

A satellite in orbit over Earth, with solar panels and instruments visible. The satellite is a rectangular platform with a central instrument bay and two large solar panel arrays extending outwards. The Earth's surface is visible below, showing green land and white clouds. The text is overlaid on the top half of the image.

**Data fusion of  
ALOS-2/PALSAR-2 data and MOLI data**

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*Japan Aerospace Exploration Agency (JAXA)*

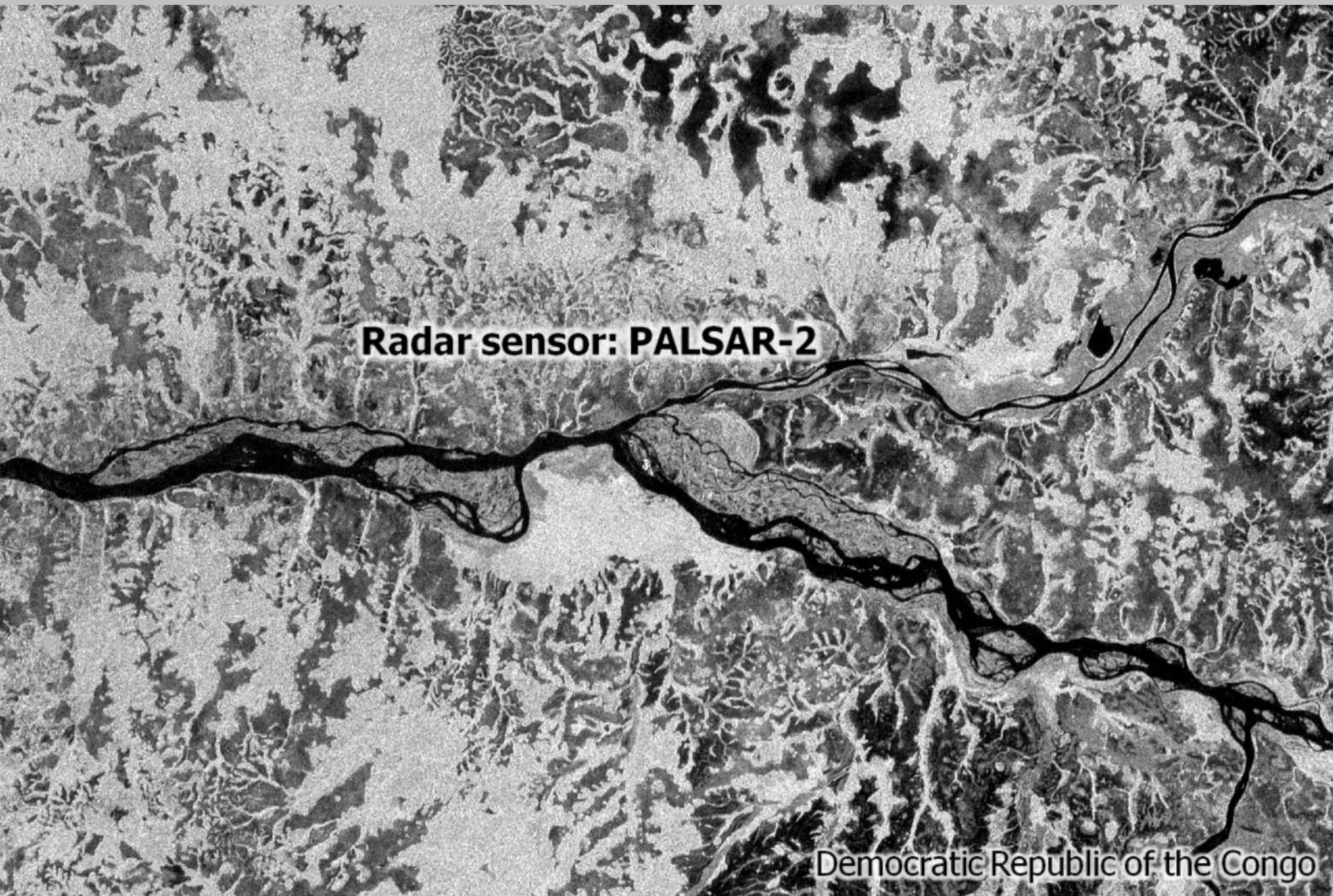
# 1. Advantage of PALSAR-2



**PALSAR-2 uses microwave, which penetrate cloud!**

PALSAR-2 can observe both day and night regardless of cloud cover.

# 1. Advantage of PALSAR-2

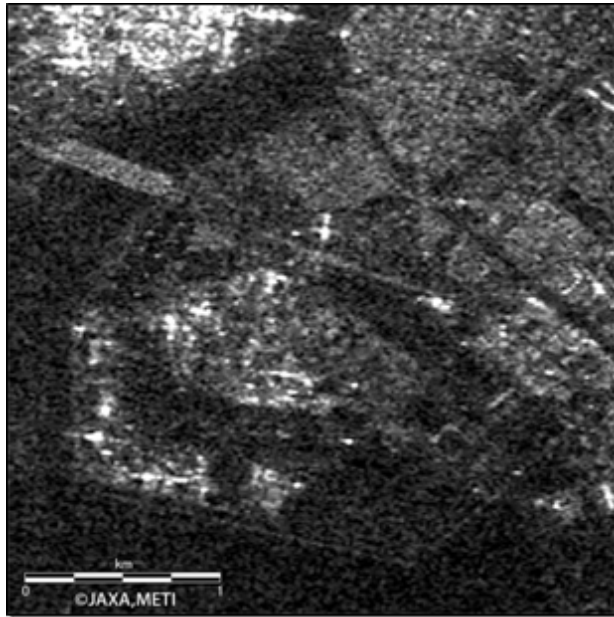
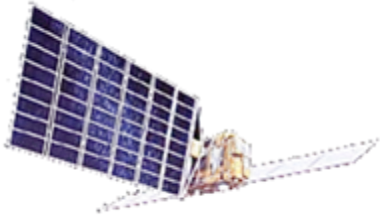


