-Leveraging Satellite Technologies and Space Agency Expertise for Monitoring and Decision-Making-

【JAXA's Key message】

- JAXA observes major variables from space to understand Earth System and share the data globally.

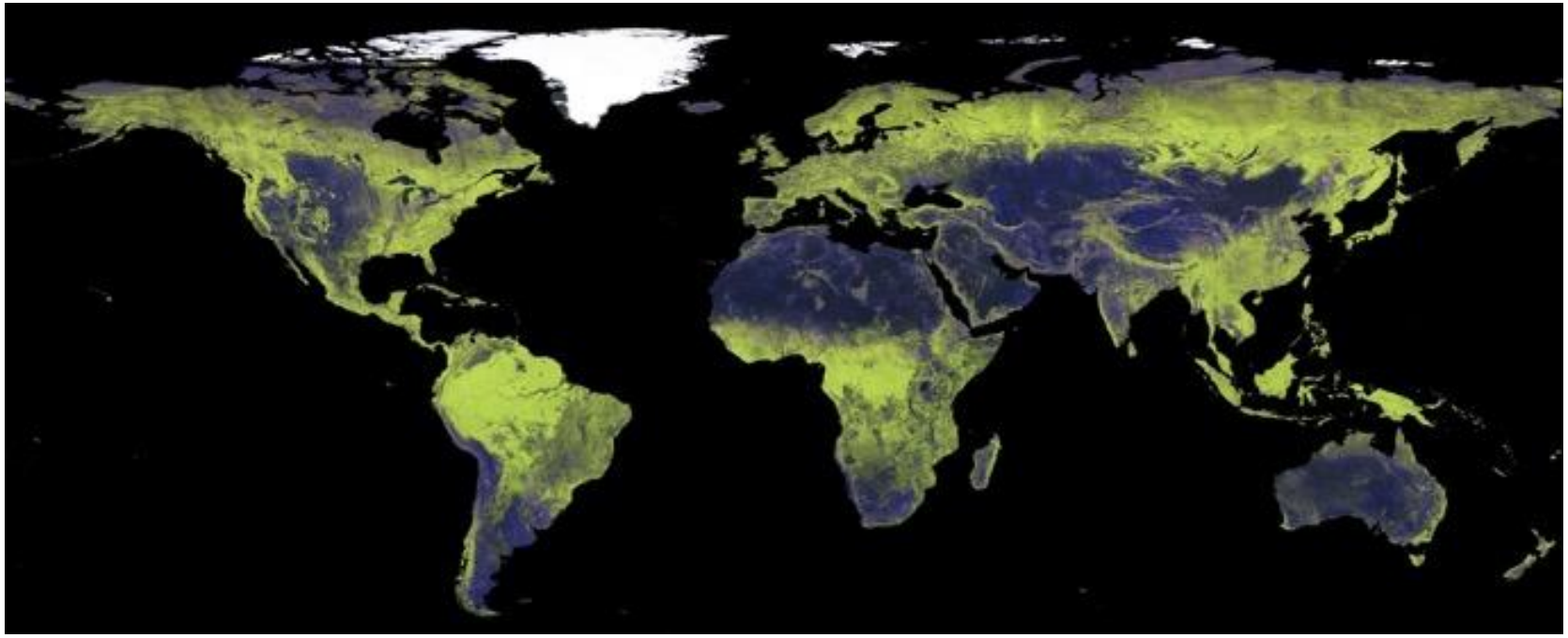
- The L-band Synthetic Aperture Radar (SAR) currently in operation on ALOS-2 and ALOS-4 is well suited for observing wetlands, water areas, and forests. Since, the Synthetic Aperture Radar (SAR) has a special feature of being able to observe regardless of time (day and night) and weather. In particular, JAXA has been conducting detailed observations using L-band SAR for over 30 years, beginning with JERS-1 in 1992.

- These observations have been supporting decision-making.
  - Supporting the law enforcement and detecting of illegal logging by the Brazilian authority responsible for the forest management.

