Une Cartographie de la Biomasse et du Carbone en Afrique par Télédétection et Inventaires Forestiers

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Mindy Sun[1], Wayne Walker[1]
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[2]Ministere des Eaux et Forets - Gabon

COMIFAC- Brazzaville, le 3 Fevrier 2010

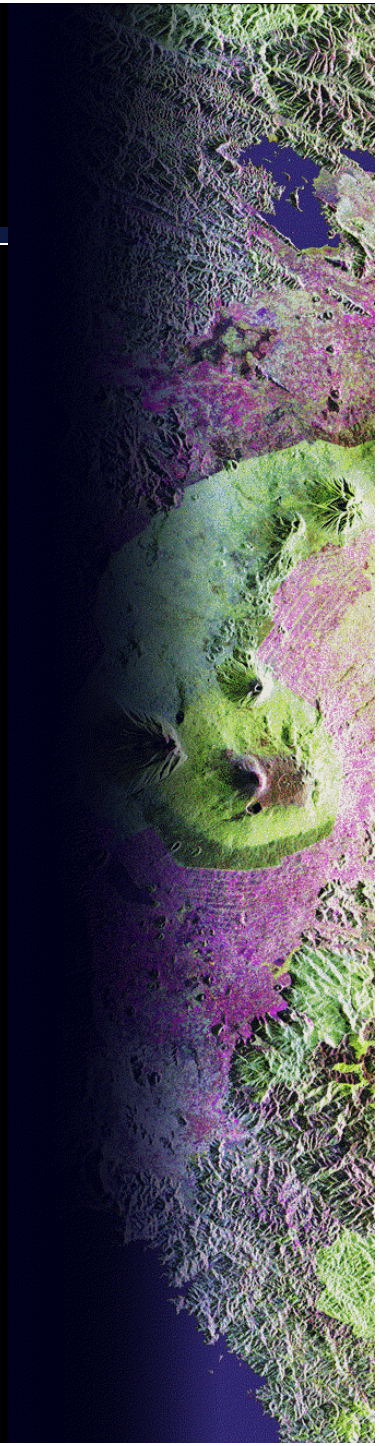
Plan de l'exposé

- La carte de la Biomasse de 2000 pour l'Afrique
  - Données images MODIS & d' inventaires forestier
  - Méthodes & Résultats

Baccini et al, 2008 Environmental Research Letters

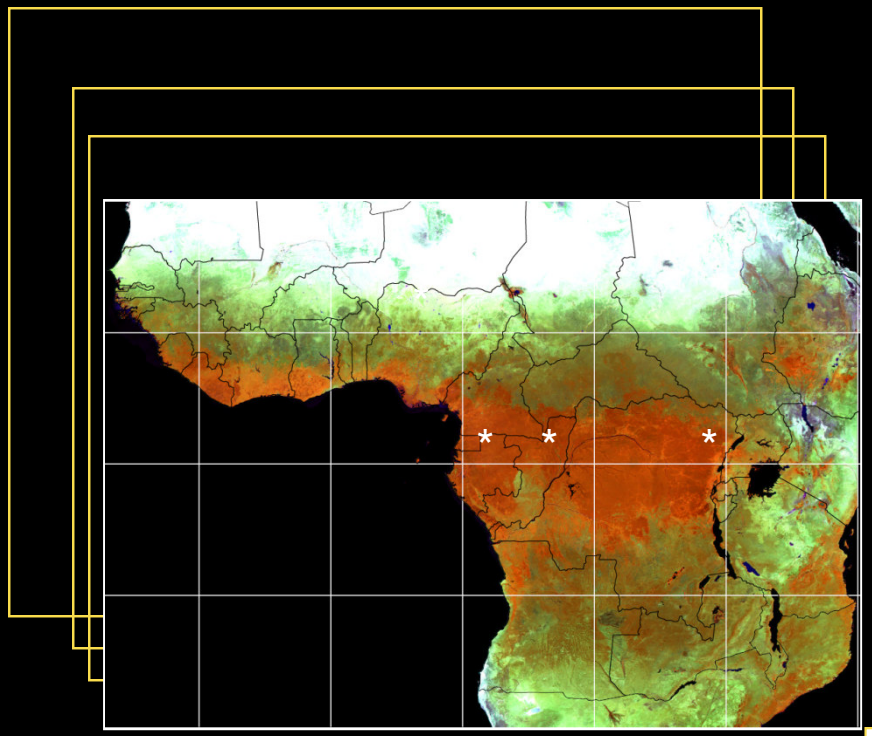
http://www.whrc.org/africa/carbonmap2000.htm

- Introduction de la carte de la biomasse intertropicale MODIS- GLAS de 2005-2006
  - L'expérience de collecte de données terrain au Gabon (Paola Mekui)



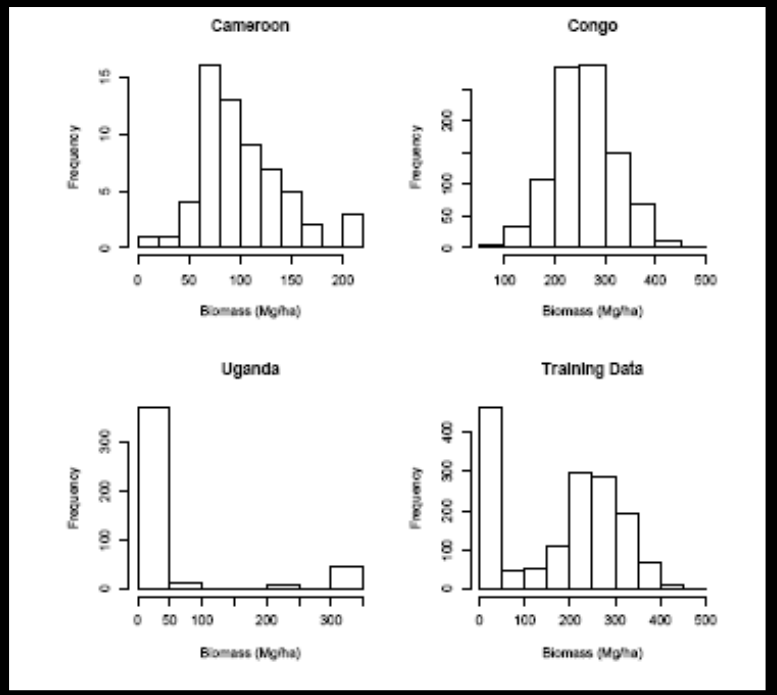
Donnees/ Methodes

- Image MODIS-Mosaïque (1km).



Serie temporelle 2000-2003

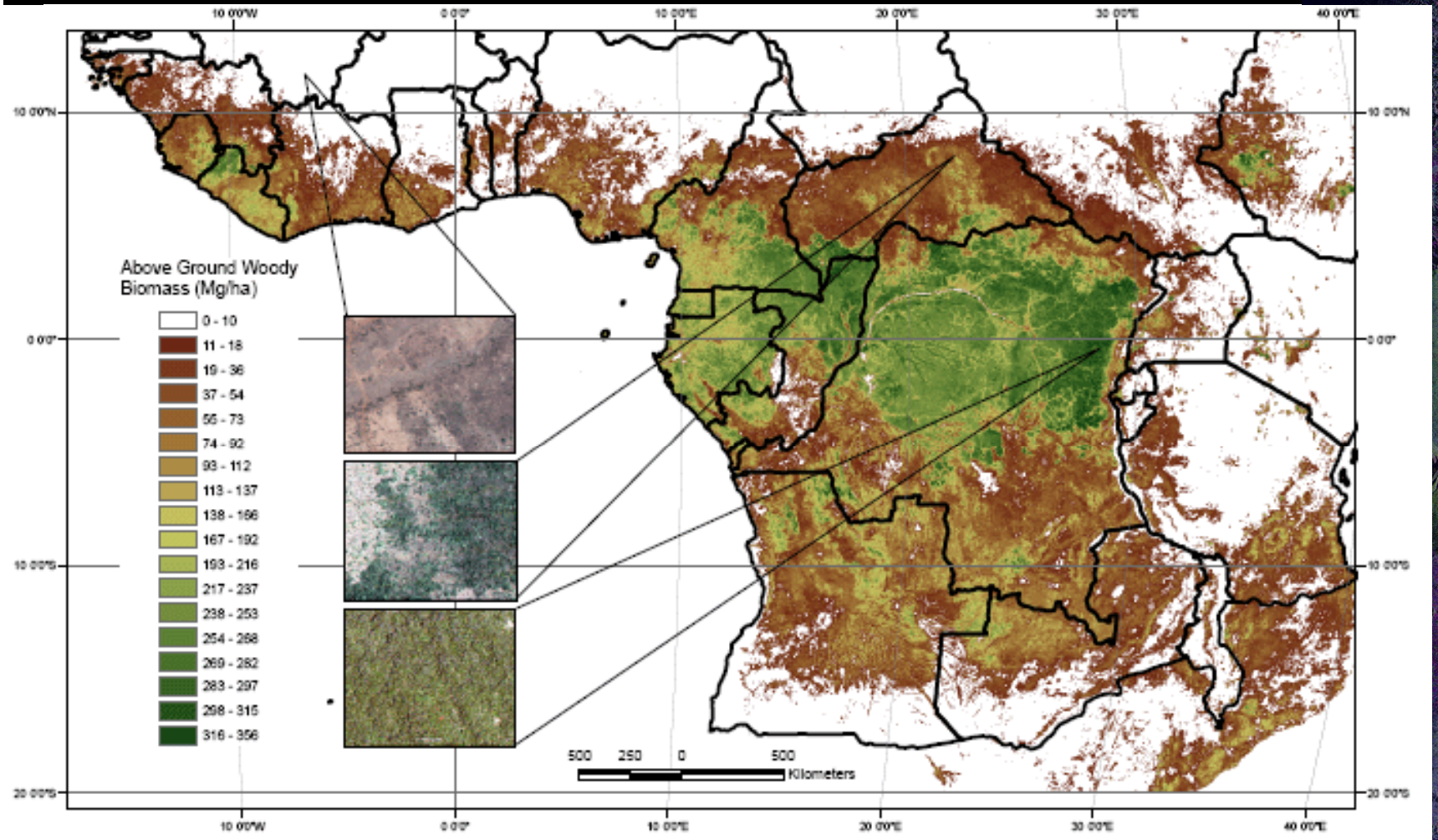
Inventaires Forestiers



Gradient de biomasse de 0->500 t/ha

Prediction de la biomasse avec Modèle statistique “regression Tree”

Carte de la Biomasse



Le modèle explique 82 % de la variance de la biomasse /erreur (RMSE) de 50 t/ha soit 25tC/ha

