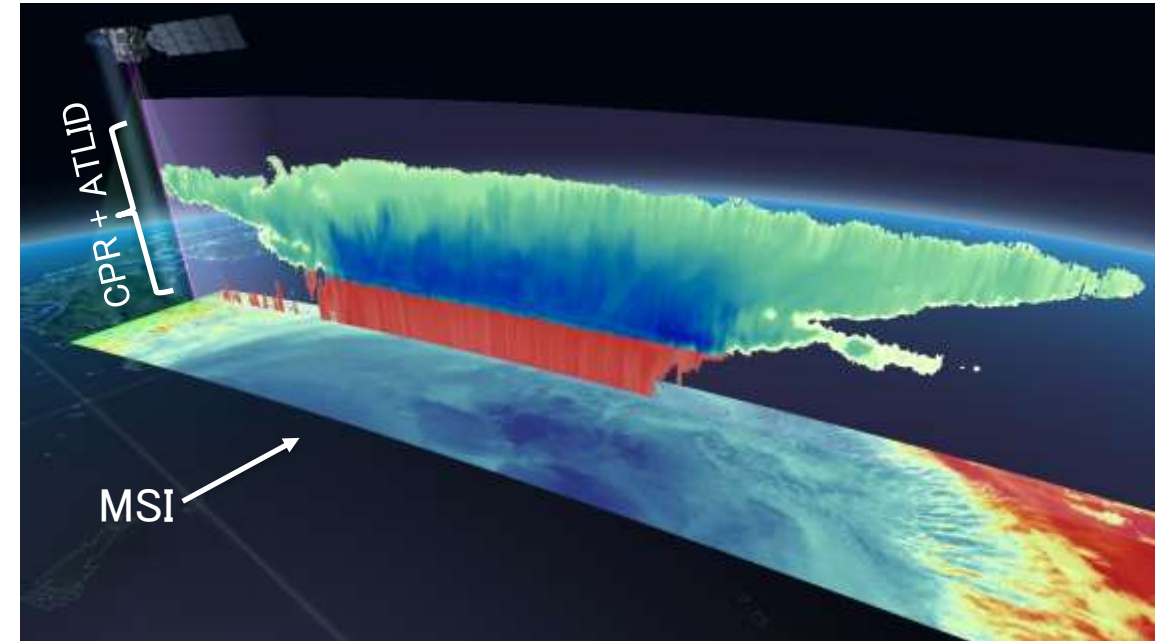
What we observe

EarthCARE:
Clouds and Aerosols



Synergistic cloud observations by multiple sensors

- ✓ *The CPR → thick cloud*
- ✓ *The ATLID → thin cloud and aerosol*
- ✓ **Address persistent uncertainties in cloud feedback and aerosol forcing**



Observation time: 17UTC on 27 August 2024

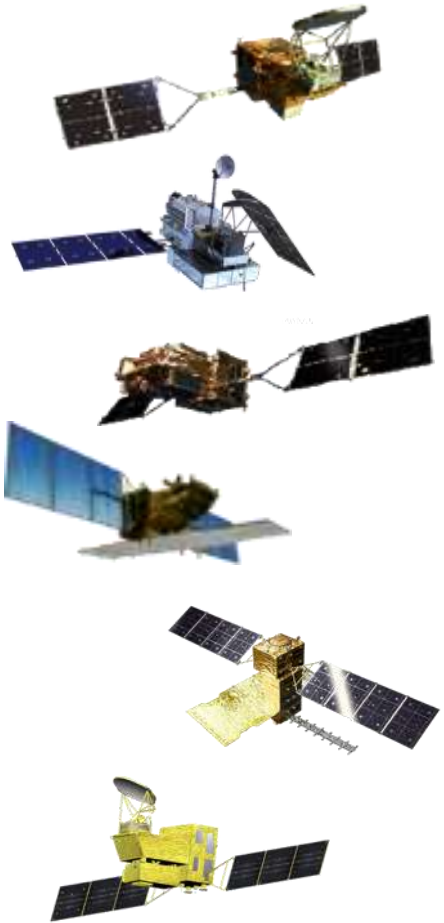
<https://www.satnavi.jaxa.jp/en/news/2024/10/04/9923/>

Japan-European cooperation:
JAXA-ESA cooperation,
JAXA-DLR cooperation,
and so on with many European
scientists..

