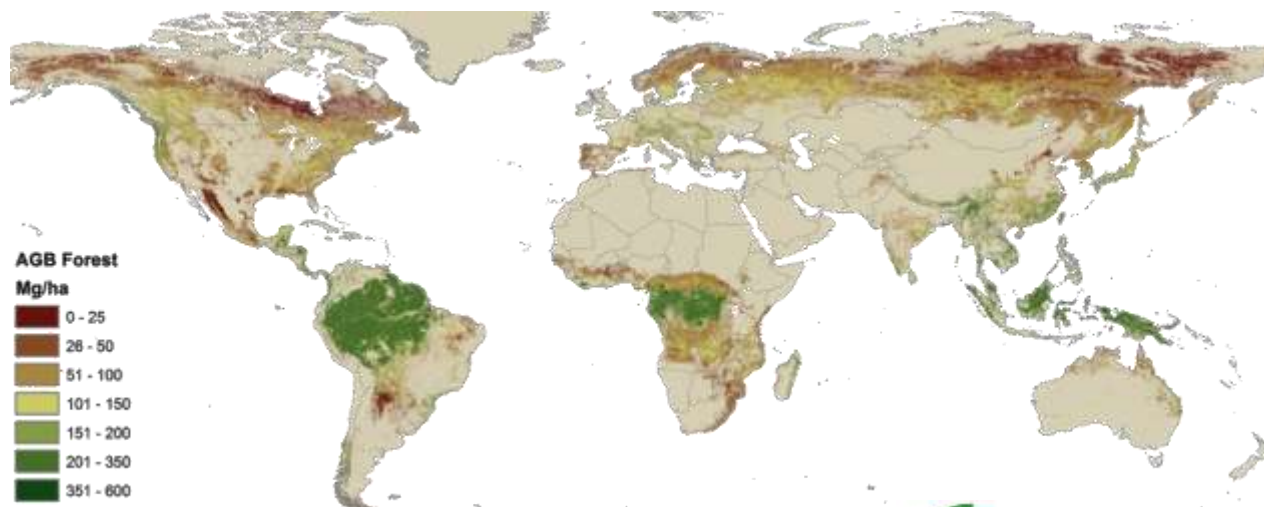


Comparative analysis and fusion for improved global biomass mapping

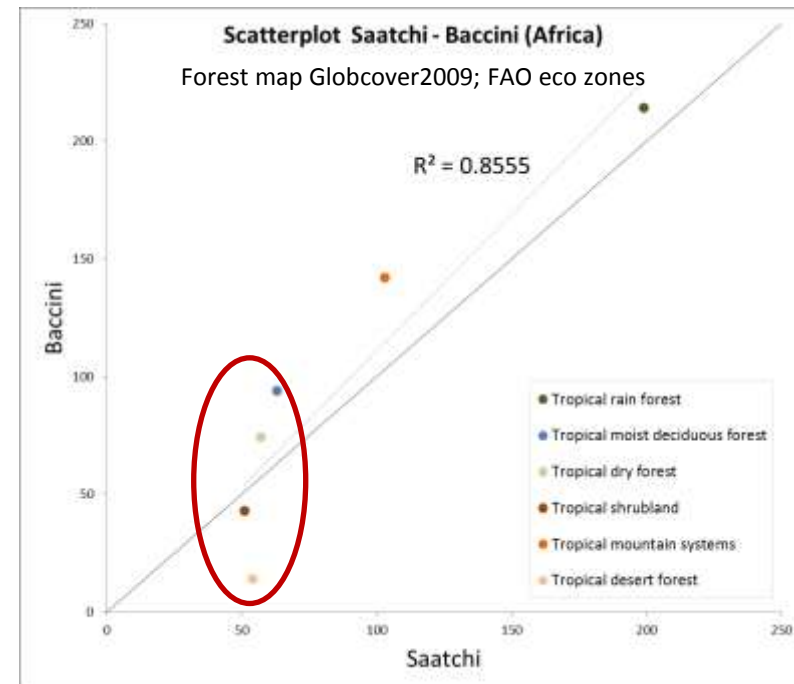
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Spatial analysis of forest biomass databases