Carte disponible au site : *whrc.org/Africa/carbonmap2000.htm*

Carte de biomasse du Gabon

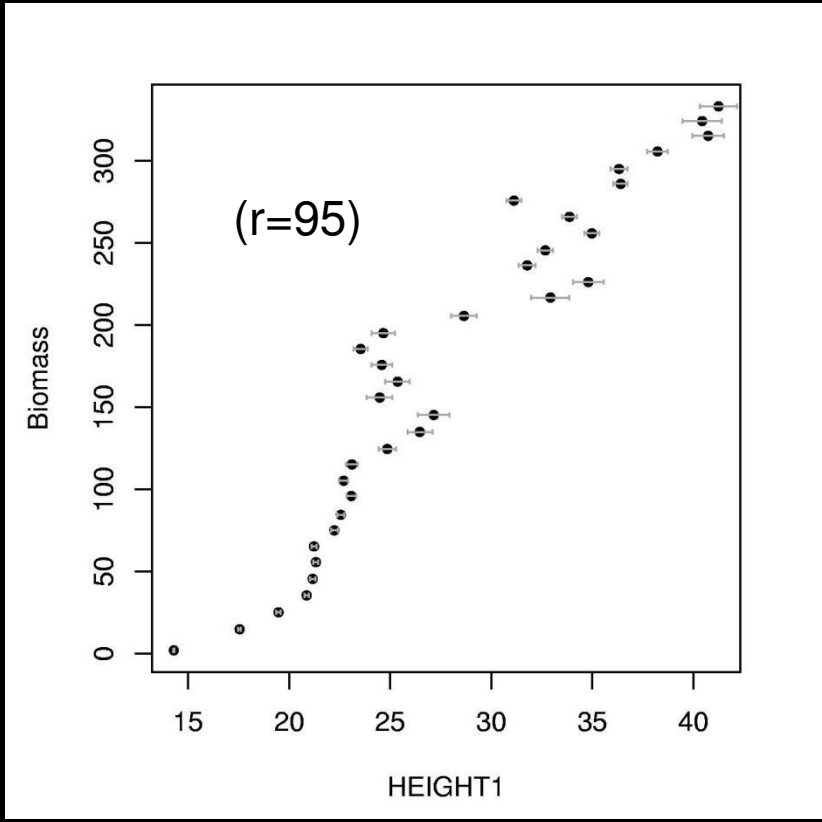
Calcul du carbone :

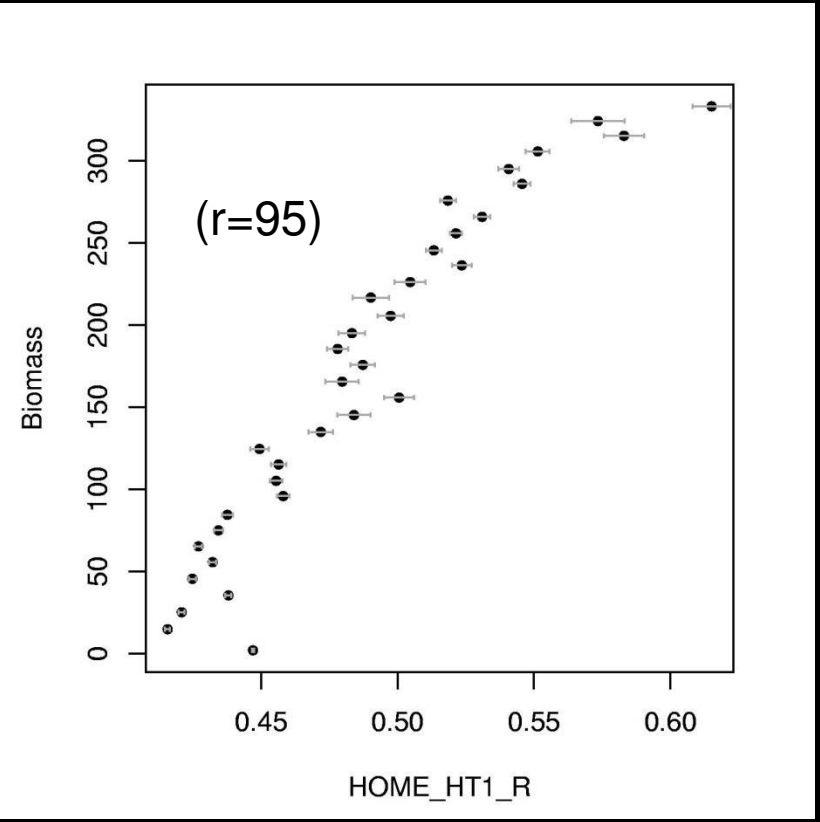
Carbone = 0,5 x Biomasse
(en Gt de carbone)

Ces cartes sont disponibles par pays au

whrc.org/Africa/carbonmap2000.htm

Validation/ Comparaison Lidar

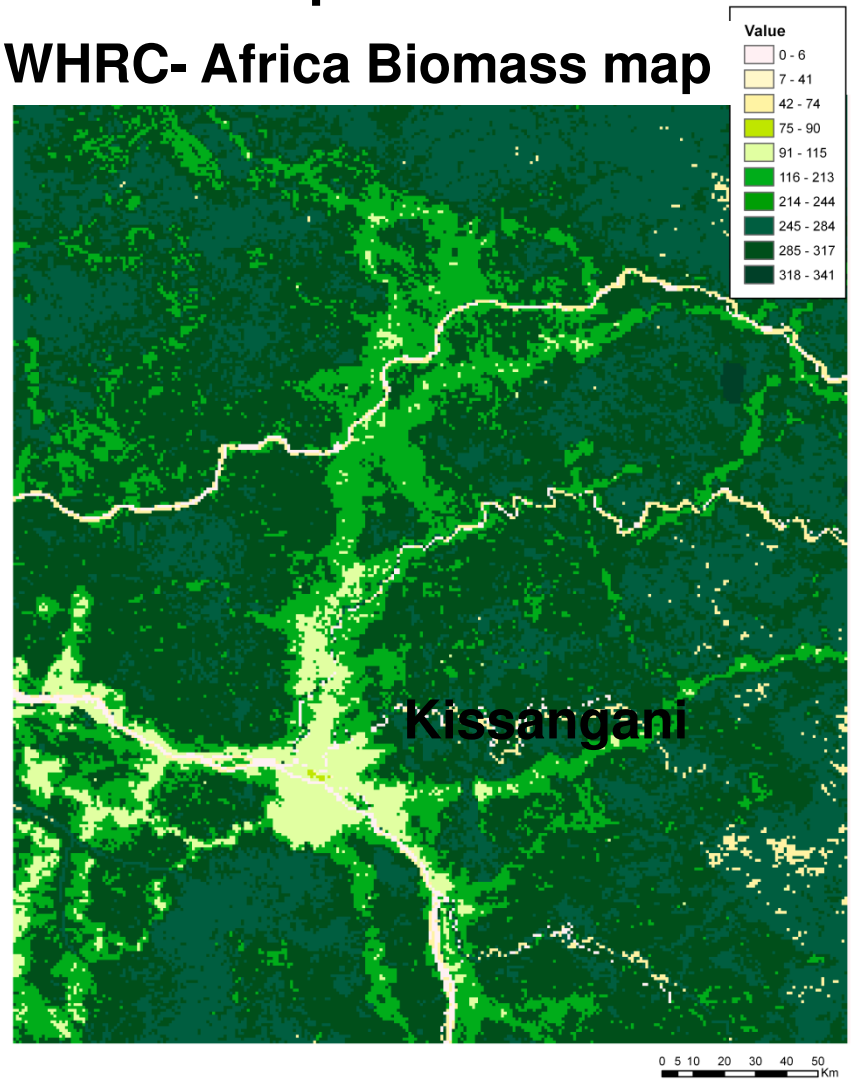




Biomasse prédite en (Mg/ha) en classes de 10 Mg/ha.
Hauteur de la canopée mesurée et “home” par un Systeme Lidar