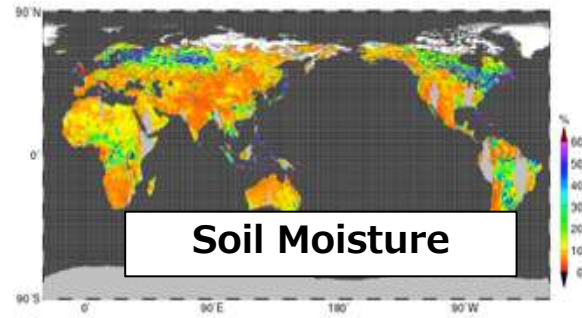
Integrated use of Multi-Satellite Data Agriculture/Food Security



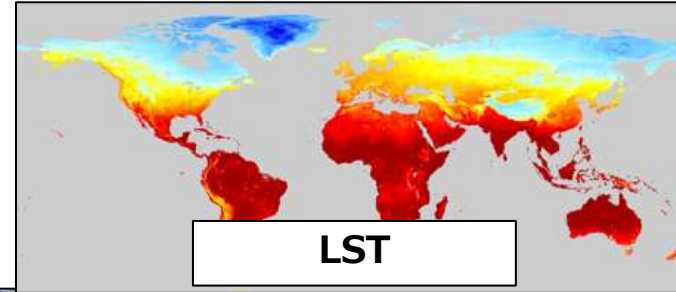
Fleet of EOS



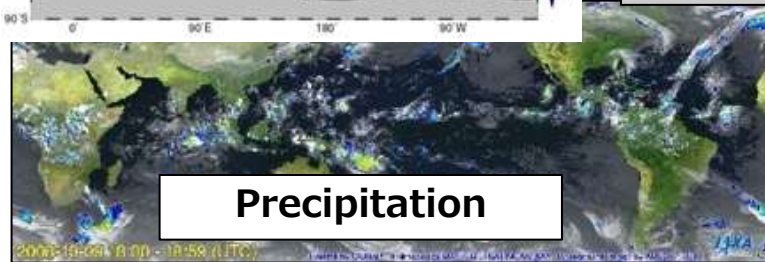
etc.



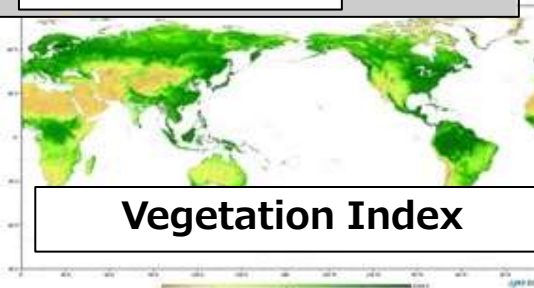
Soil Moisture



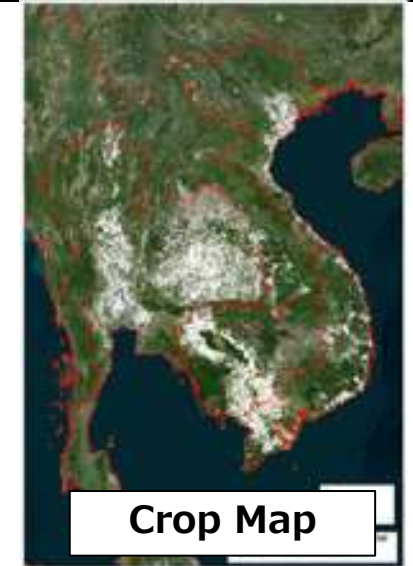
LST



Precipitation



Vegetation Index



Crop Map



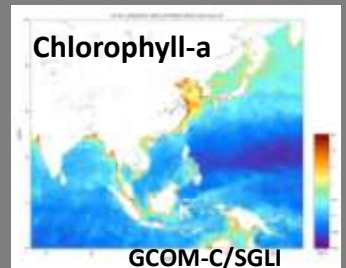
Agromet Monitoring System (MAFF/Japan)