Radar sensor: PALSAR-2

Democratic Republic of the Congo

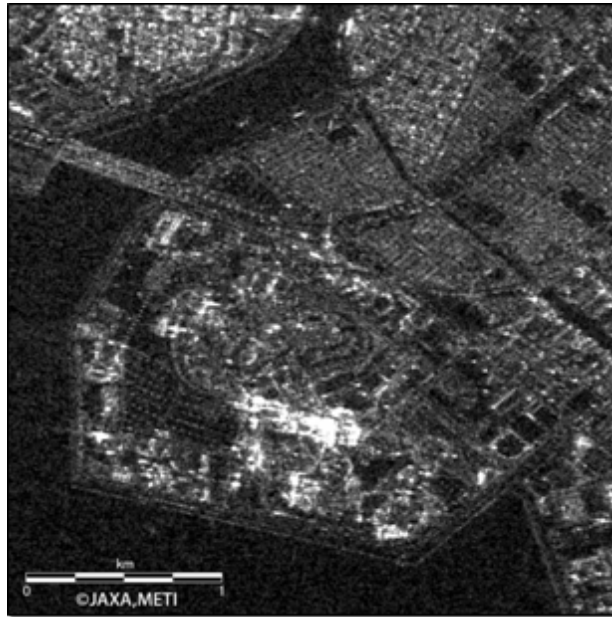
## 2. JAXA's SAR satellites

**JERS-1/SAR**



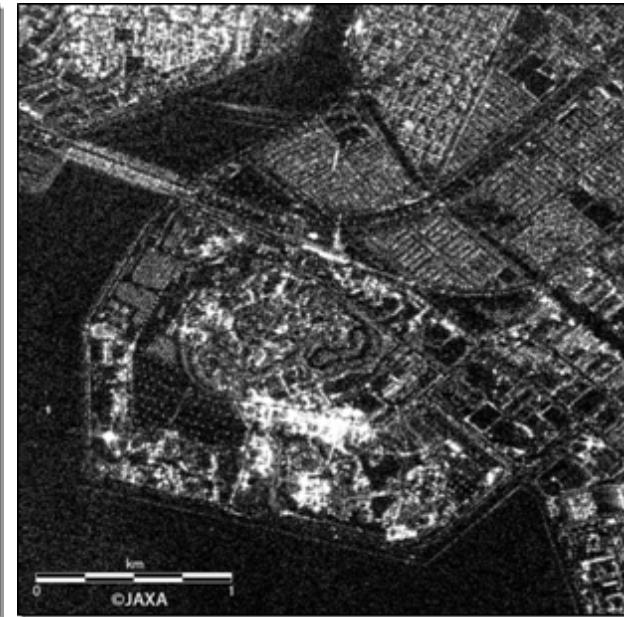
1992 - 1998  
Resolution = 18m

**ALOS/PALSAR**



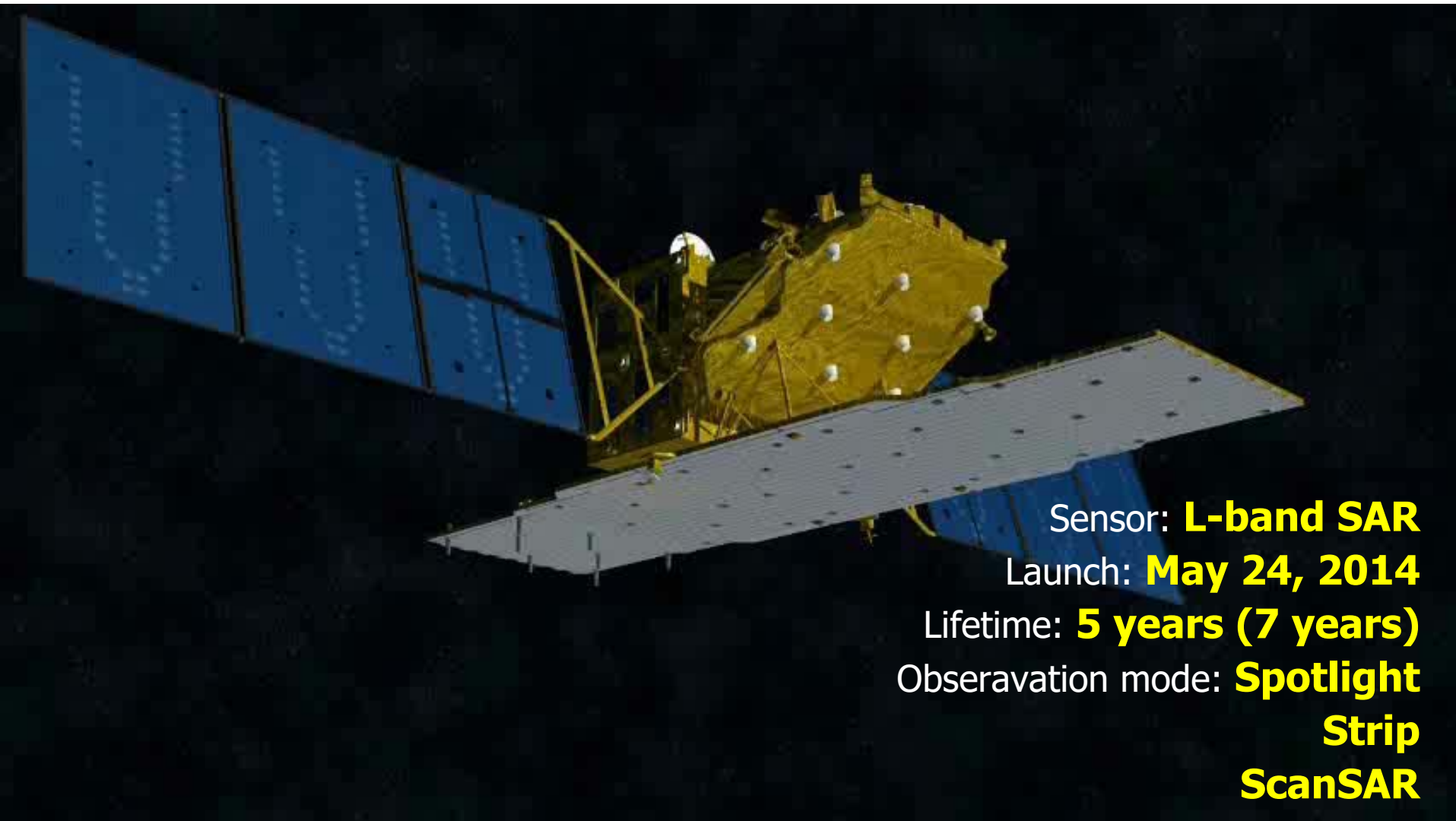
2006 - 2011  
Resolution = 10m