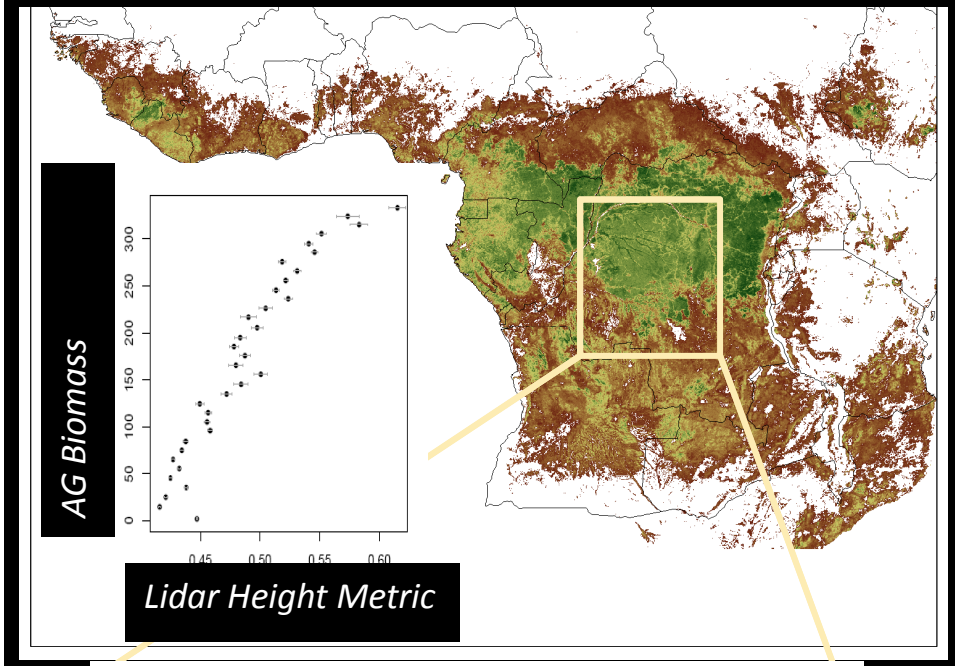
Comparaison Visuelle avec Carte FAO

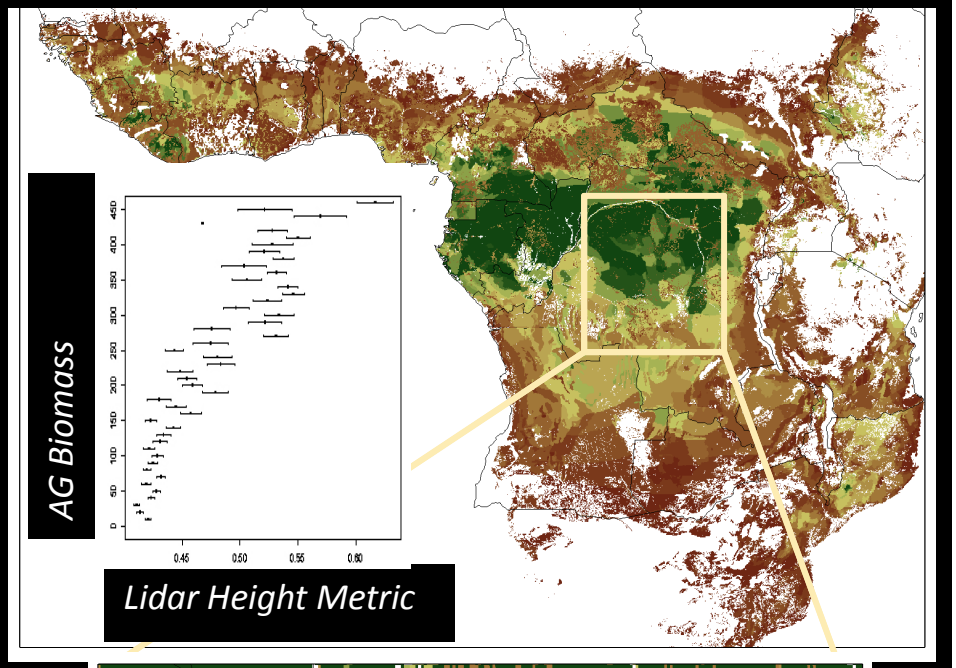
WHRC- Africa Biomass map

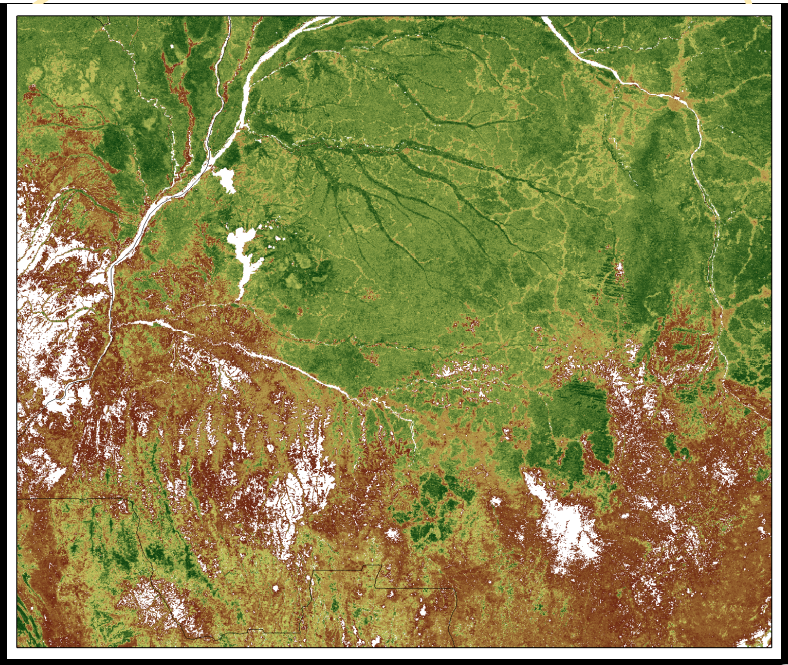


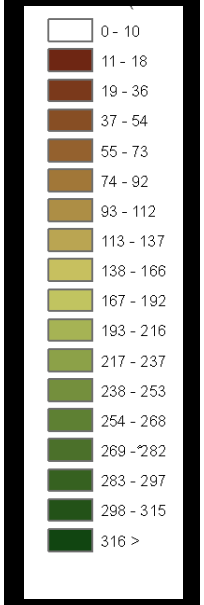
FAO-Africover

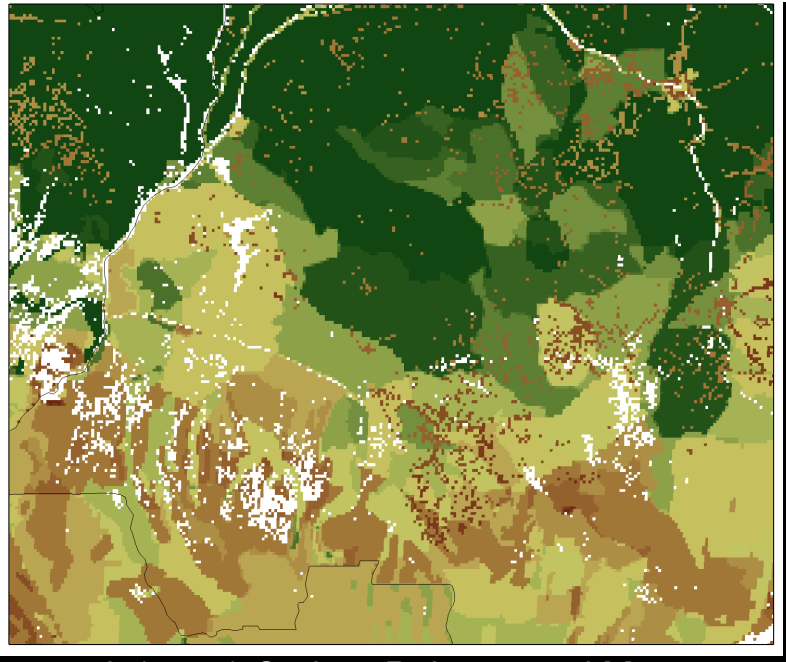
Comparaison de la Carte du WHRC avec la carte de Gibbs et al, (2008)







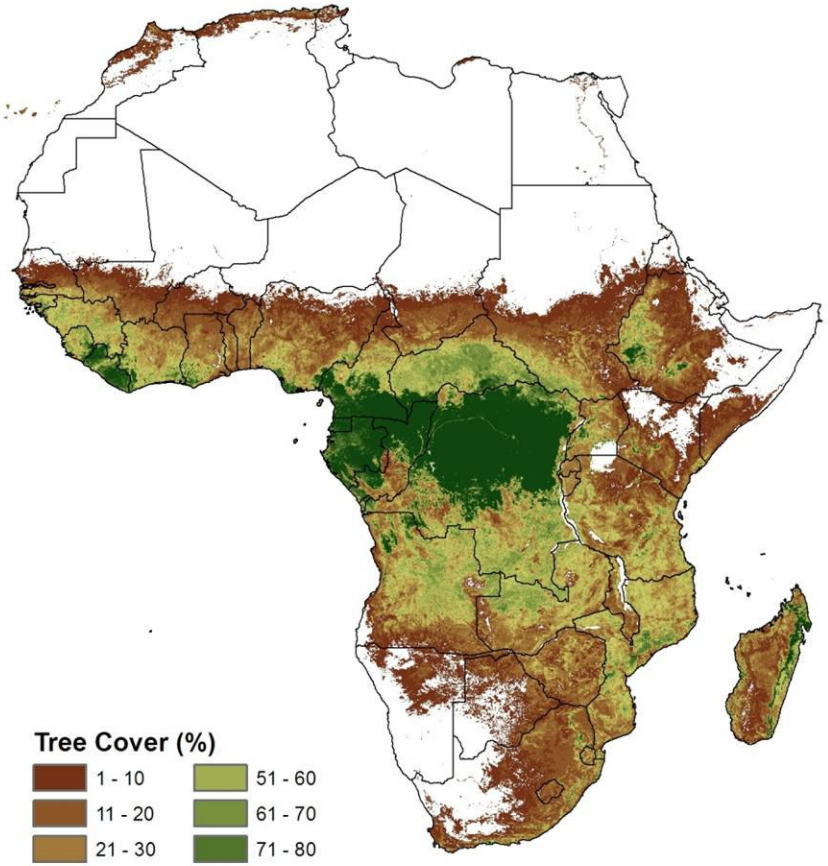




Source: Goetz et al. (2009) Carbon Balance and Management

MODIS Tree Cover

1-km resolution
Hansen et al. 2003

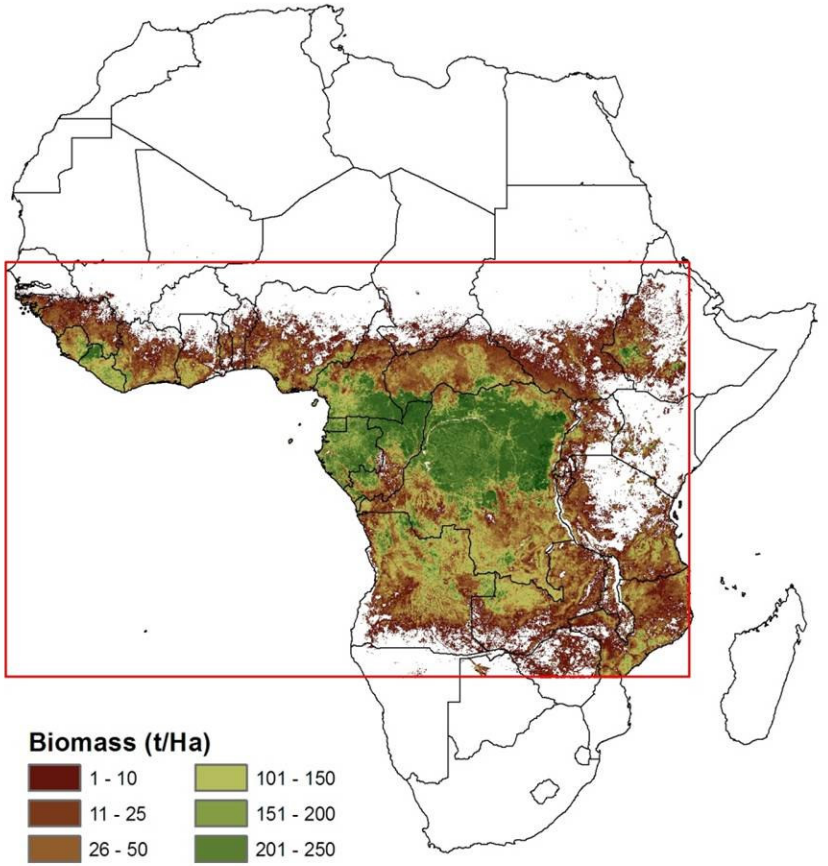


Tree Cover (%)

1 - 10	51 - 60
11 - 20	61 - 70
21 - 30	71 - 80
31 - 40	81 - 90
41 - 50	91 - 100

Above-ground Biomass

1-km resolution
Baccini et al. 2008



Biomass (t/Ha)

1 - 10	101 - 150
11 - 25	151 - 200
26 - 50	201 - 250
51 - 75	251 - 300
76 - 100	> 300

Result limited to Tropical Africa and areas west of 42^0 East Longitude

The Woods Hole Research Center
149 Woods Hole Road
Falmouth, MA 02540
http://whrc.org

MODIS Tree Cover

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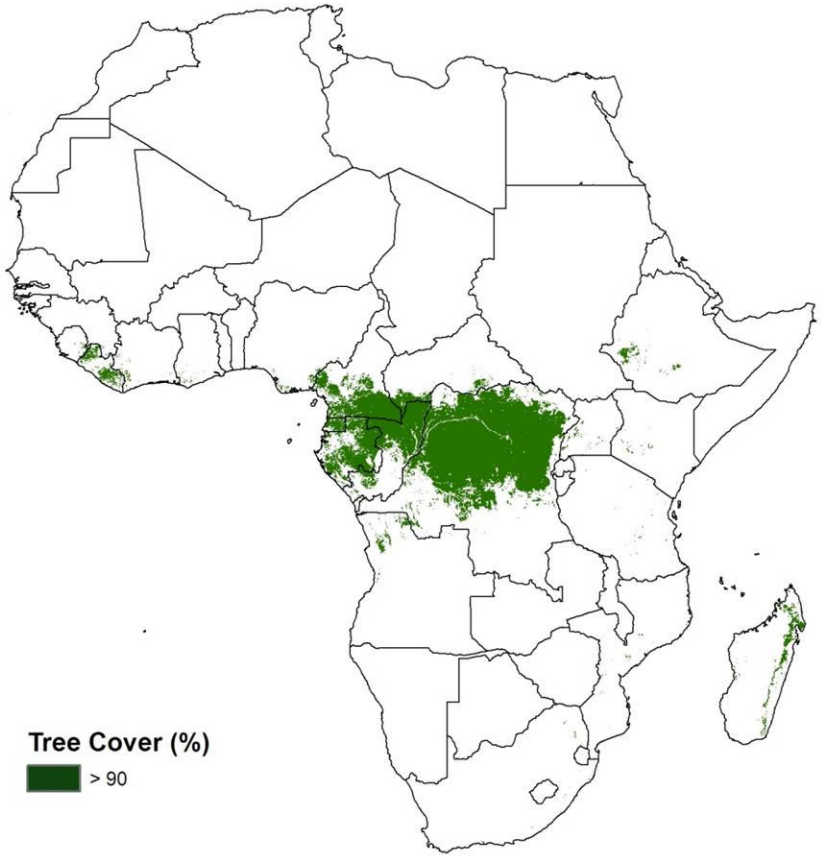
Hansen et al. 2003