- Way forward
  - JAXA is conducting research maximizing the capabilities of the L-band SAR, which is capable of

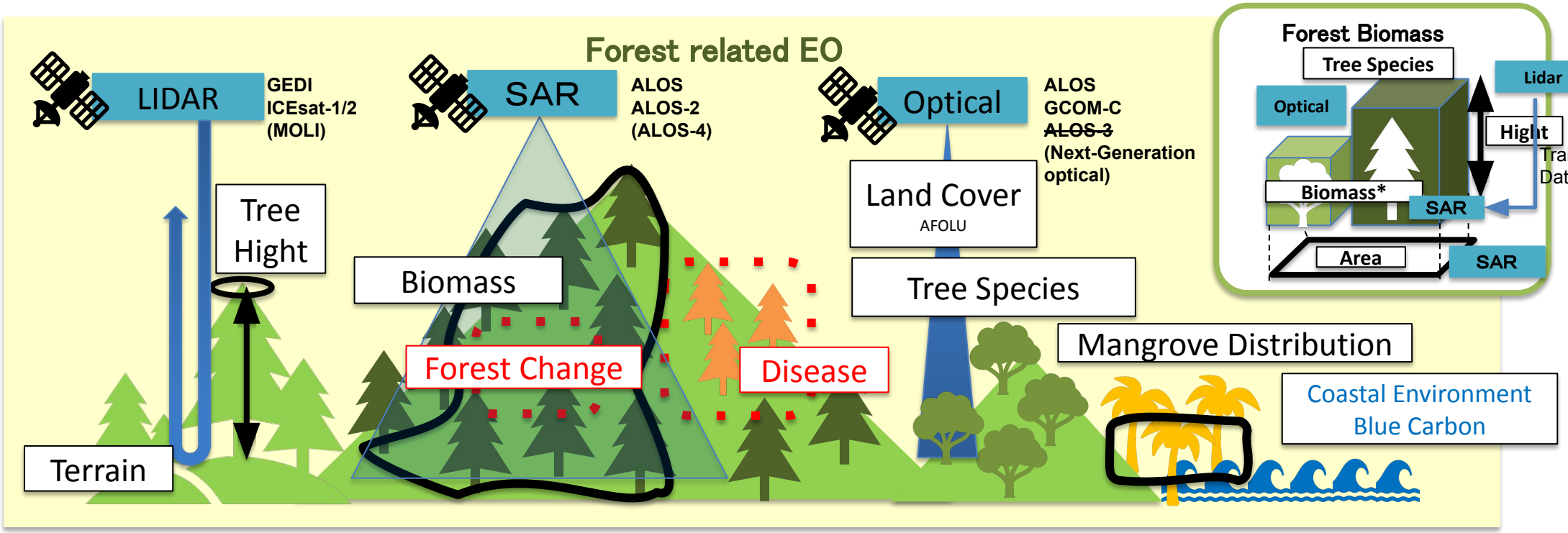
The Advantages of Japan's Time-Series L-band SARs

- JAXA the first space agency to implement systematic global acquisition strategy by SAR satellite.
- ALOS and ALOS-2 data acquired globally multiple times per year.
  - JERS-1 (1992 – 1998)
  - ALOS (2006 – 2011)
  - ALOS-2 (2014 – present)
  - ALOS-4 (2024 – present)
- ALOS & ALOS-2: 9 times/year over the pantropical zone.

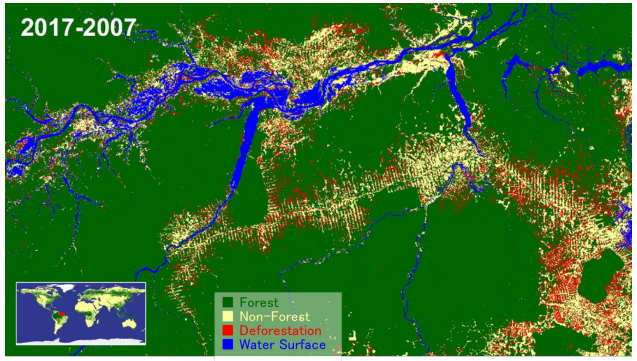


Annual global land mosaics by L-band SAR 25-meter resolution since 1992 to present, which are freely available in public.