**ALOS-2/PALSAR-2**



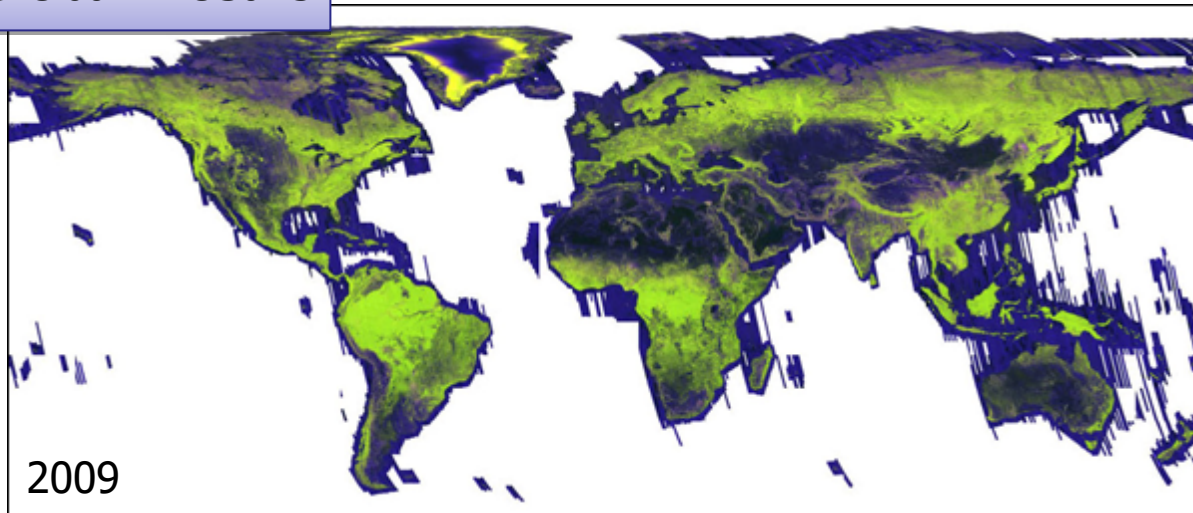
2014 -  
Resolution = 3m

### 3. Specification of PALSAR-2



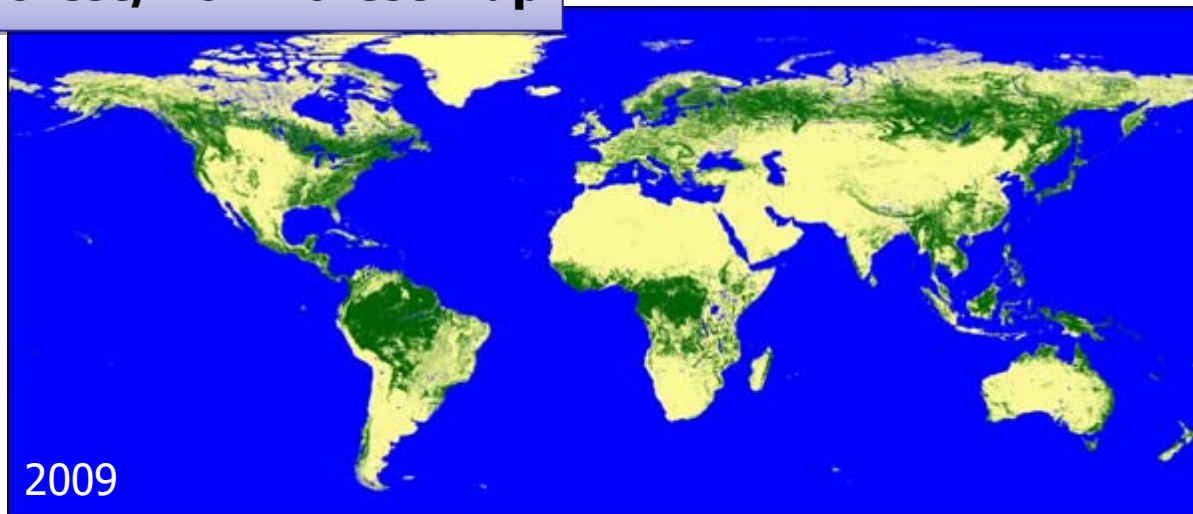
# 4. PALSAR-2 application: Global map

## Global Mosaic



Resolution = 25m  
Year = 2007, 08, 09, 10, 15  
Polarimetry = HH, HV

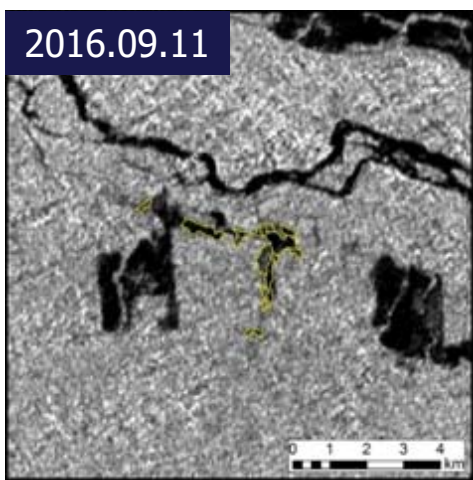