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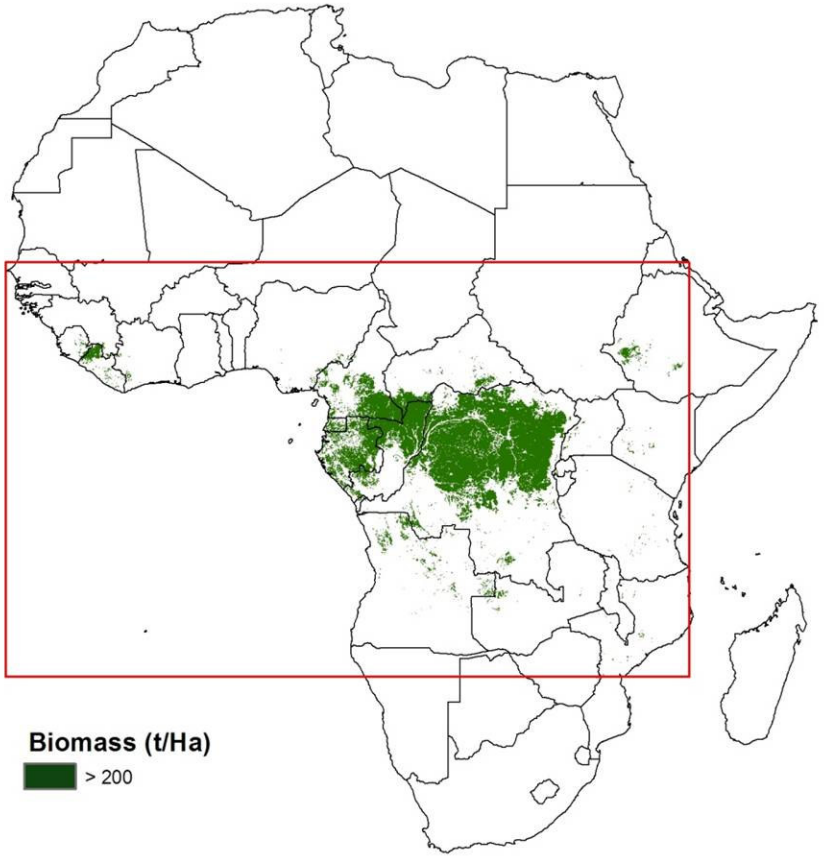

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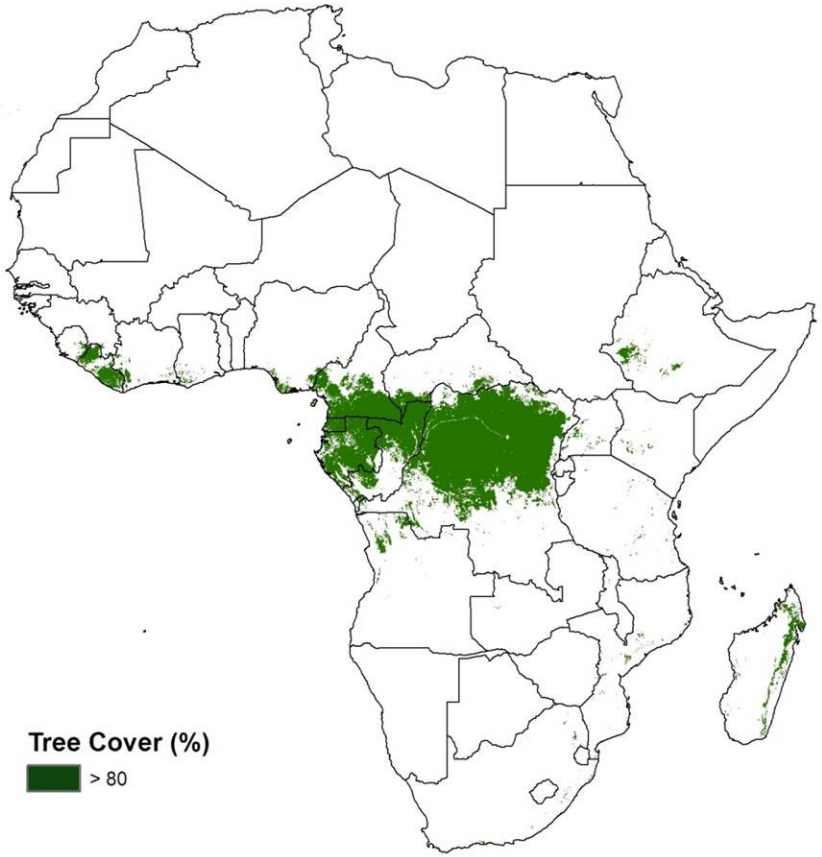

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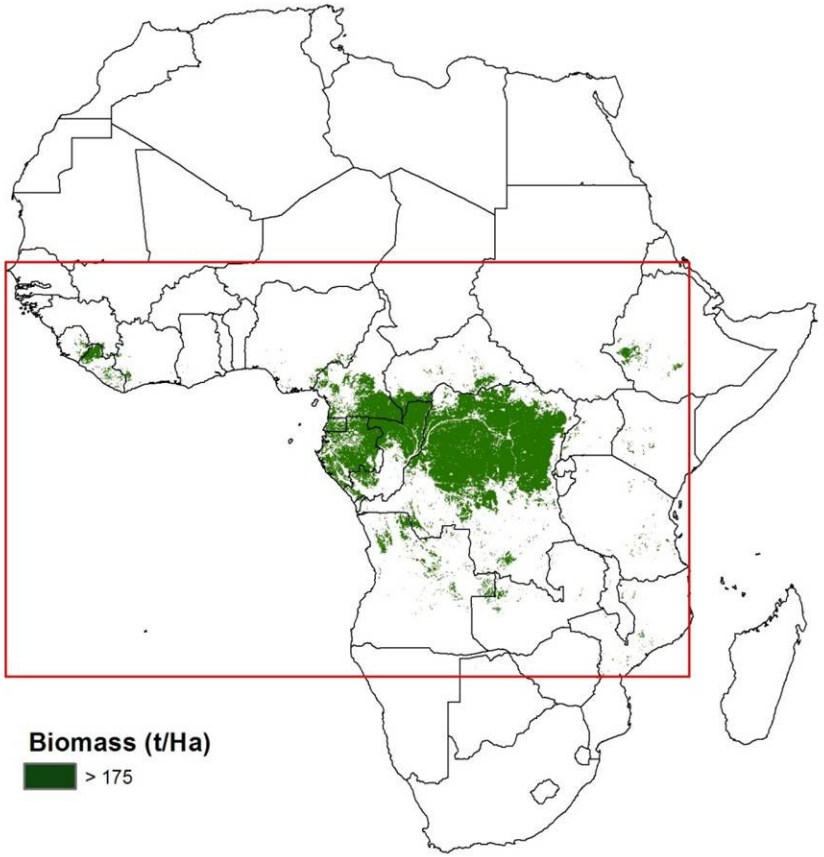

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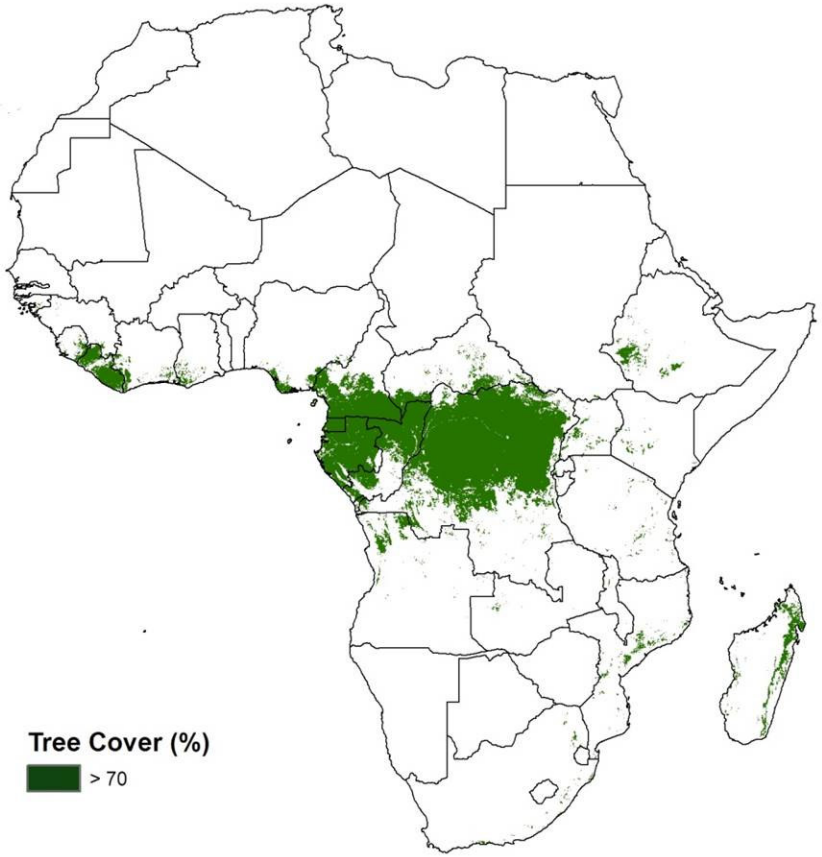

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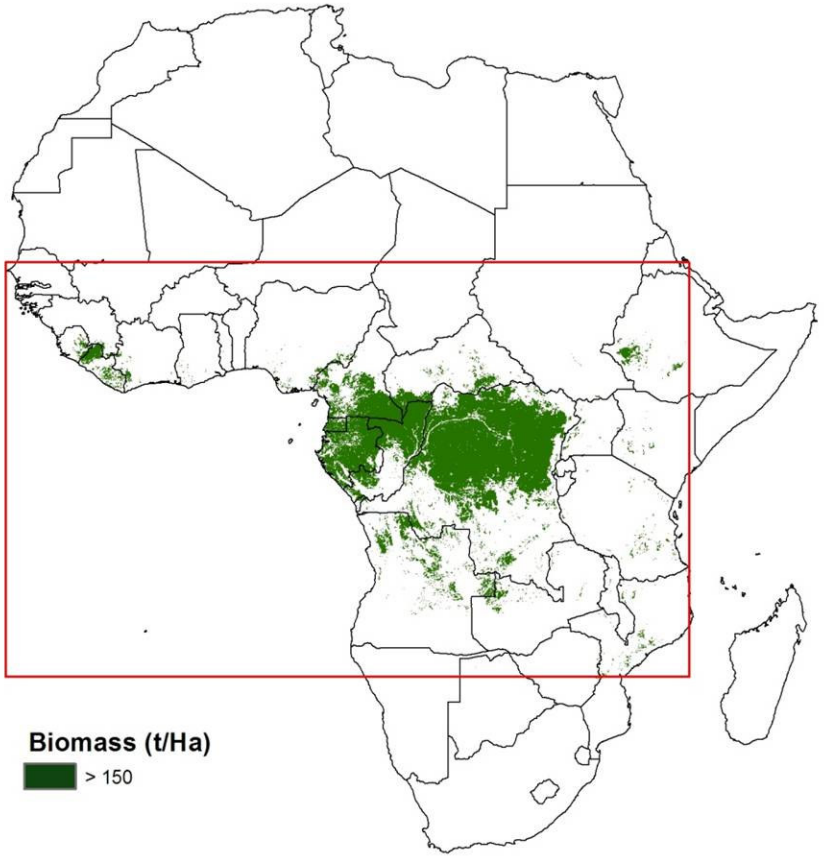