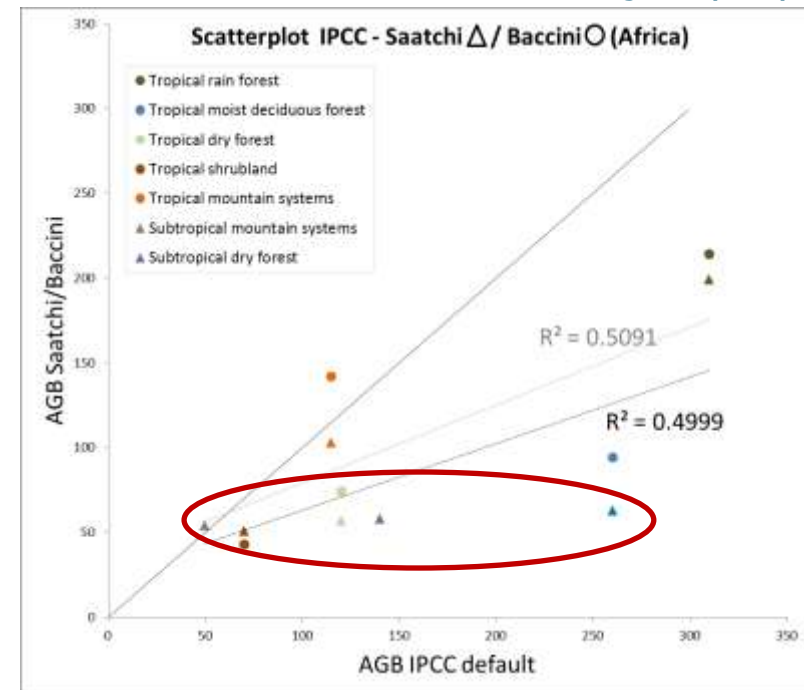
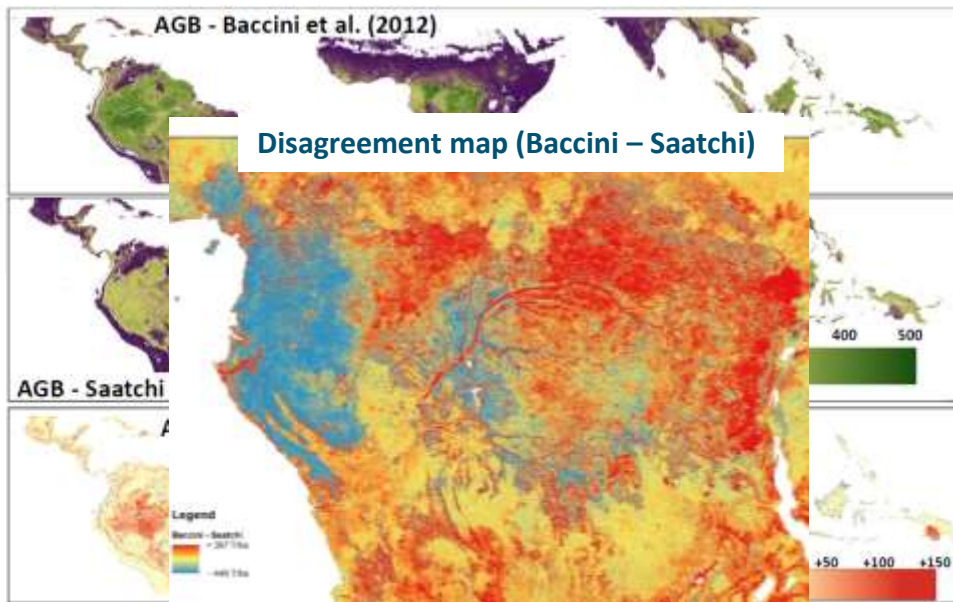
- Implementation of REDD+ requires Activity Data and Emission Factors
- Default Emission Factors (IPCC Tier 1): high uncertainty, low credibility
- Lack of technical/financial capacities: Majority of developing countries use Tier 1
- Saatchi (2011) & Baccini (2012) biomass maps improve Tier 1 values
 - Source of data is comprehensible → increased transparency/credibility
- Comparison for Africa:
 - Overall good correlation ($R^2 = 0.86$)
 - Saatchi > Baccini in low biomass ecozones
 - Red Circle: similar AGB for Saatchi but different for Baccini
 - Variability of field data (e.g. Mai-Ndombe) (depend on allometric eq.)
 - Assessment with various field data is problematic