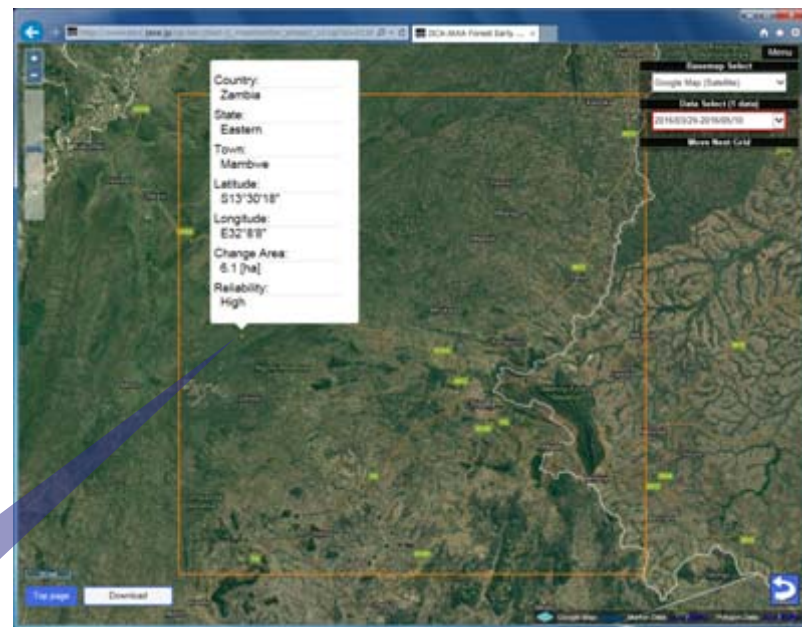
## Forest/Non-Forest Map



Resolution = 25m  
Year = 2007, 08, 09, 10, 15

# 5. PALSAR-2 application: JJ-FAST

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

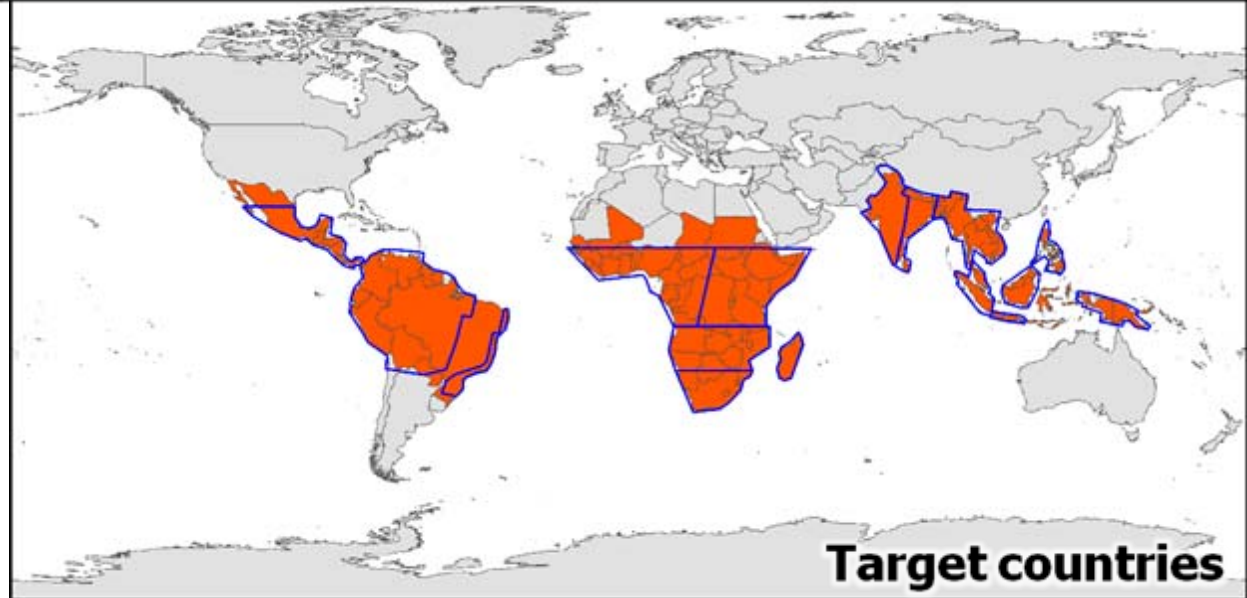


**Deforestation monitoring system.**

Released in November 2016.

