







Centre for Landscape and Climate Research GlobBiomass D11 Deliverable Region Mexico

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In-situ reference data (INFyS)



- Circa 26,000 primary sampling units (1 ha) with 4 x 400 m² subplots measured by CONAFOR (2004 to 2012)
- Approximately 5,000 available for the period 2009-11 for the study areas
- Independent Validation dataset (not used for training the algorithm): 15% of the INFyS data (~700)
- A total of 339 biomass allometric equations and 214 species-specific wood densities were used by CONAFOR to estimate AGB

Forest and arid vegetation

Tropical forest and Mangroves













DATASET	SENSOR	NUMBER LOOKS	SPATIAL RESOLUTION
ALOS PALSAR Mosaics	L-Band SAR	16	25 m
Landsat 7 ETM+ SR	Multispectral Optical	N/A	30 m
Landsat Percent Tree Cover	Multispectral Optical	N/A	30 m
SRTM Plus (NASA V3) ⁽¹⁾	Elevation product	N/A	30 m

⁽¹⁾ Void-filled Shuttle Radar Topography Mission elevation dataset corresponds to the year 2000











- > Landsat 7 Surface Reflectance (SR) annual composites (2010±1)
 - SR as computed by the LEDAPS method
 - Composites generated using Google Earth Engine (GEE) Playground
 - Scenes with less than 50% cloud cover (metadata) and less than 100m coregistration errors (based on GEE assessment)
 - Exclusion of pixels based on QA layers (i.e. cloud pixels, etc)
 - Pixel value corresponds to the 50% percentile of the annual observations (median)
- > K&C ALOS PALSAR Mosaics 25m resolution (2009/10)
 - Mosaics with standard SAR pre-processing (Shimada et al., 2014): Calibration, multi-looking (output of 16 looks), projection, orthorectification, slope correction using SRTM DEM and an additional destriping process (Shimada and Isoguchi, 2002)
 - Multi-channel filtering (7x7 window) using 2007, 2008, 2009, and 2010 mosaics



MaxEnt Approach



 Combination of sensors based on probabilistic framework





Biomass Class Probability Distribution Models







Biomass Class Probability Distribution Models



Maximum probability weighted mean for each pixel

$$\overline{AGB} = \frac{\sum_{i=1}^{N} P_i^n AGB_i}{\sum_{i=1}^{N} P_i^n}$$

 P_i is the MaxEnt probability estimated for each biomass range class AGB_i (median value of the range), and \widehat{AGB} is the predicted value of AGB for each pixel

Prediction Error:

$$\varepsilon_{prediction} = \sigma_{\widehat{AGB}} / \widehat{AGB} \times 100$$

$$\overline{\sum_{i=1}^{N} (AGB_i)}$$

where

$$\sigma_{\widehat{AGB}} = \sqrt{\frac{\sum_{i=1}^{N} (AGB_i - AGB)^2 P_i}{\sum_{i=1}^{N} P_i}}$$

Error Propagation:

$$\varepsilon_{AGB} = (\varepsilon_{measurement}^2 + \varepsilon_{allometry}^2 + \varepsilon_{sampling}^2 + \varepsilon_{prediction}^2)^{1/2}$$









Percent contributions to AGB

map per biomass range



Central Mexico

Yucatan Peninsula











Yucatan Peninsula











Residual Landsat 7 ETM+ scan line corrector (SLC) effects. Yucatan map more affected due to less cloud-free scene availability

Residual SAR strip effect in Central Mexico map



Comparison to previous studies



Assessment	Period	Method	Datasets	Spatial Resolution	Spatial Outputs	RMSE pixel level (t C ha ⁻¹)
Saatchi et al. (2011)	2000	MaxEnt	GLAS, MODIS (1000m), QSCAT (2.25km), SRTM (90m)	1000 m	AGB map & Uncertainty map	±27.3% ⁽¹⁾
Baccini et al. (2012)	2005	Random Forest	GLAS, MODIS (500m), SRTM (90m)	500 m	AGB map	25.0 ⁽²⁾
Cartus et al. (2014)	2005	Random Forest	INFyS, LUV, Landsat PTC (30m), ALOS PALSAR (30m), SRTM (90m)	30 m	AGB map	14.1 (*slopes) 14.4 (all data)
Regional GlobBiomass	2005 2010 2015	MaxEnt	INFyS, Landsat 7 SR (30m), Landsat PTC (30m), ALOS PALSAR (25m), SRTM (30m)	25 m	AGB & Uncertainty maps, Forest Probability maps, AGB- change maps	12.3 (Central) 16.9 (Yucatan)
⁽¹⁾ Relative error for the whole South America; ⁽²⁾ For the whole tropical region						









DANKE!