Spatial analysis of forest biomass databases

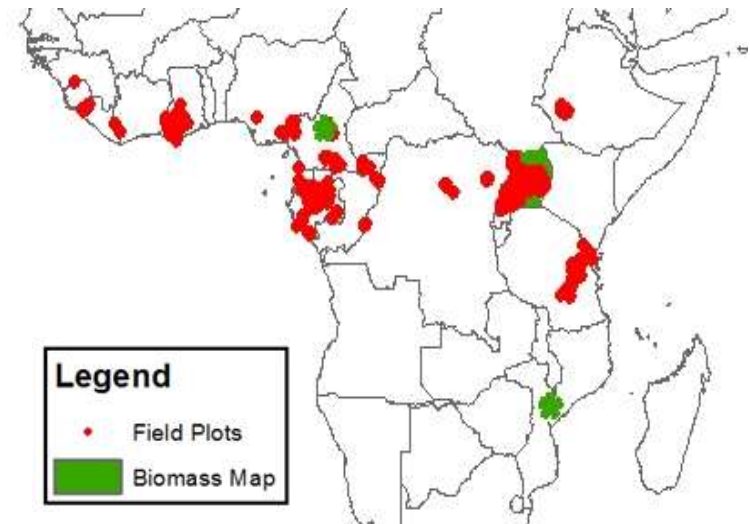
- Comparison with IPCC Tier 1 (Ruesch & Gibbs 2008) for Africa
 - IPCC values > Saatchi / Baccini (except for Tropical mountain systems by Baccini)
 - IPCC vs. Saatchi ($R^2 = 0.50$) ; IPCC vs. Baccini ($R^2 = 0.51$)
- Interpretation of the results
 - Red circle: eco zones with similar AGB for Saatchi but different for Baccini
 - Saatchi has larger spatial coverage than Baccini (includes subtropical zones)
 - Results can vary strongly on local scale
 - Simple preference of one map not possible
- Spatial disagreement of biomass maps

Credit: A. Langner (JRC)



A new biomass reference dataset

	Field plots	Biomass maps
1. Screening	Visual analysis with Google Earth	Areas with ground data
2. Upscaling	Average Biomass @ 1Km	Aggregation @ 1Km



	Data after initial quality selection	Data suitable for scaling	1 km reference pixels
Plots	1091	909	396
Maps	2765	525	271

A fusion approach

Combining biomass maps (Baccini, Saatchi) using Reference data by:

- Bias removal and Weighted average by error strata
- Weights computed by the Error Covariance of input maps