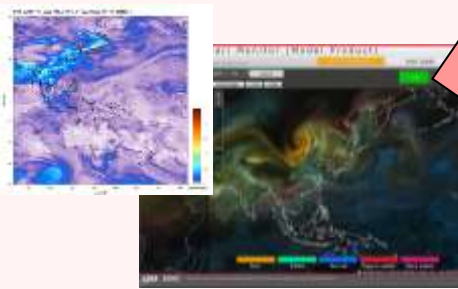
ASEAN Rice Growing Outlook (RGO)



Monitoring: Value-added Information through Satellite and Model Collaboration

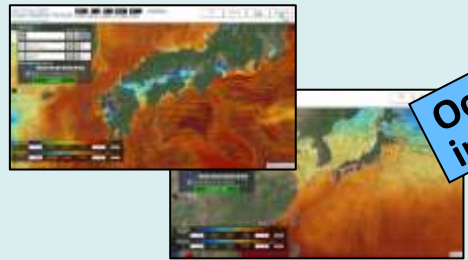


with JMA, MRI, NIES, Kyushu Univ.

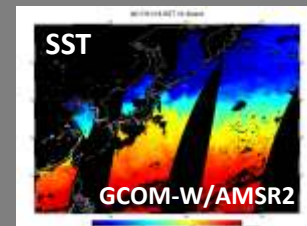


Aerosol Model

Ocean Model



with JAMSTEC, RIKEN



Digital Twin of the Earth

Natural Disasters
Water Resources
Fisheries
Agriculture
Health
Ecosystem

Interaction

Ocean information

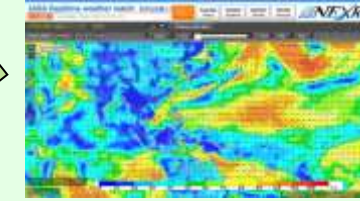
with U. Tokyo, JAMSTEC, etc.
Climate Model & Earth System Model

Atmosphere/
Land/Ocean

Various parameters

with U. Tokyo, RIKEN

Atmosphere information

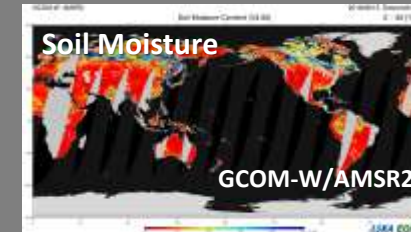


Atmospheric Model

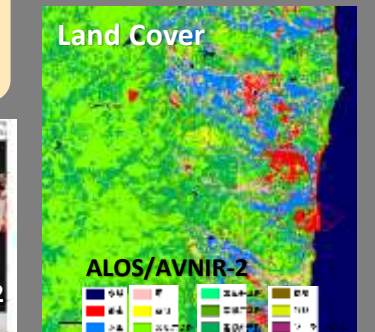
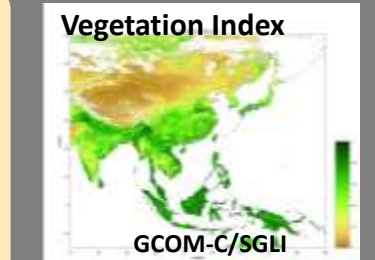
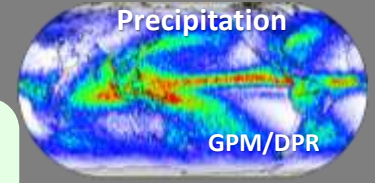
Land/River Model