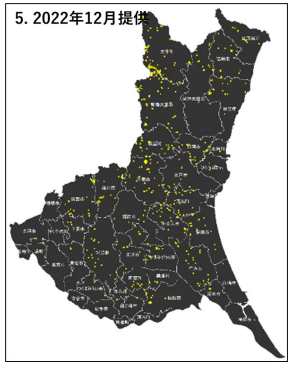
Satellite observation related to forests



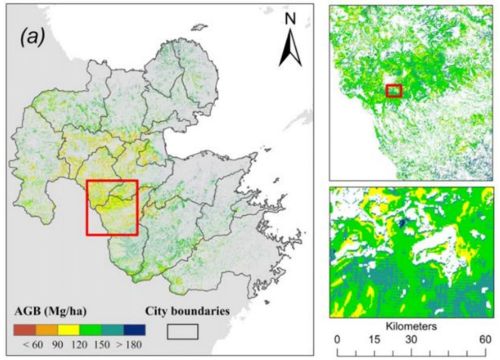
Forest Related Products by EO



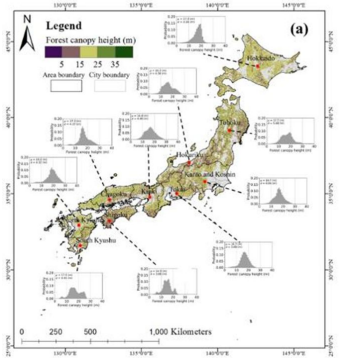
Forest / Non-forest Classification



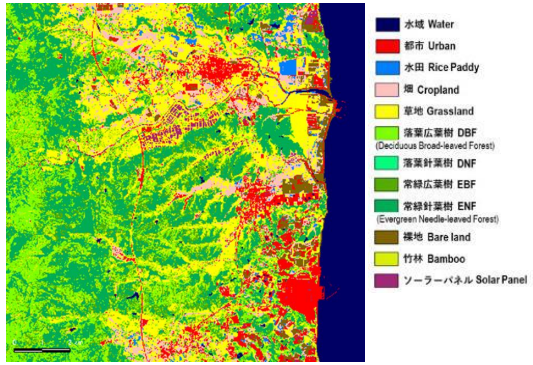
Logging Detection



Forest Biomass Map



National Tree Height Map



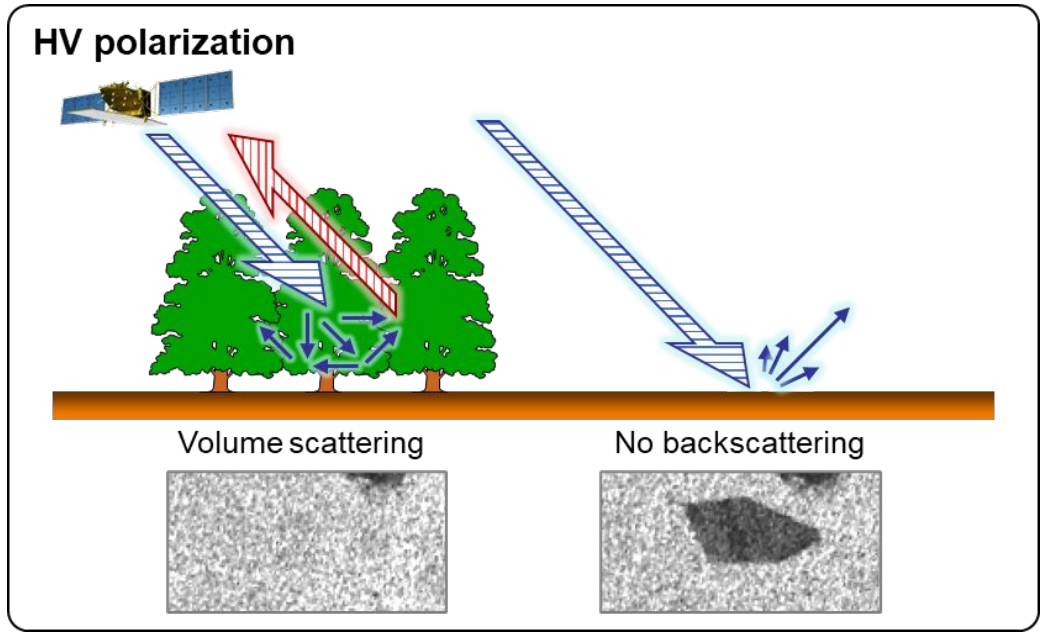
Land Cover & Tree Species Classification