Baccini



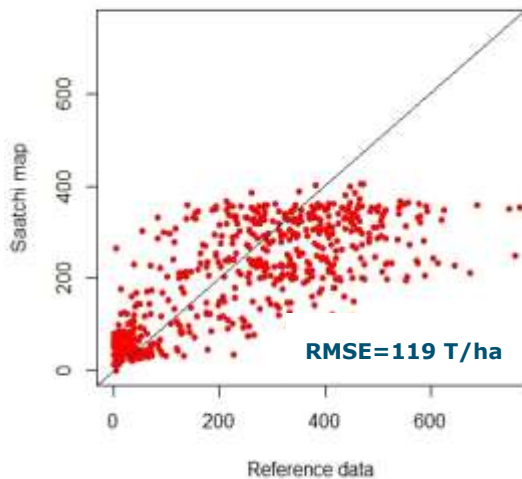
Saatchi



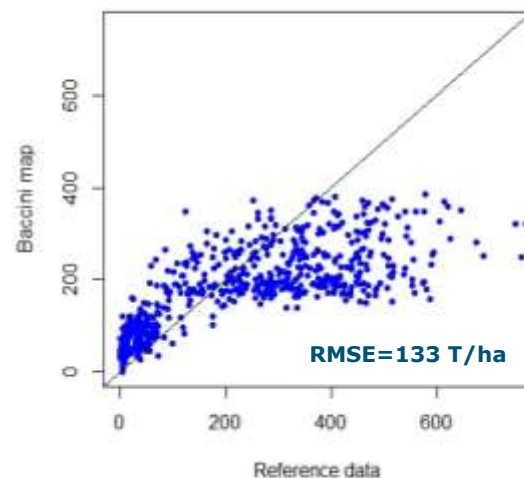
Fused Map



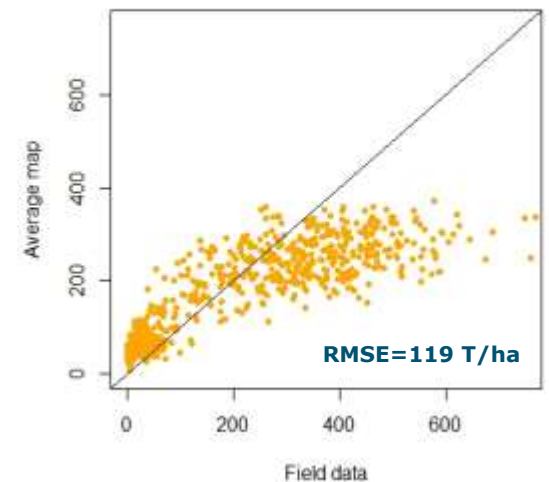
Saatchi vs. Reference



Baccini vs. Reference



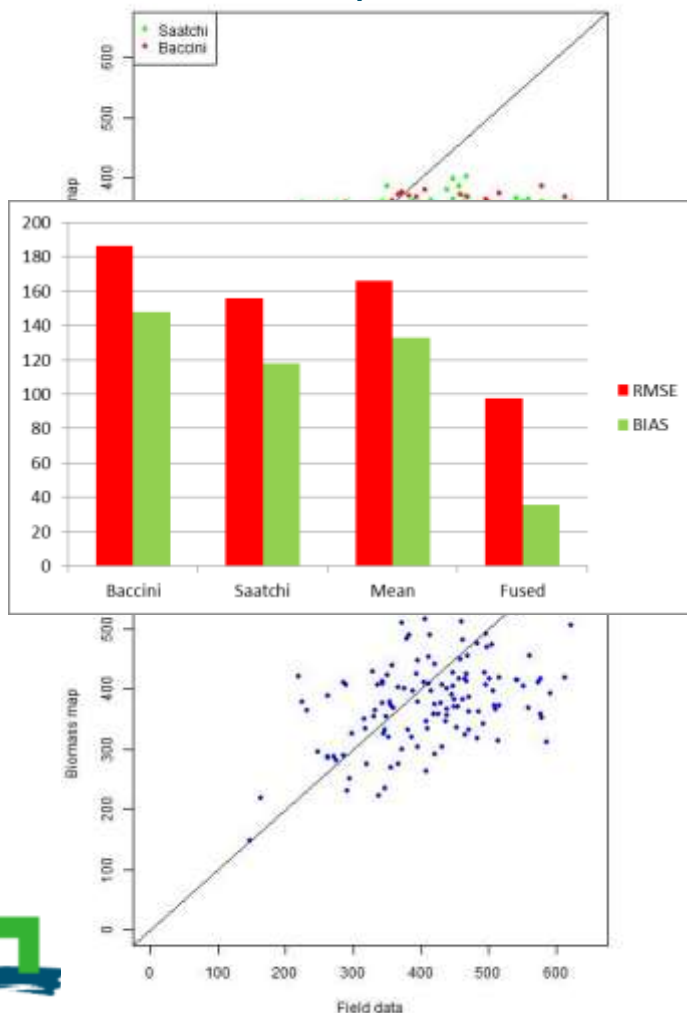
Average map vs. Reference