# 5. PALSAR-2 application: JJ-FAST

|                        |   |
|------------------------|---|
| <b>Data source</b>     | <b>ALOS-2/PALSAR-2</b> (ScanSAR mode)   |
| <b>Target area</b>     | About <b>80 countries</b>   |
| <b>Update</b>          | Every <b>1.5 months</b>   |
| <b>Characteristics</b> | <ul style="list-style-type: none"><li>- <b>Global coverage</b>: almost all tropical forests.</li><li>- <b>Cloud-cover area observation</b>: even in rain season.</li><li>- <b>Small data traffic</b>: forester can use it in the field.</li></ul> |

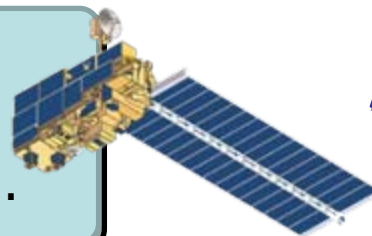




# 6. Expectation for MOLI: Training data

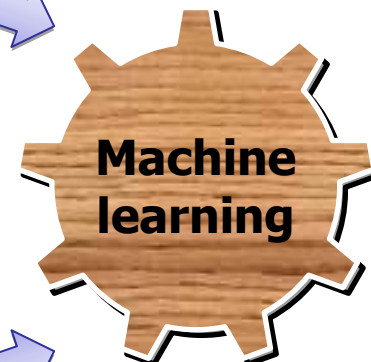
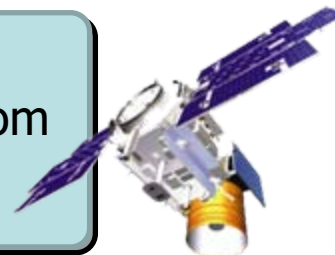
## Image data

**Wide-area** forest observation data from Satellite **imager**: PALSAR-2, MODIS, SGLI...



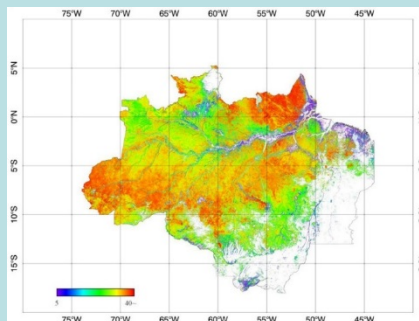
## Training data

**Accurate** canopy height / biomass data from Spaceborne **LiDAR**: MOLI, ICESat, GEDI...



## Large-scale map

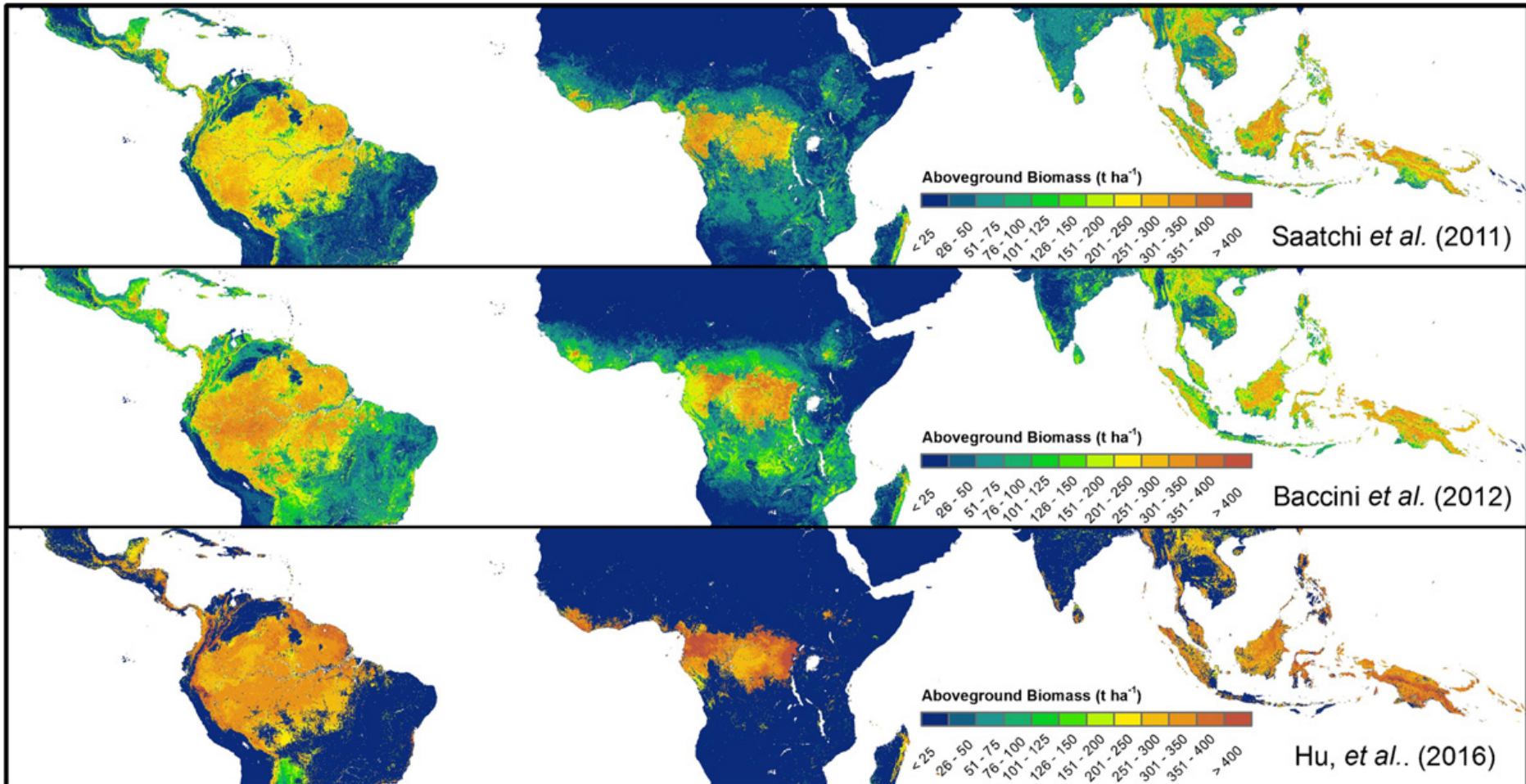
Canopy height / biomass map



[Sawada et al., 2015]