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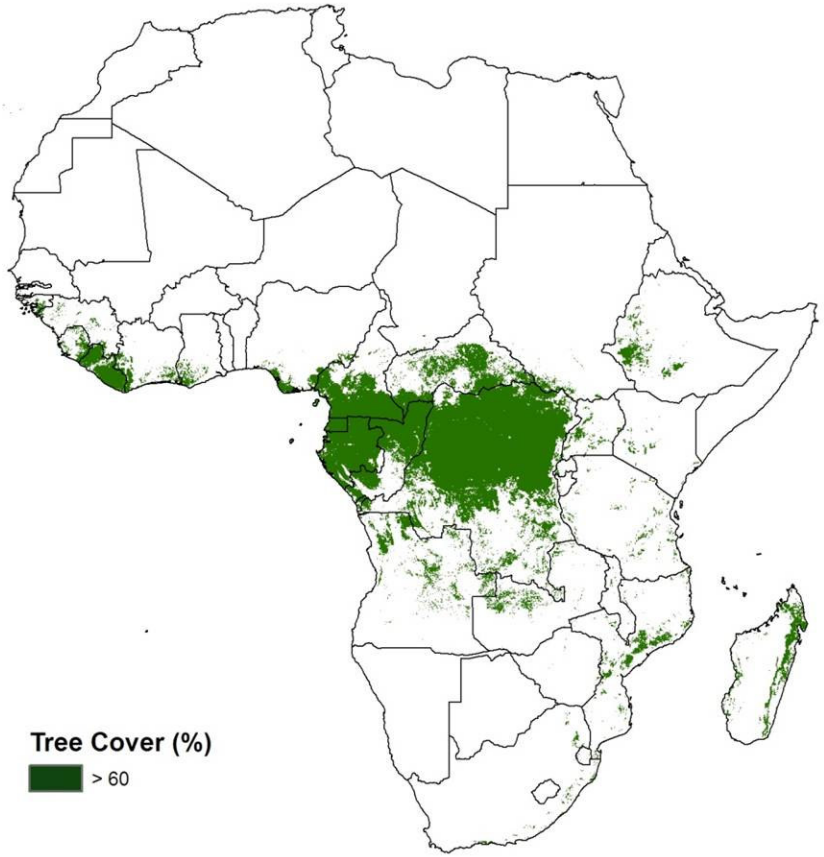

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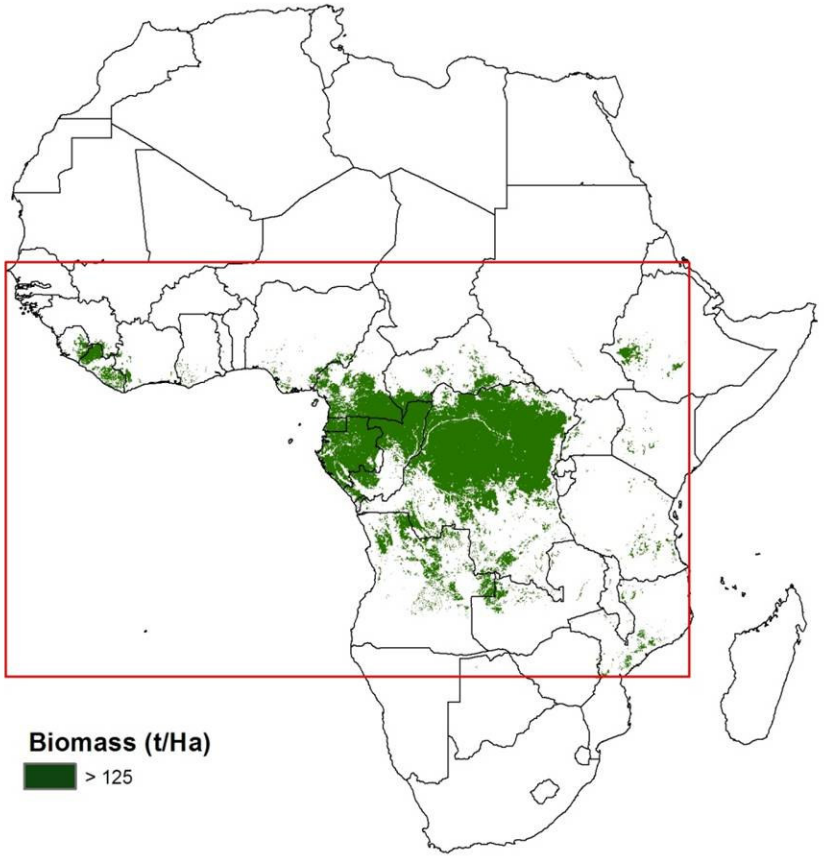

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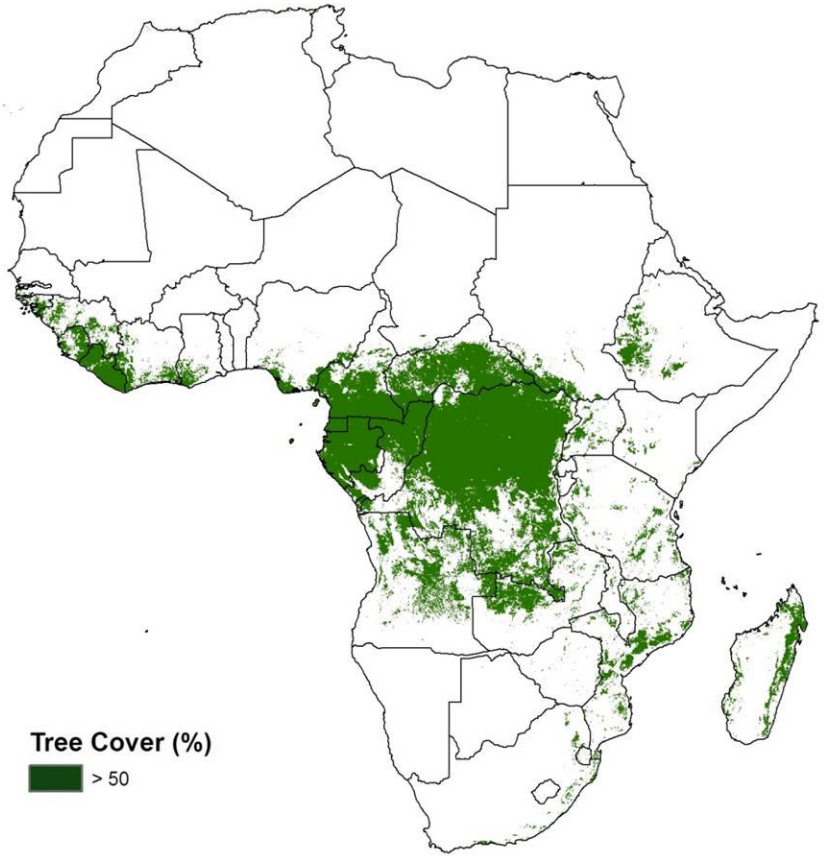

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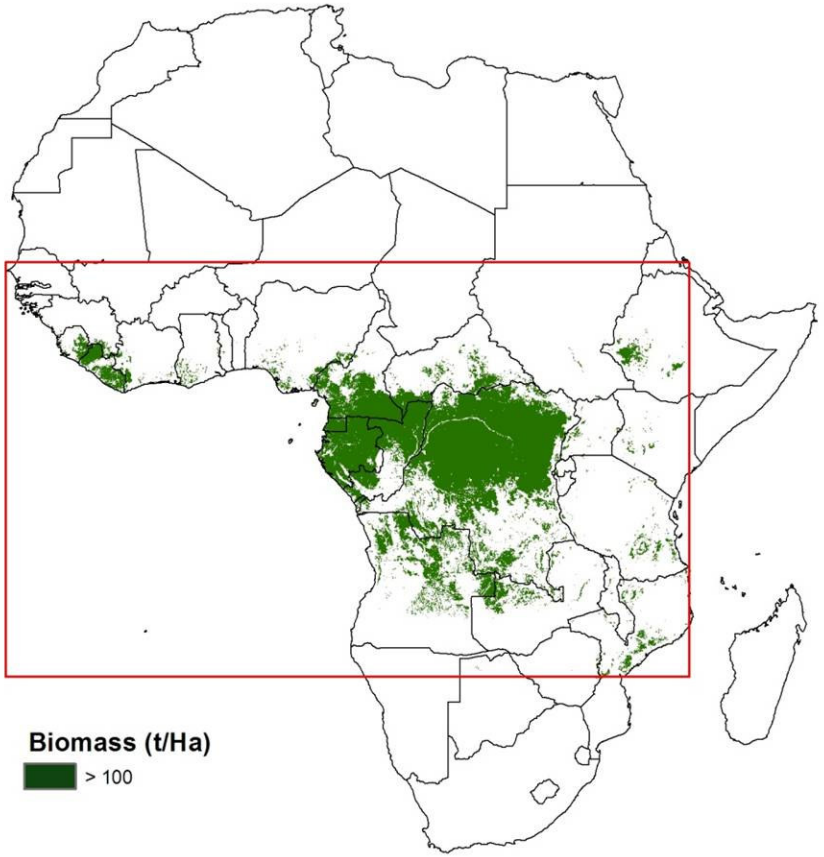

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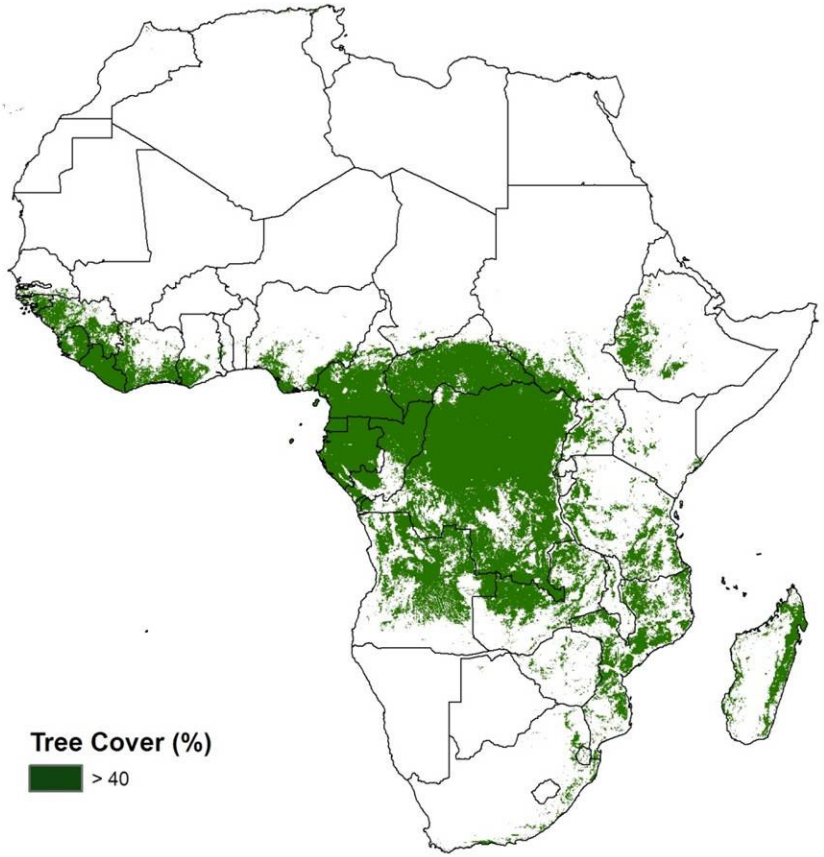