Results for undisturbed forest and savannah

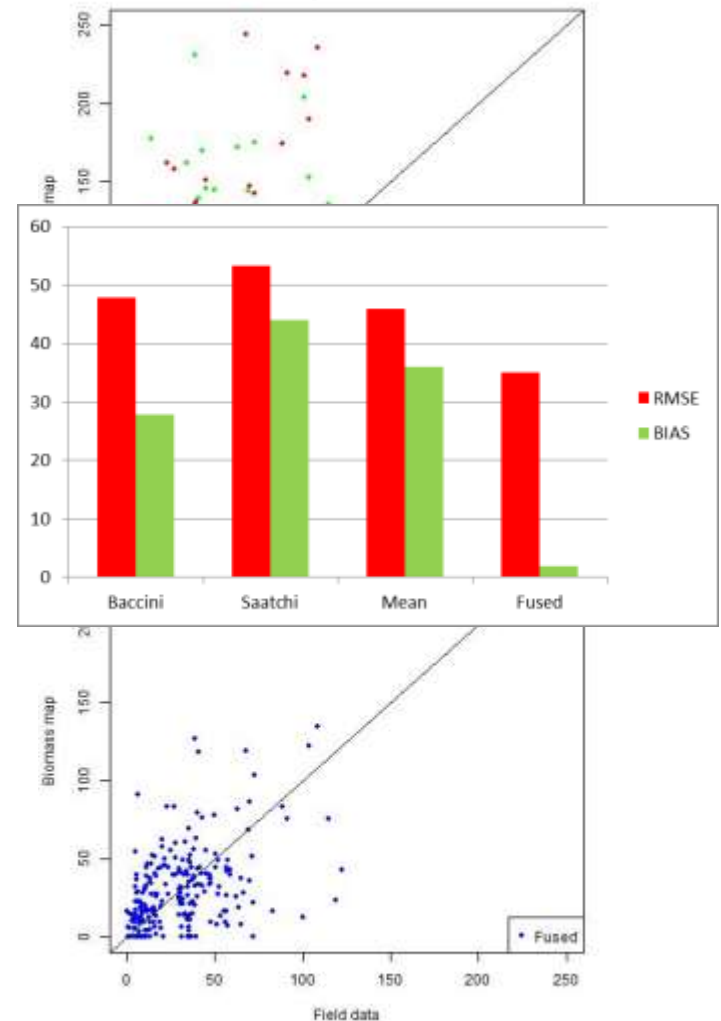
Congo basin – Undisturbed forest RAINFOR network (Leeds Univ.)

Saatchi, Baccini



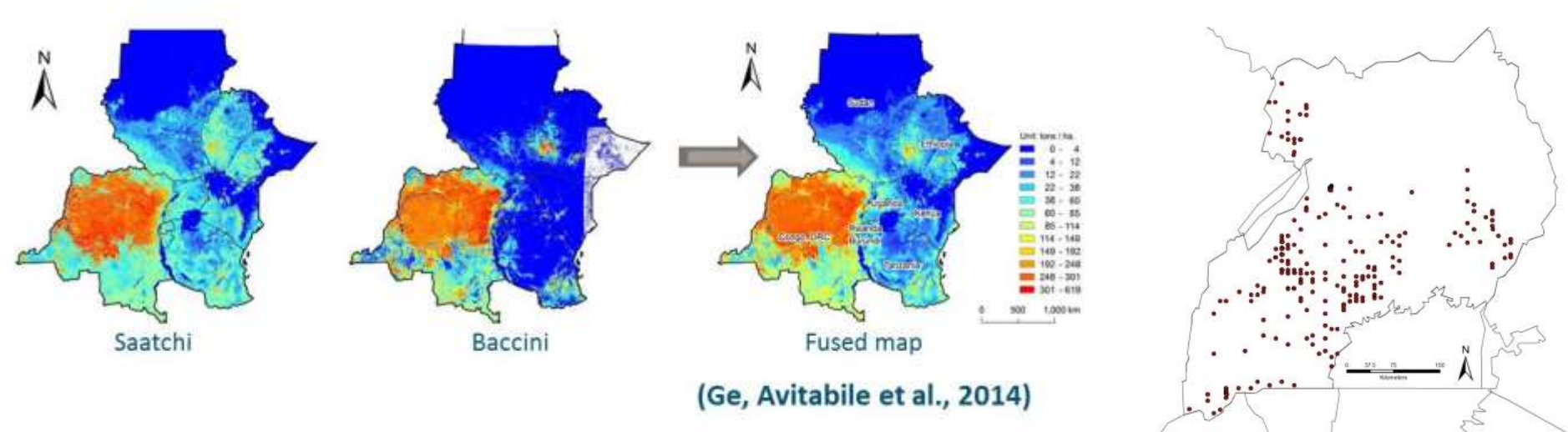
Eastern Africa (Uganda, Mozambique) Woodland and Savannah