# 6. Expectation for MOI: Training data

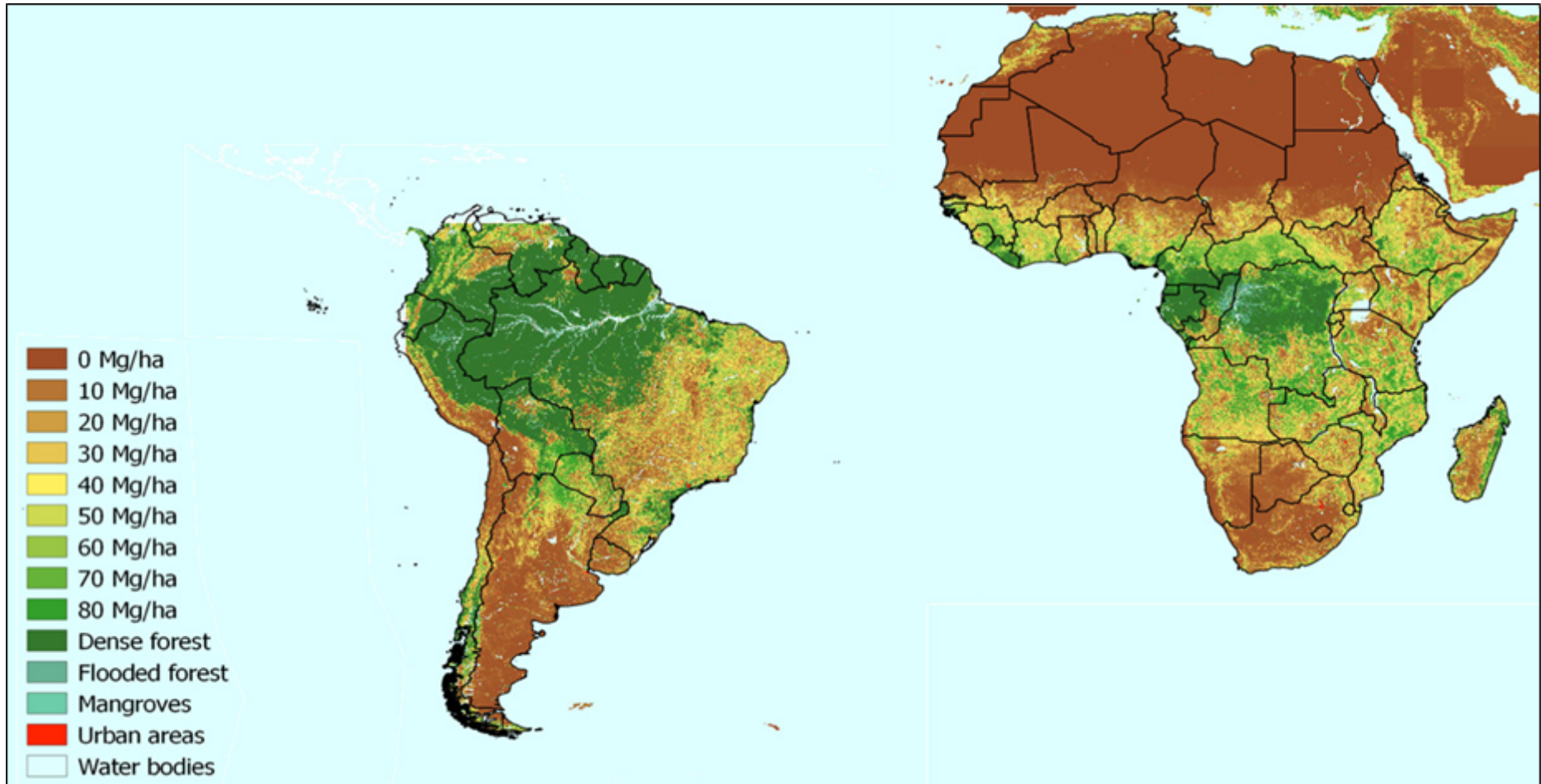
## Global forest maps using ICESat and MODIS data.