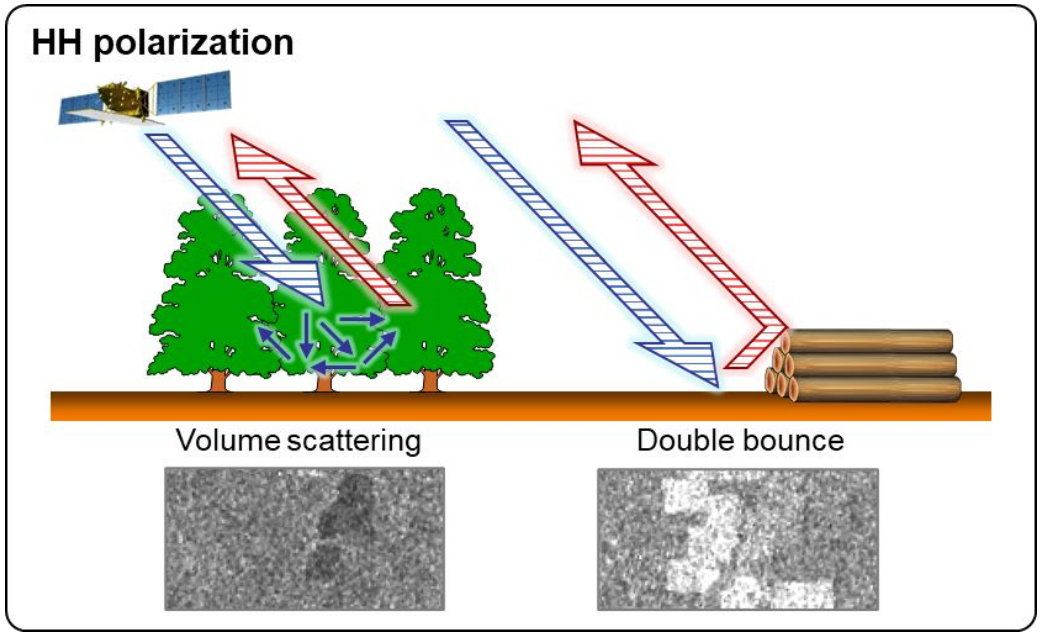
Detecting Deforestation from Space

Monitoring deforestation using SAR (especially L-band) effectively utilizes polarization information.
This approach allows for the **purpose-specific** use of

✔ signals indicating the conversion of forested areas to clear-cut bare land, and

✔ signals reflecting changes associated with early detection of logging activities.





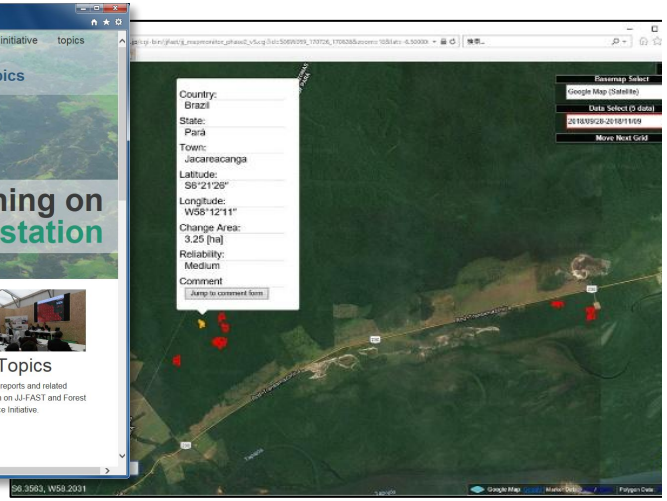
- HV polarization image is bright in forests due to volume scattering at the canopy. It is dark in logging areas due to weak backscattering.