Saatchi, Baccini



Application at national level

- The fusion approach can be easily applied at national / local level, using forest inventory data to improve (sub)national biomass mapping



Improving biomass and emission estimation

1. Acquire existing data in under-represented areas

- Congo basin: plots/maps in Disturbed and Secondary forests (?)

2. Acquire new quality data

CIFOR Global Comparative Study (GCS):

- Cameroon: EF for peatlands
- Gabon: Use of the Terrestrial Laser Scanning (TLS)



What's new in Peatland and GHG emission measurements



Emission Factors (EF)

■ New IPCC EFs for Peatland

Land Use	CO ₂ –C (t ha ⁻¹ y ⁻¹)	CH ₄ (kg ha ⁻¹ y ⁻¹)	N ₂ O (kg N ha ⁻¹ y ⁻¹)
Deg Forest	5.3	4.9	--
Croplands	14	7.0	5.0
Rice	9.4	143	0.4
Oil Palm	11	0.0	1.2
Acacia	20	2.7	2.4
Sago	1.5	26	3.3

■ Other ongoing activities in Africa

- Kenya: CH₄ in plantations, LUC in Mau Forest
- Cameroon: EF in wetlands (starting)
- Biomass in Zambia (Miombo)

Gabon: Terrestrial Laser Scanning (TLS)

Field plots in Lope National Park for:

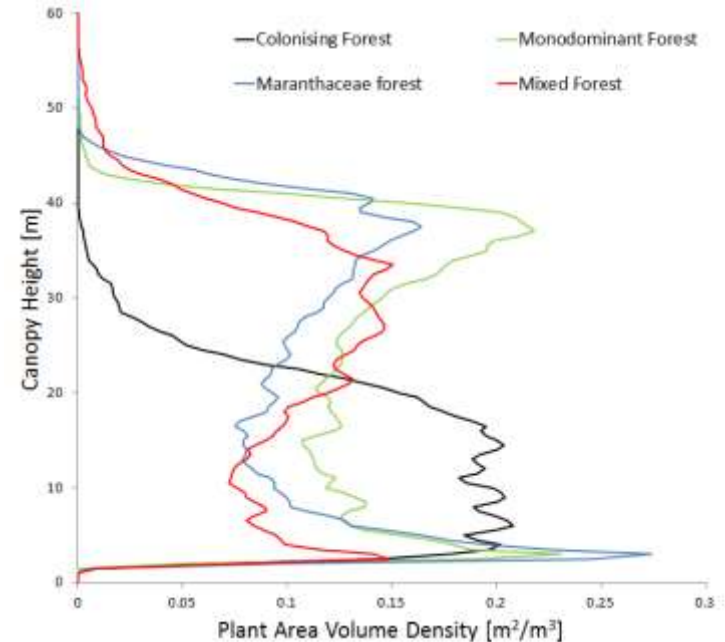
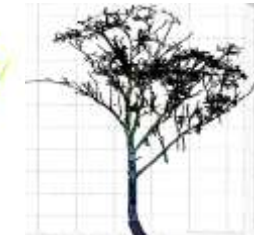
1. Vertical plant profiles
2. Biomass stock density

Collaboration:

Wageningen University (WUR)

University College London (UCL)