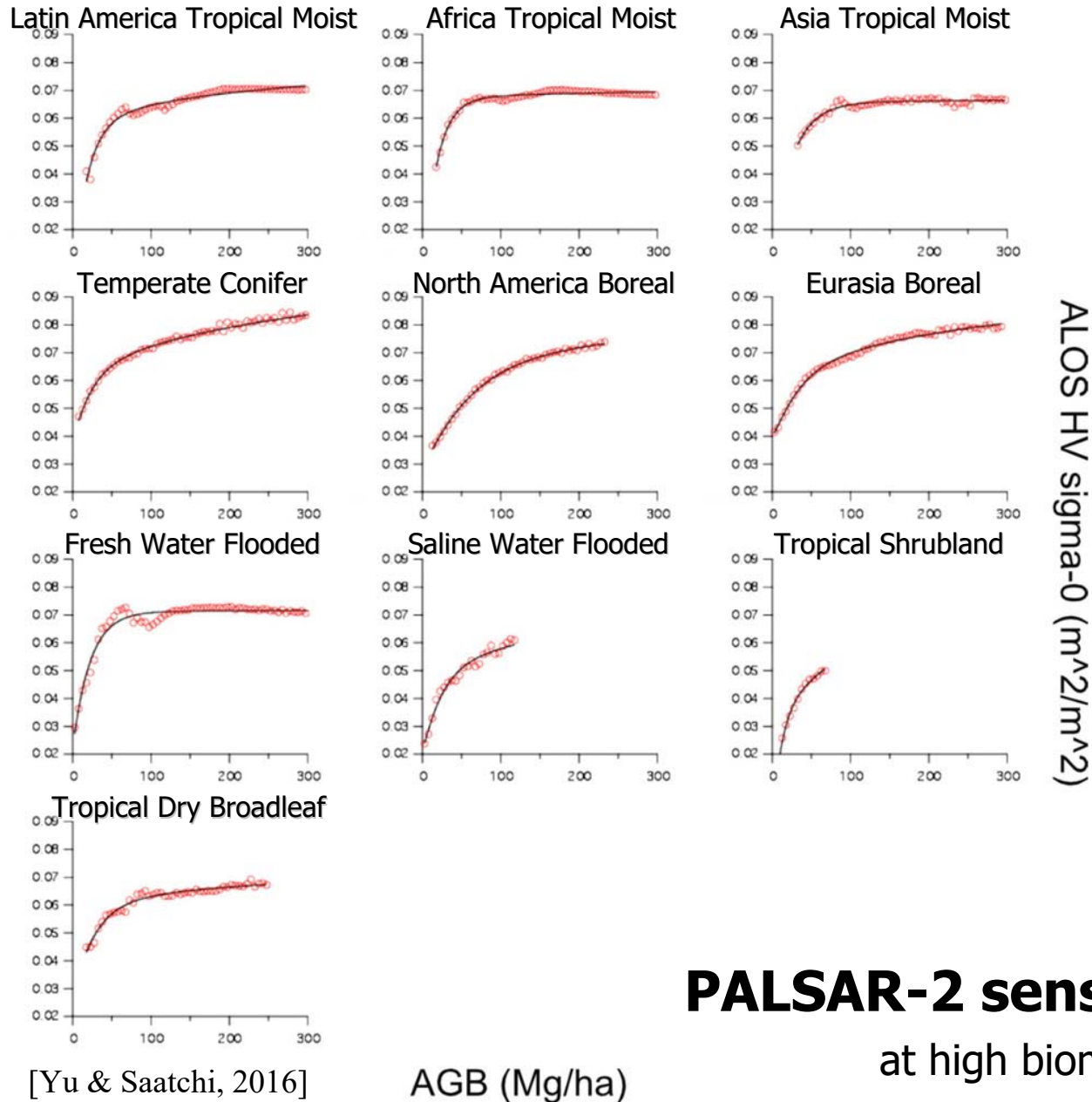
[Rodríguez-Veiga et al., 2017]

# 6. Expectation for MOI: Training data

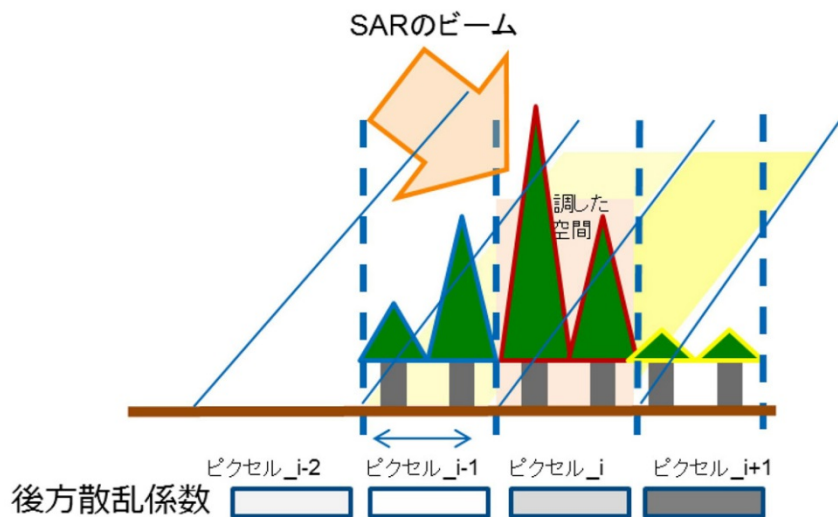
## Global forest map using in-situ and PALSAR data.



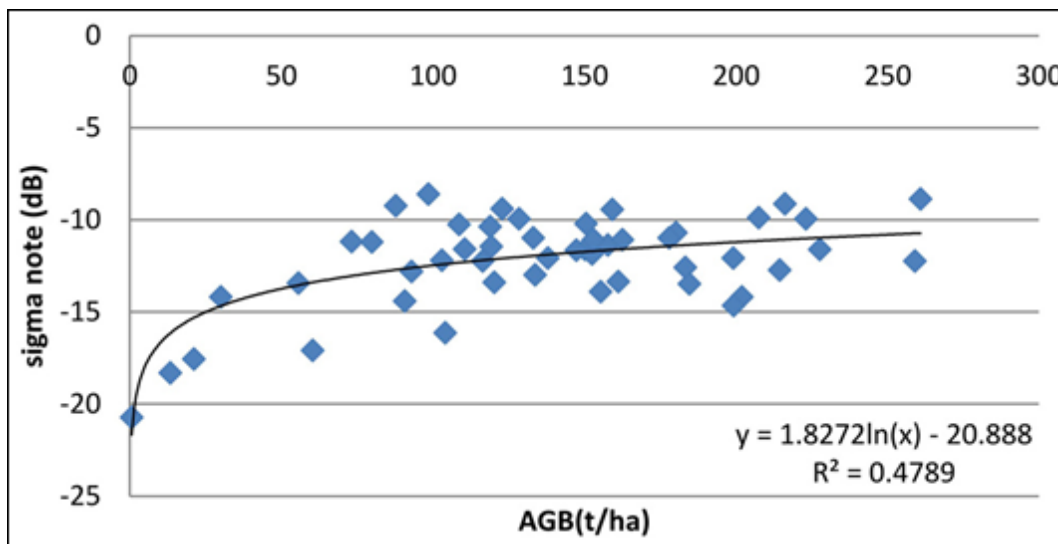
# 6. Expectation for MOLI: Training data