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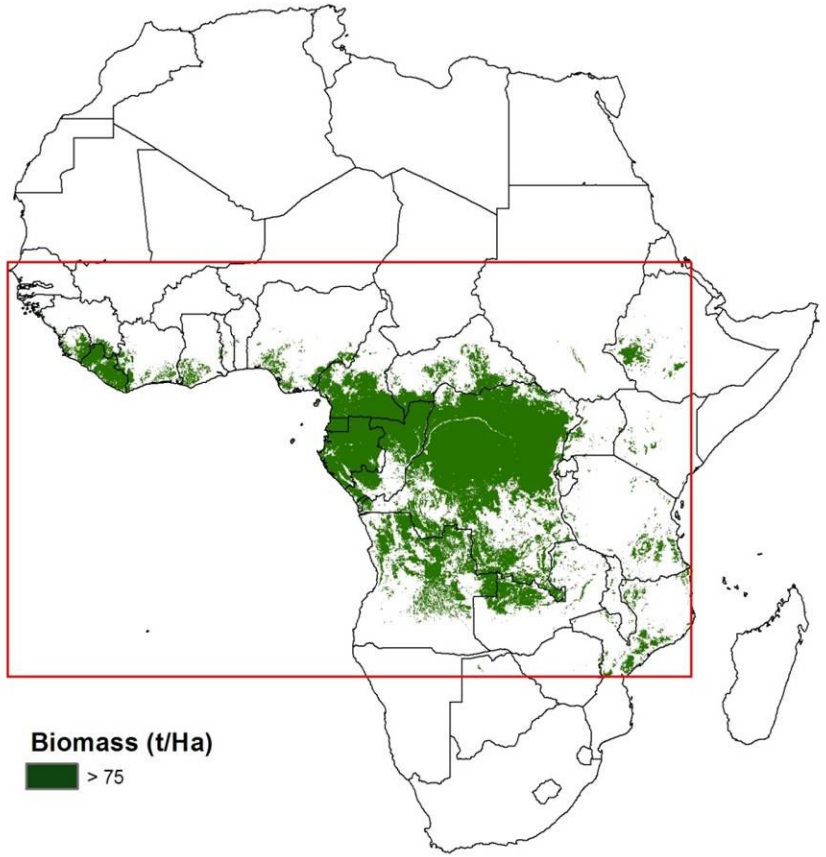

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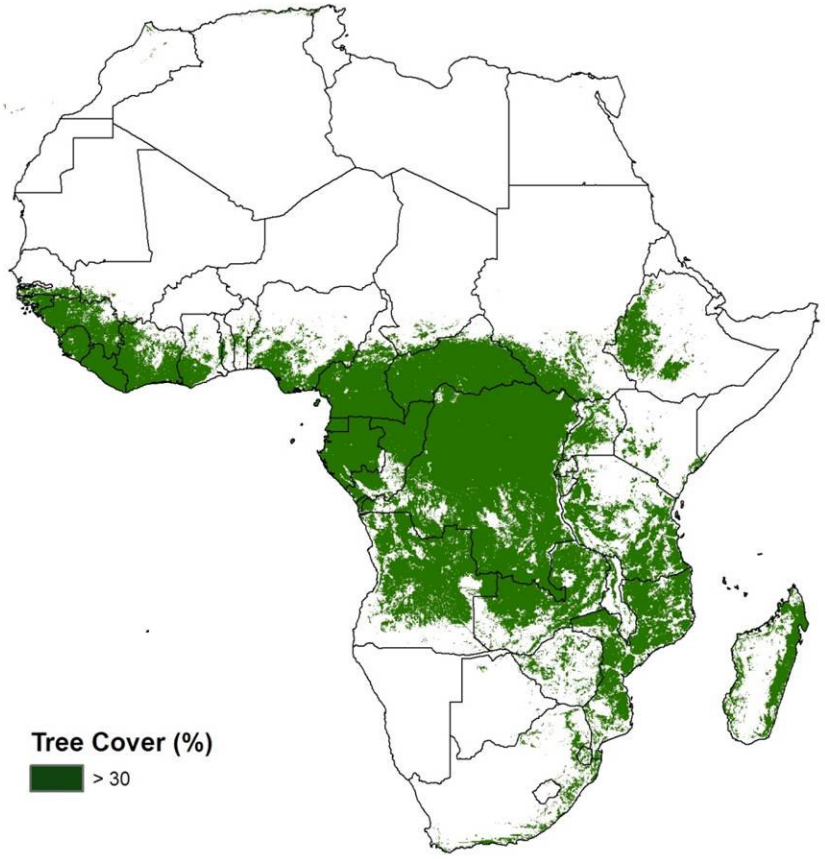

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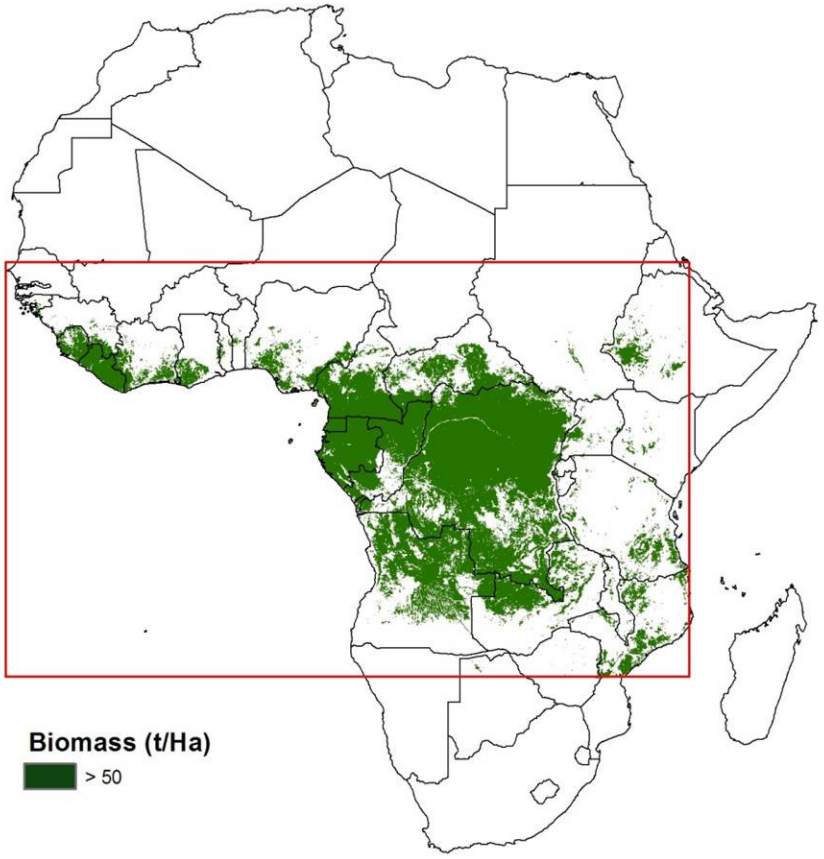

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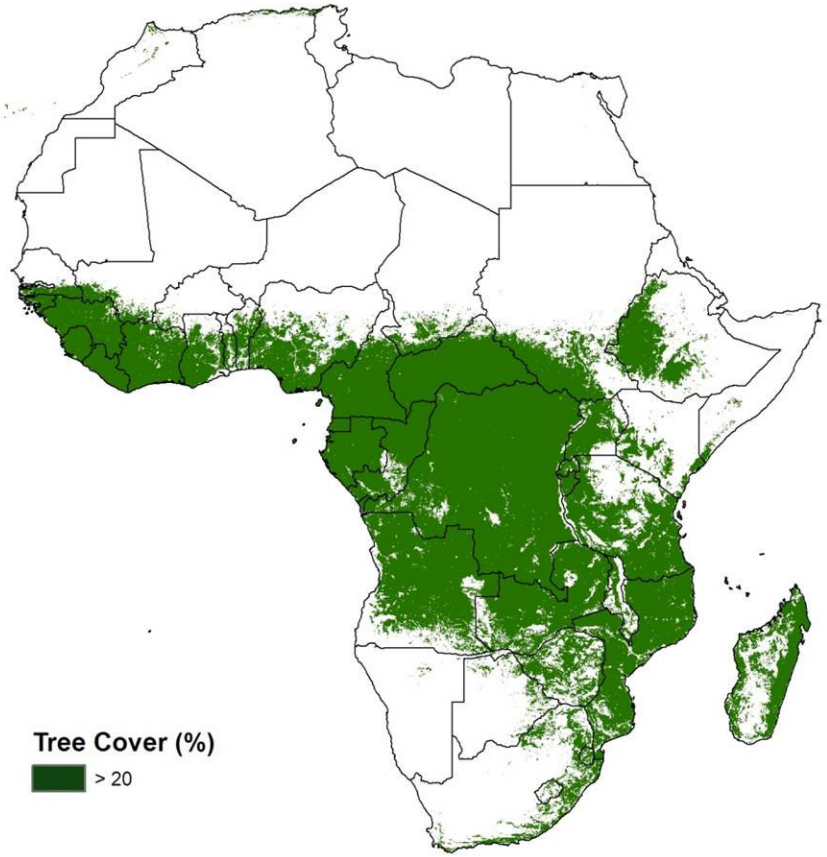
Hansen et al. 2003



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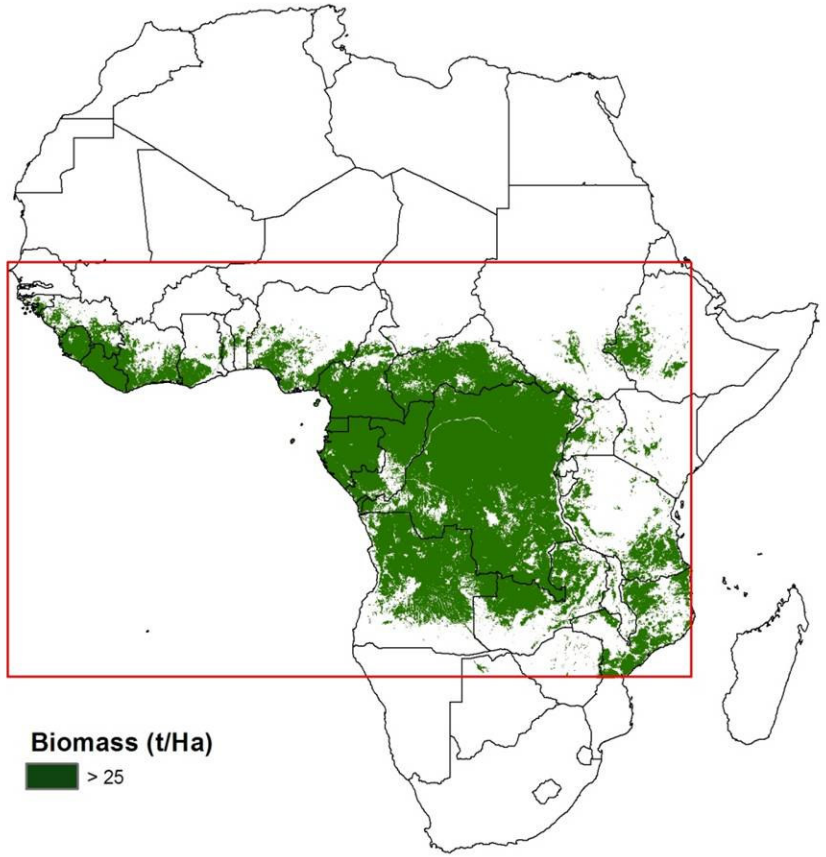