with U. Tokyo

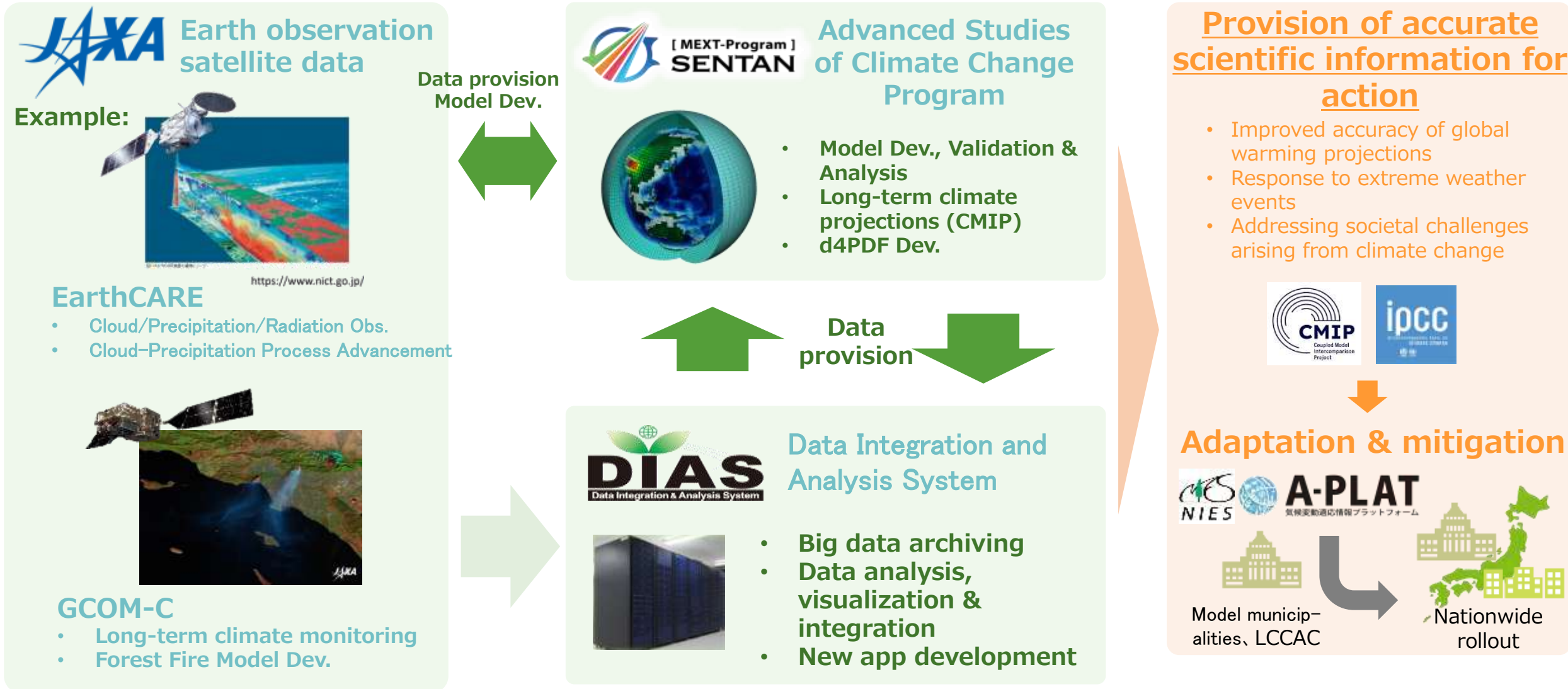


Observation Data Lake (including Satellite and in-situ)



Collaboration between satellite Earth observation and climate models•DIAS.

Strengthening collaboration among satellite observations, SENTAN and DIAS.





Envision the Future

Look WIDER

Look FASTER

Look DEEPER

Look SMARTER

and

ACT TOGETHER

For the

SAFE and RESILIENT WORLD