> Clear-cut detection, *i.e.*, forest area change

- HH polarization image is also bright in forests. It is somewhat dark in logging areas due to low backscatter, but it can be bright due to forest residuals.

> Early detection of logging activities.

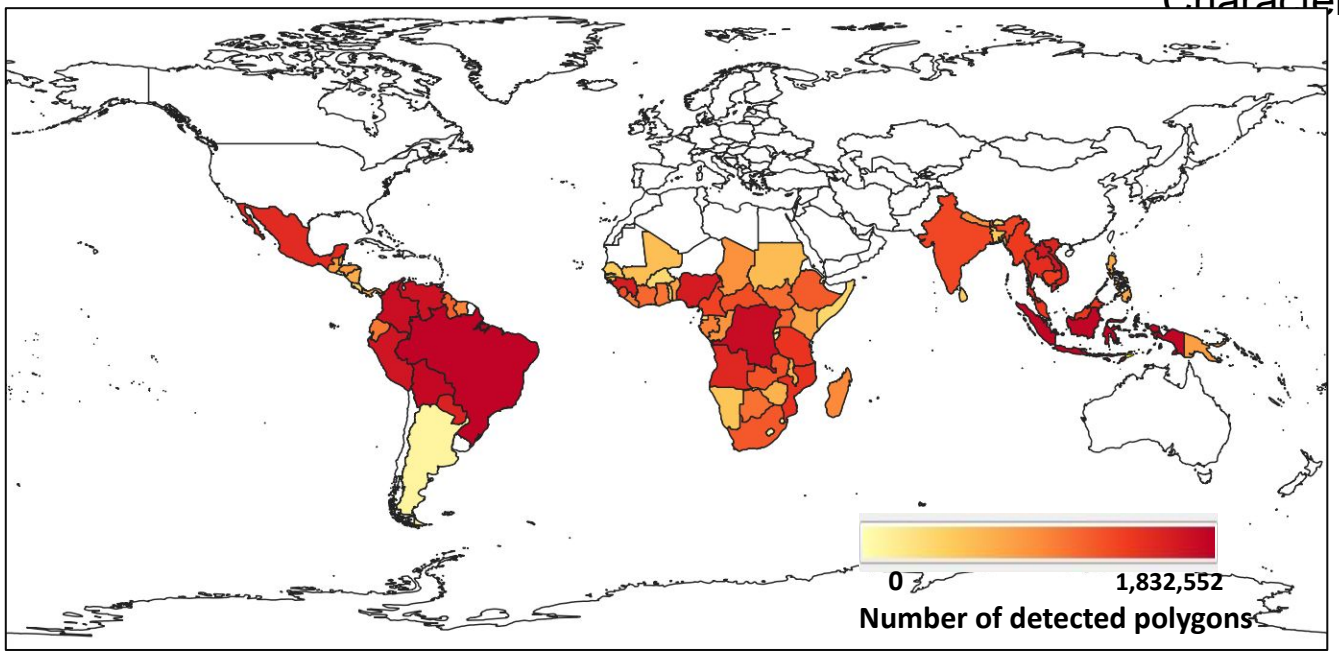
Detecting Deforestation from Space



JICA-JAXA Forest Early Warning System in the Tropics (JJ-FAST)

Data source	ALOS-2/PALSAR-2 ScanSAR mode
Target area	78 countries in the tropics until March 2024; Updates are being made only for Brazil from April 2024
Operation period	Since November 2016
Update	Every 1.5 months
Characteristics	- Global coverage: almost all tropical forests. - Cloud-cover area observation: even in the rainy season. - Early detection for illegal logging enforcement. - Fast webpage: Forester can use it in the field.