CIFOR



Savannah



Colonising



Monodominant



Maranthaceae

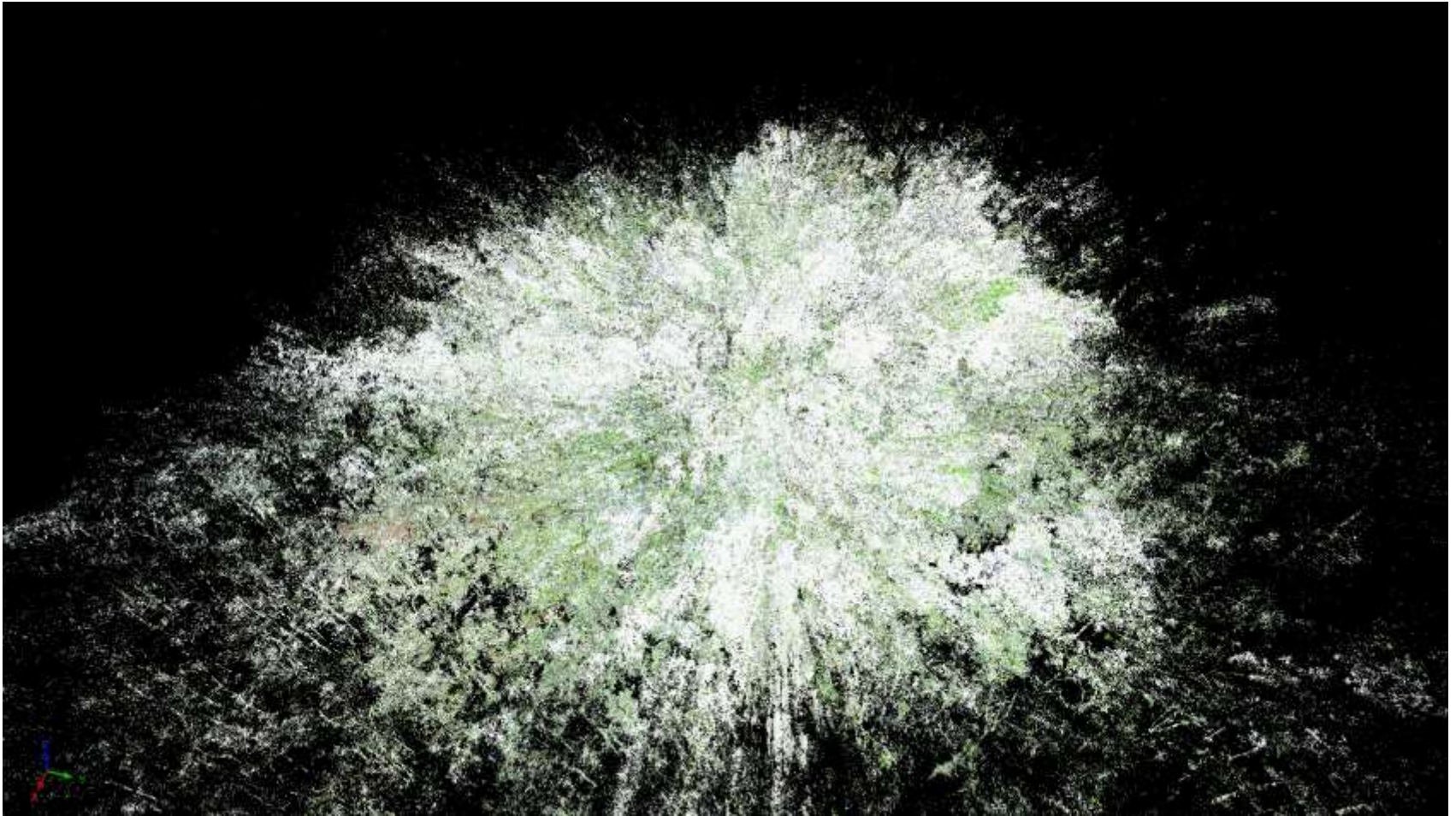


Mixed



Gabon: Terrestrial Laser Scanning (TLS)

www.lidar.wur.nl



Thank you for your attention!

And thanks to the co-authors:

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