

ALOS PALSAR

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Biomass estimation



Sensor description

The **ALOS PALSAR**
(**Phased Array type L-band Synthetic Aperture Radar**
from
Advanced Land Observing Satellite)
has the following characteristics :

- **Frequency & Wavelength** : 1.27 GHz | L-Band & 15-30 cm
- **Chirp Bandwidth** : 14 or 28 MHz
- **Incident angle** : 8 to 60°
- **Resolution & Coverage** :
7 to 88m & 40 to 70km (Fine Beam | detailed imaging)
24 to 89m & 20 to 65km (Polarimetric | multi-polarization analysis)
100 m & 250 to 350 km (ScanSAR | wide-area monitoring)
- **Revisit** : ~46 days (global coverage)
- **Key feature** : All-weather, day/night imaging capability

Context

What is biomass ?

The biomass is the quantity of living beings in a given environment. (e.g. In forestry, it usually means the mass of trees (trunks, branches, leaves))

Goal - Biomass estimation :

Estimate forest "Above-Ground Biomass" (AGB) and related carbon stocks.

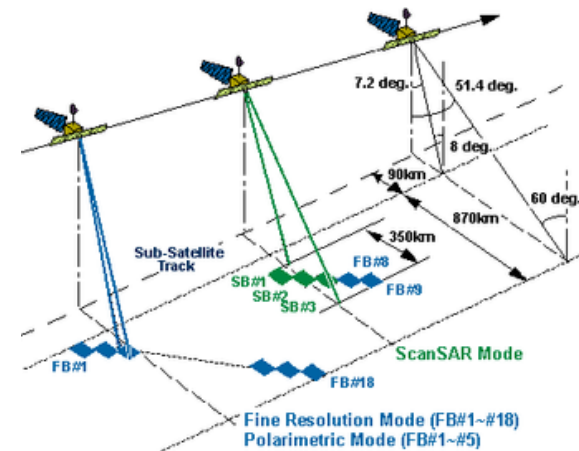
Use cases :

- Tropical & temperate forest health monitoring
- Understand carbon storage
- Observe forest ecosystems changes
- Support climate studies in order to reduce deforestation

Possible challenges

- **Signal saturation** : backscatter saturation might limit observation in dense forests.
- **Complex scattering** : mix of canopy, trunk and soil can make the task of separating elements difficult.
- **Topographic distortions** : mountainous terrain could introduce layover effect, shadows.
- **Data fusion required** : might need integration with optical imagery and field measurements for higher accuracy.

PALSAR Acquisition Modes

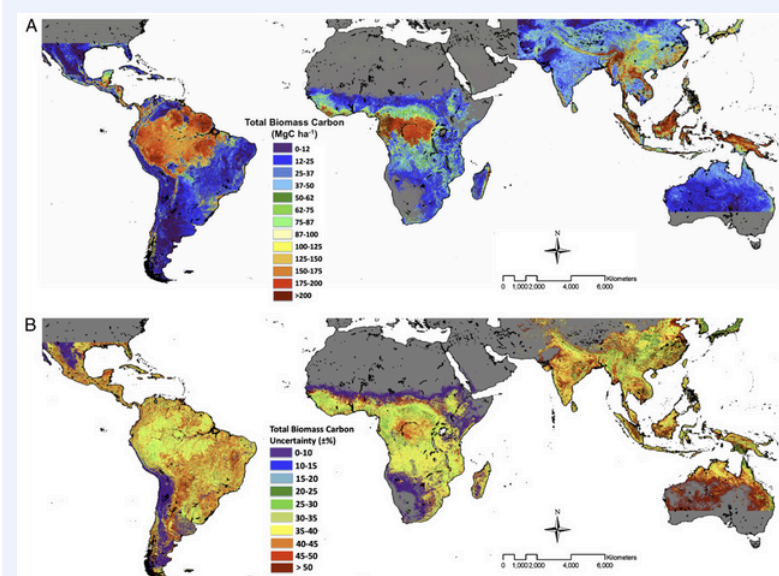


https://www.eorc.jaxa.jp/ALOS/en/alos/sensor/palsar_e.htm

Why does it fit

- **PALSAR wavelength** : penetrates forest canopy and sensitive to trunks and large branches which is directly linked to biomass
- **Polarization** : provides additional information on forest density
- **All-weather** : as already mentioned the PALSAR device can receive information at night as well. It can also gather information through clouds which is a critical for tropical forest with frequent cloud cover

Examples



Explanation: This benchmark map integrates ALOS PALSAR data with field plots and LiDAR to estimate Above-Ground Biomass (AGB) across the tropics. (Saatchi et al., 2011, PNAS)

Why using PALSAR in this case?

PALSAR fits because its L-band wavelength is sensitive to trunks/branches, polarization captures structural info, and all-weather coverage is critical for tropical regions.