# 6. Expectation for MOL: Training data

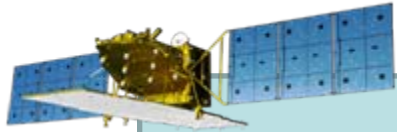


**Improving relationship**  
between PALSAR-2 image and biomass  
using canopy height data.



[RESTEC, 2016]

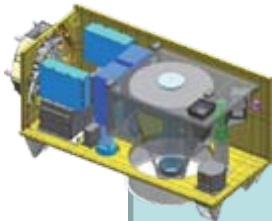
# 7. Expectation for MOLI: Carbon estimation



## PALSAR-2

### Forest area change detection

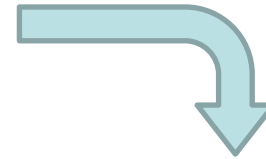
- Forest / Non-Forest Map
- JJ-FAST



## MOLI

### Forest carbon stock measurement

- Carbon stock = 50% of biomass

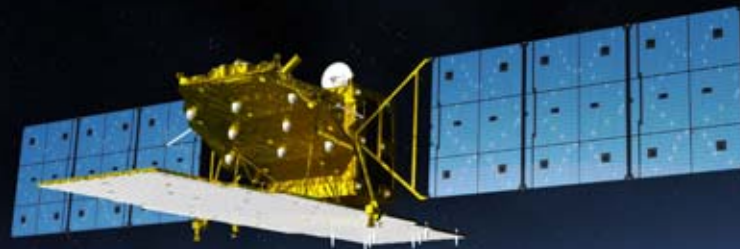


**National-level  
carbon budget  
estimation**

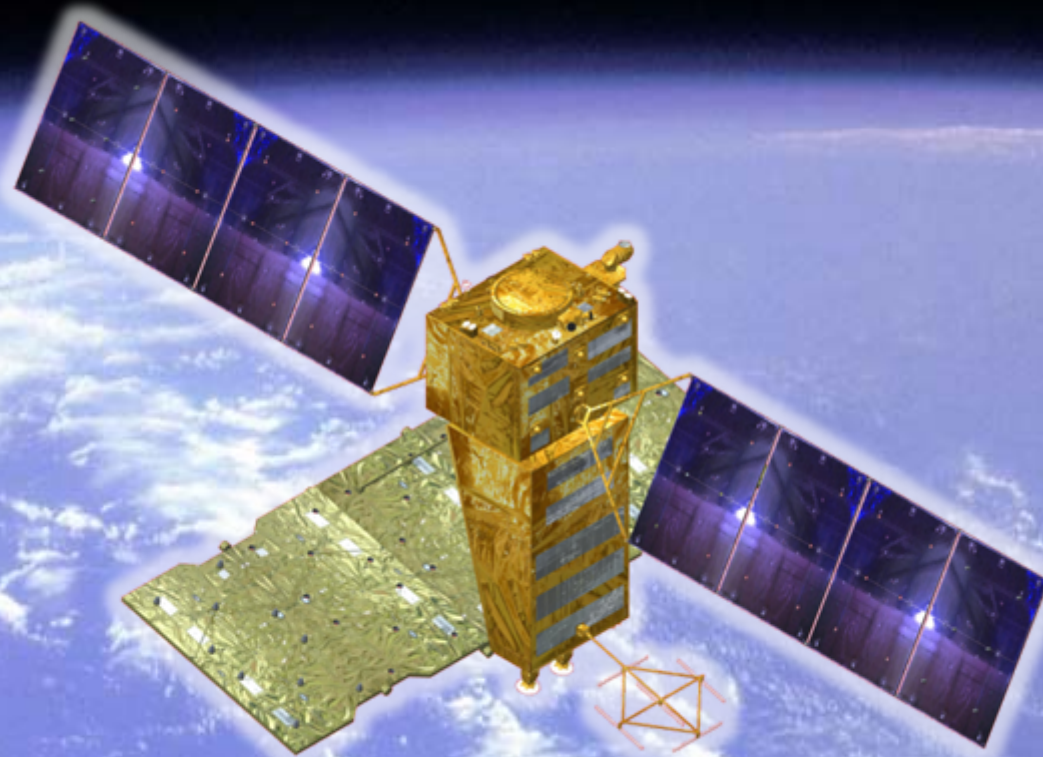
## 9. Conclusion

1. **ALOS-2/PALSAR-2 acquire cloud-free image, so quite suitable for global-scale forest monitoring.**
2. **MOLI is expected to provide an accurate training data for a forest biomass map development using PALSAR-2 data.**
3. **Fusion of PALSAR-2 and MOLI data can provide strong forest monitoring tool.**

**ALOS-2**



# 10. ALOS-2 follow-on mission



**Advanced Radar Satellite: ALOS-4**

Launched in JFY 2020