Global biomass mapping

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CESBIO, France
CESBIO method for low biomass forests

Use of ALOS-PALSAR for low biomass forests (AGB< 150 t/ha)
- Mapping of woody savanna in Africa: Cameroon, Congo basin, South Africa, Africa
- Currently starting validation in Australia
- Looking for collaboration for training/validation in Brasilian Cerrado

AGB map S. Africa
Globbiomass regional site

AGB map Cameroon
REDDAF

0-10 Mg ha$^{-1}$
10-20 Mg ha$^{-1}$
20-30 Mg ha$^{-1}$
30-40 Mg ha$^{-1}$
40-50 Mg ha$^{-1}$
50-60 Mg ha$^{-1}$
60-100 Mg ha$^{-1}$
> 100 Mg ha$^{-1}$

water

no data

2-5 February 2016
GlobBiomass 1st User Meeting – Laxenburg, Austria
Comparison with existing maps

This study

Saatchi et al., 2011

Baccini et al., 2012

Subset from tile:
Latitude: 10°S to 5°S
Longitude: 20°E to 25°E

0-10 Mg ha⁻¹
10-20 Mg ha⁻¹
20-30 Mg ha⁻¹
30-40 Mg ha⁻¹
40-50 Mg ha⁻¹
50-60 Mg ha⁻¹
60-100 Mg ha⁻¹
> 100 Mg ha⁻¹
water
no data
Methodology for low biomass forests

\[ AGB = \frac{-1}{c} \ln \left[ \frac{b - \gamma^o_{HV}}{b - a} \right] \]

- \(a = \gamma^0_{\text{ground}} = \gamma^0\) for \(AGB=0\) (ground)
- \(b = \gamma^0_{\text{veg}} = \gamma^0\) for \(AGB\) at saturation level
- \(c = \text{attenuation coefficient of the vegetation layer}

\(a\), \(b\) and \(c\) are defined by fitting the curve to field plots and/or using ancillary data.
Current work: Validation in Australia

Lidar-derived AGB map in NewSouthWales, Australia (Boona forest)

*Courtesy of the School of Ecosystem and Forest Sciences, University of Melbourne*
Current work: Validation in Australia

AGB (t/ha) CESBIO without training

R² = 0.83

AGB from airborne lidar

AGB (t/ha) from Lidar
1. Using electromagnetic modeling to simulate the radar backscatter from a forest canopy described as a structured ensemble of dielectric scatterers (cylinders for stem, branches, ellipsoids for leaves).

2. Experimental data in Central African Republic

Example of a simulation of the effect of wood density $\rho$ (linked to tree species)
Mapping of high AGB forests at low resolution (500 m) using the HV decreasing trend-A test to be pursued.

AGB map at 500m resolution-Congo basin
Mapping of high AGB forests at low resolution (500 m) using the HV decreasing trend-A test to be pursued

AGB map at 500 m - Cesbio

AGB map at 1 km – Saatchi et al.

AGB map at 500 m – Baccini et al.

AGB map at 1 km – Avitabile et al.
Understanding the biomass distribution

AGB from CESBIO

Soil map – kastanozems (thick layer & rich in humus)

Terrain slope

Current work to be pursued
Comparison with 1 km in situ data

Land cover (500 m)

Savanna

Dense tropical forest
Comparison with 1 km in situ data

Land cover (500 m)

Savanna

Dense tropical forest

CESBIO (1 km)

550 t/ha

0
Comparison with 1 km in situ data

Land cover (500 m)

Savanna

Dense tropical forest

CESBIO (1 km)

CIRAD In situ data

550 t/ha

0
Comparison with 1 km in situ data

- Land cover (500 m)
  - Savanna
  - Dense tropical forest

- CESBIO (1 km)

- CIRAD In situ data

- Saatchi et al., 2011 (1 km)

- Baccini et al., 2012 (500m)
Integration in the global map

Under study:

1. Comparison CESBIO and Gamma maps on low biomass forests
2. Validate and improve CESBIO high biomass dense forest maps
3. Integrate CESBIO and Gamma maps
END