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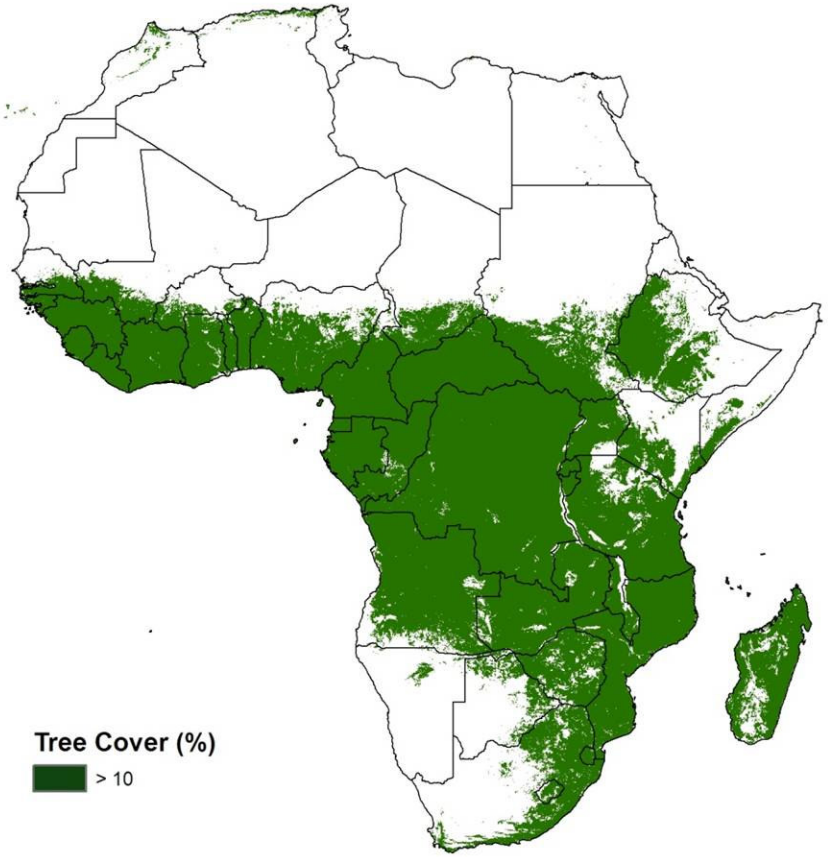

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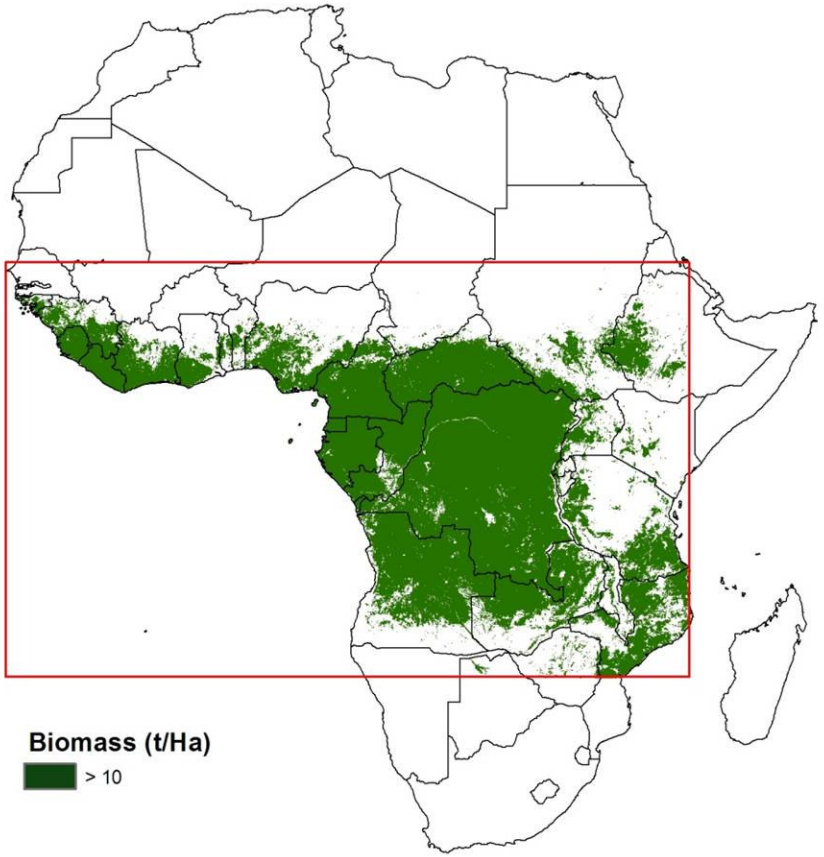

Result limited to Tropical Africa and areas west of 42^0 East Longitude

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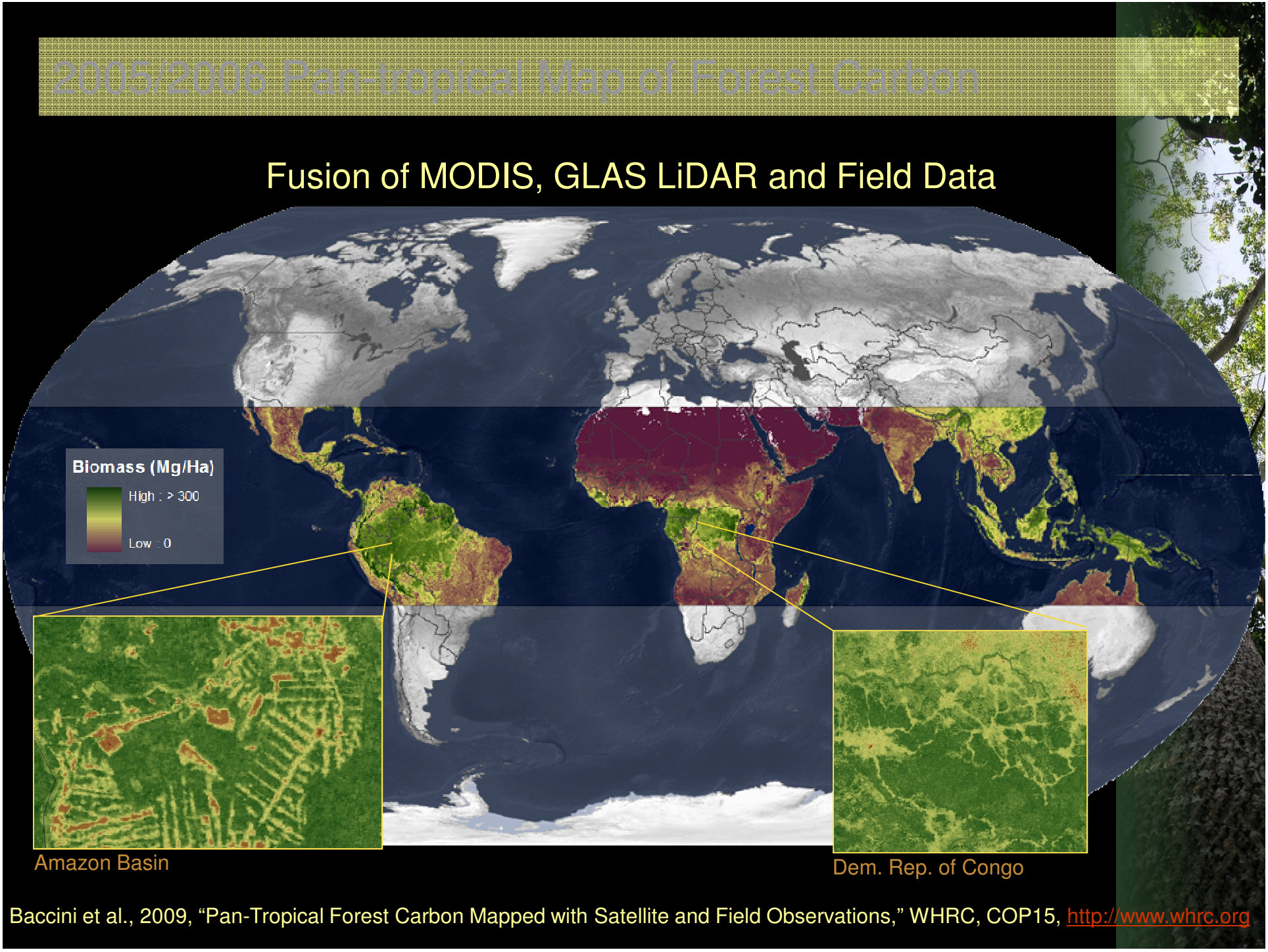
Limitations/ avantages de la methode

- Une même méthode pour tous les tropiques
- Robuste, résultats peuvent être repliqués
- Algorithme utilisé par beaucoup de chercheurs
- Données gratuites/ traitement données standard

- Ne permet pas de mesurer les changements de carbone directement
- Résultats dépendent fortement de la qualité, du nombre et de la distribution des inventaires forestiers

2005/2006 Pan-tropical Map of Forest Carbon

Fusion of MODIS, GLAS LiDAR and Field Data



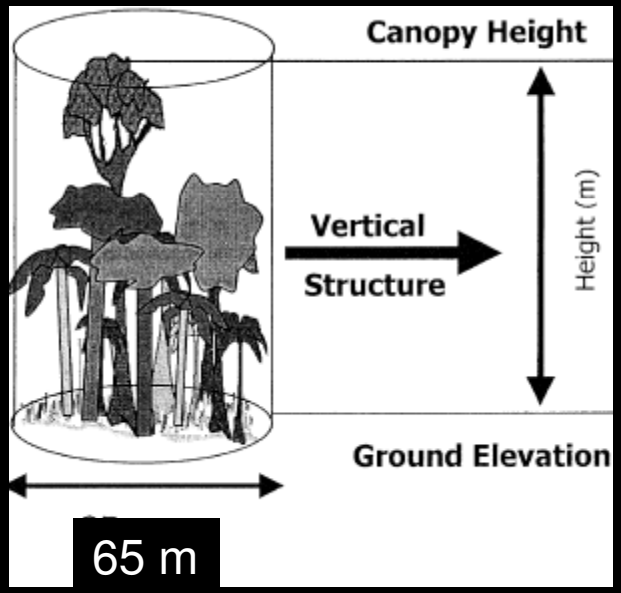
Amazon Basin

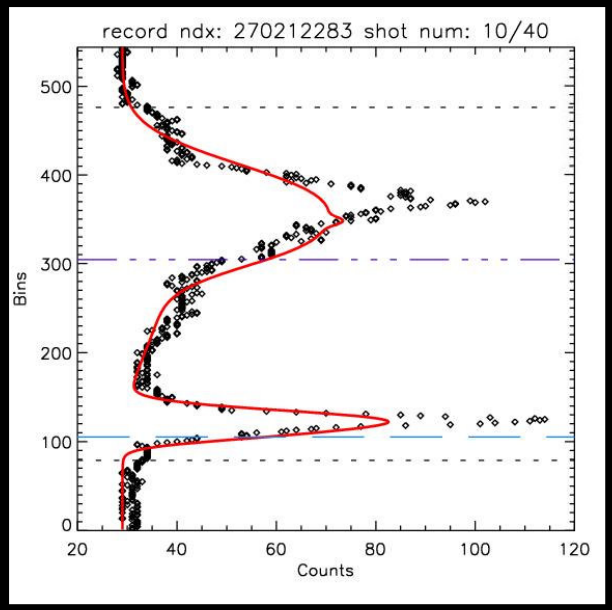
Dem. Rep. of Congo

Baccini et al., 2009, “Pan-Tropical Forest Carbon Mapped with Satellite and Field Observations,” WHRC, COP15, http://www.whrc.org