https://www.eorc.jaxa.jp/jjfast/jj_index.html

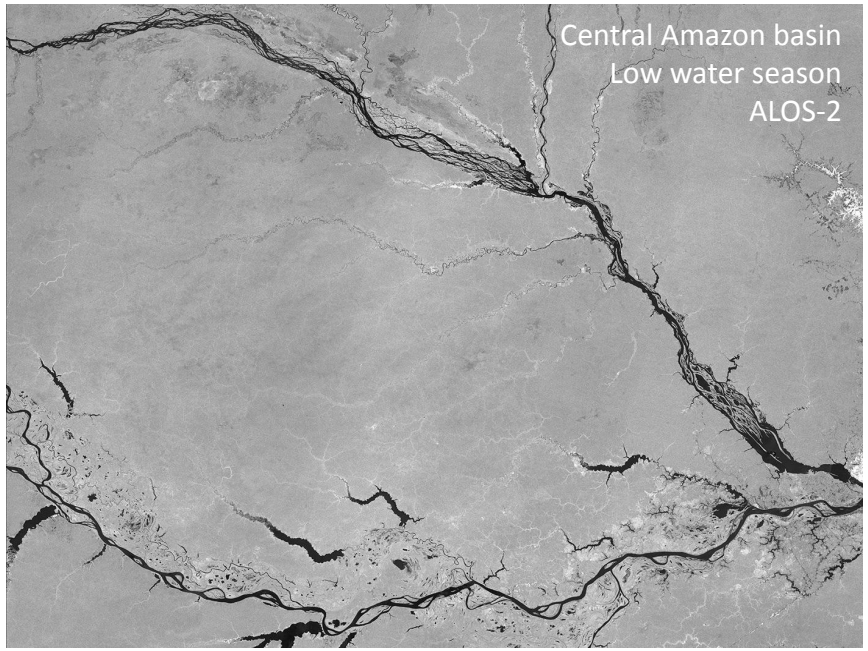


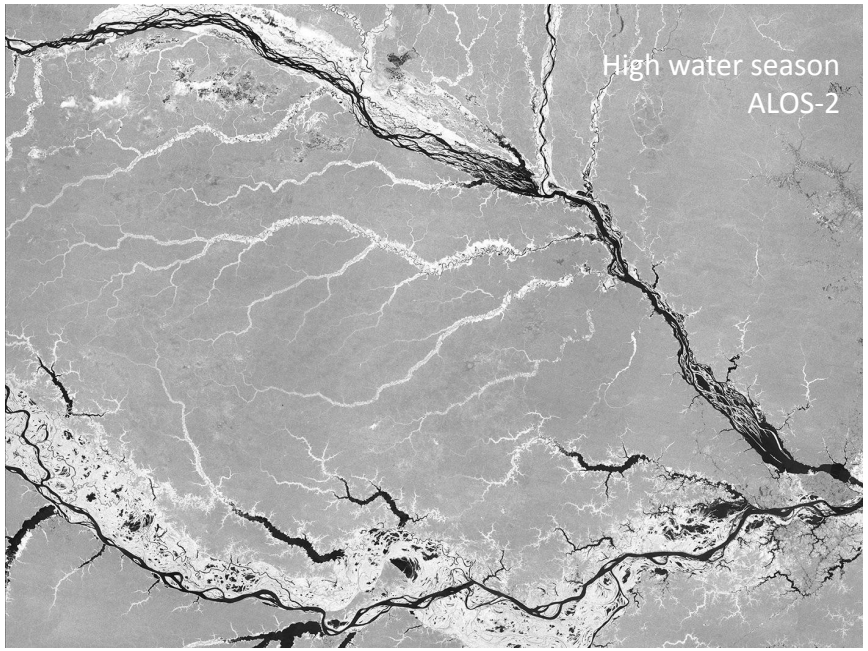
Number of detections (as of March 2024)

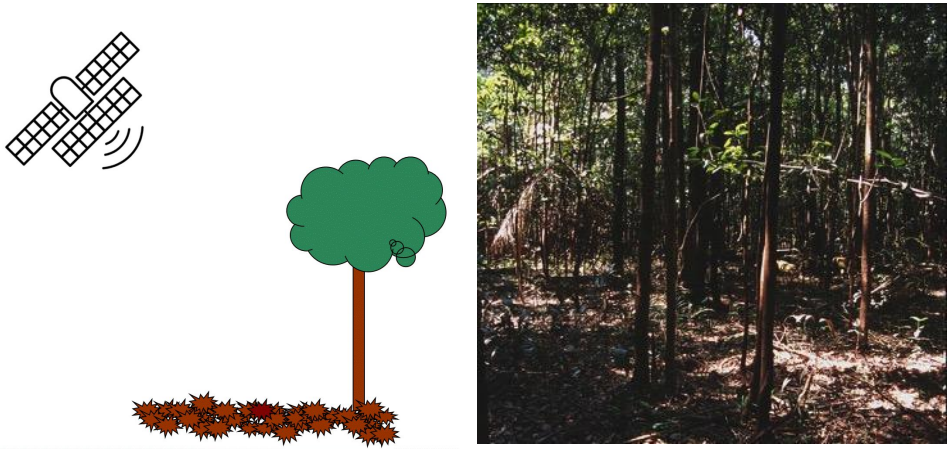
5 million sites in total, of which 1.83 million are in Brazil

JJ-FAST
JICA-JAXA Forest Early Warning System in the Tropics

A few more words about satellite radar…



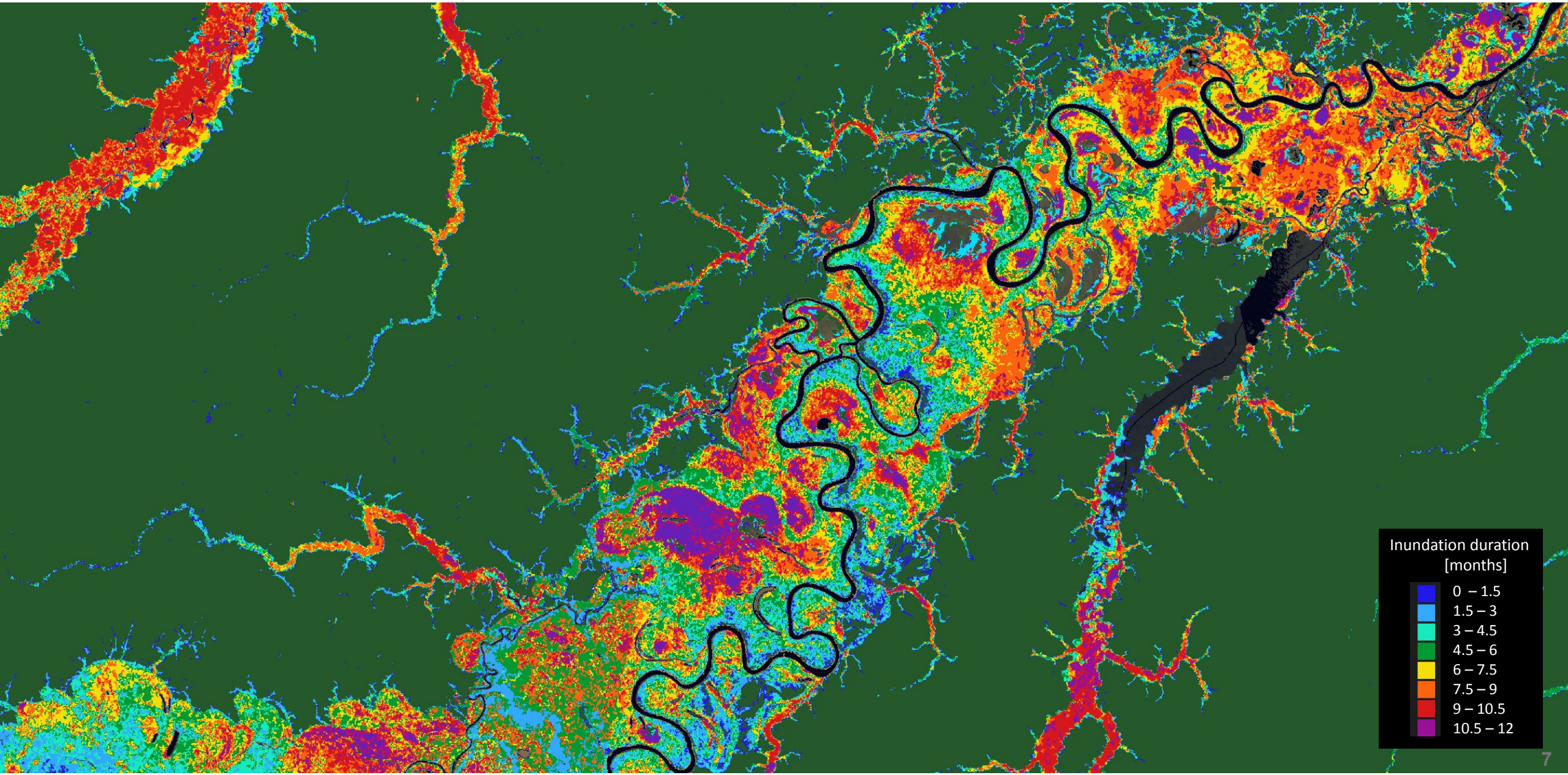




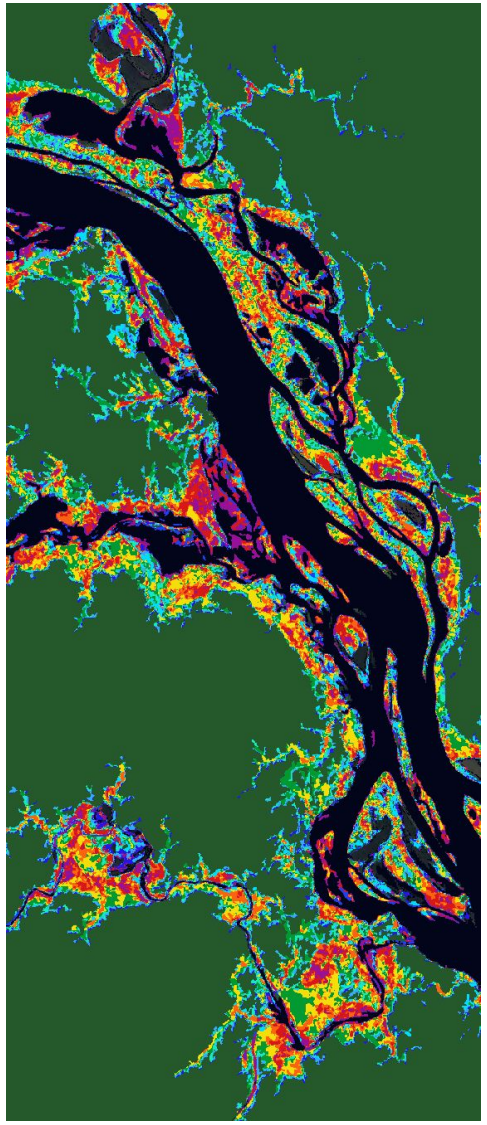
Dry forest

Flooded forest

Inundation duration



Inundation duration maps – Potential applications



- Inundation maps provide detailed information about wetland MAX / MIN extent and inundation geospatial variations over time
- Ecosystem stratification and habitat mapping, and biodiversity
- Input to regional models for CH4 and other trace gas emissions
- Assessment of inundation inter- and intra-annual variations
- Impact of El Niño and La Niña & Climate Change
- Support UNFCC and Ramsar CP to include forested wetlands in National Wetlands Inventories
- Etc…