Structure de la végétation avec le Lidar

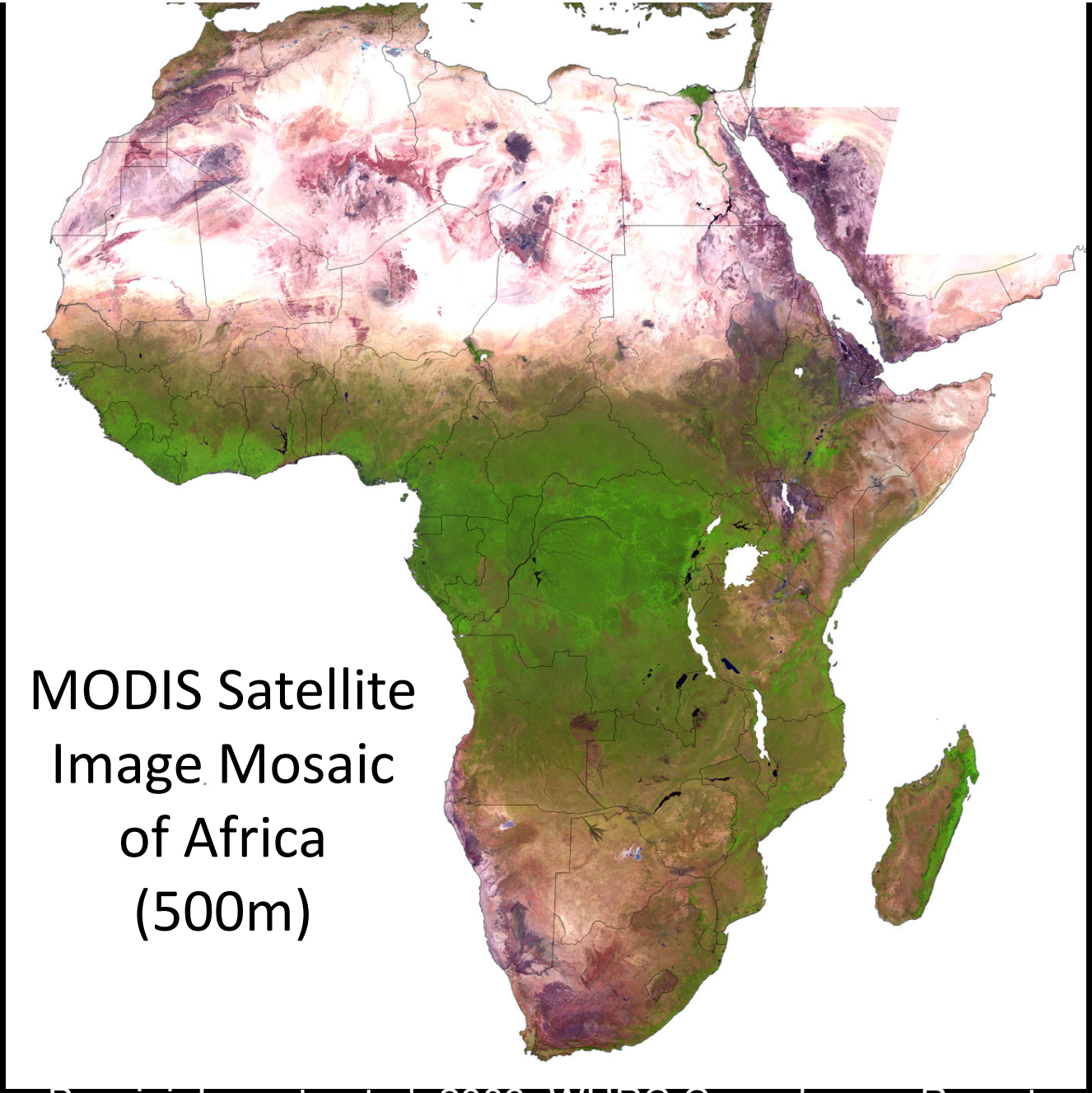
Le lidar est utilisé depuis de nombreuses années pour caracteriser la structure de la végétation (Sun et al. 2008, Lefsky et al. 2005, Lefsky et al. 1999)





Drake et al. (2003), Lefsky et al. 2005, Drake et al. 2002 ont trouvé une correlation entre Biomasse et les variables issues du Lidar comme la hauteur de la canopée

Distribution des données Lidar

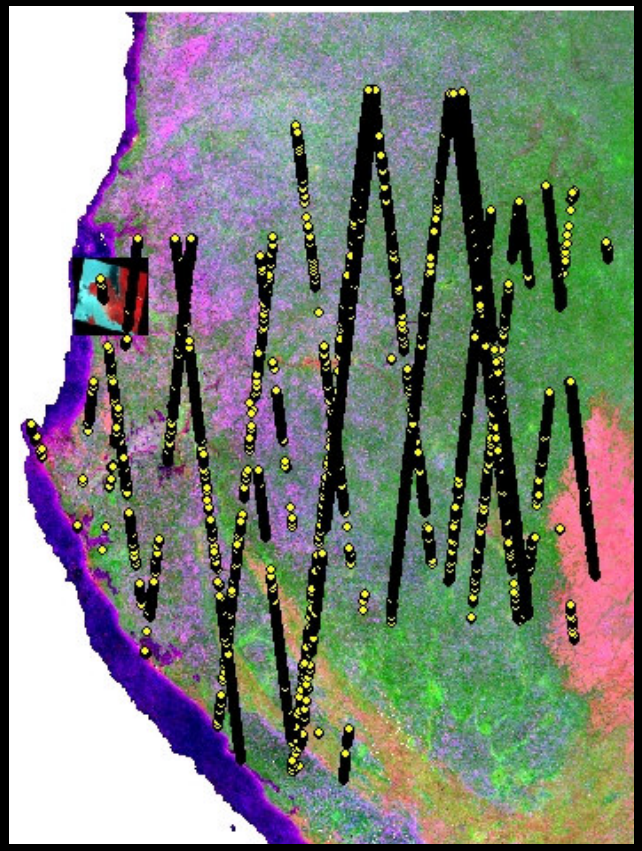


MODIS Satellite Image Mosaic of Africa (500m)

Source: Baccini, Laporte et al. 2009, WHRC Copenhagen Report

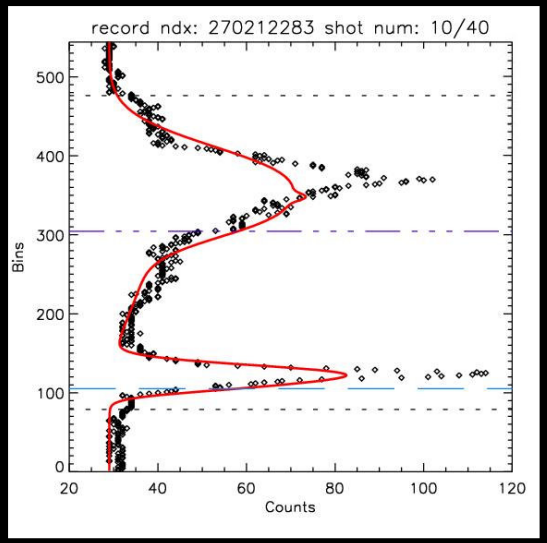
Le travail de terrain-Gabon

Satellite ICESAT - mesure lidar de GLAS
(Geoscience Laser Altimeter System)
2003-2007

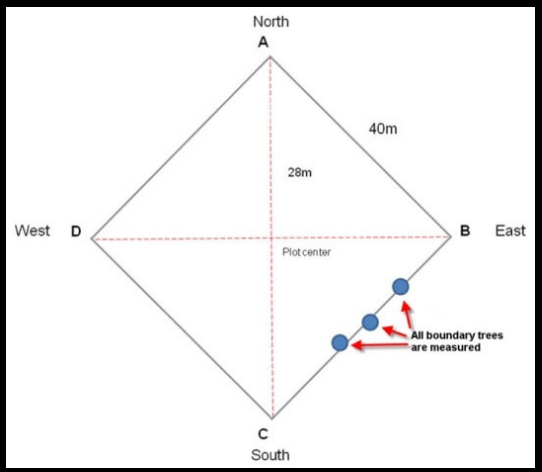


Images satellitaire : MODIS – 500 m (2007)

Données Lidar

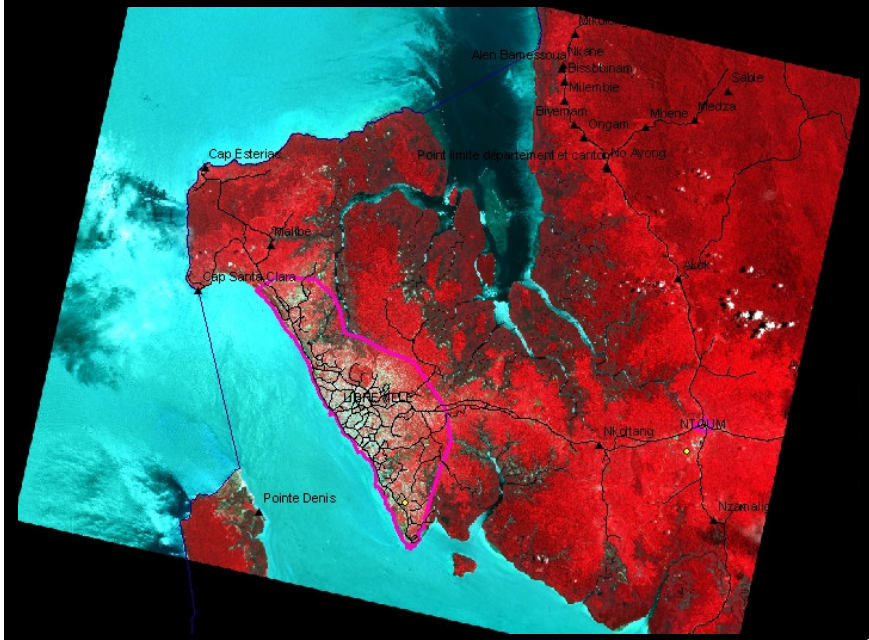


Données d'inventaires forestiers : placette terrain

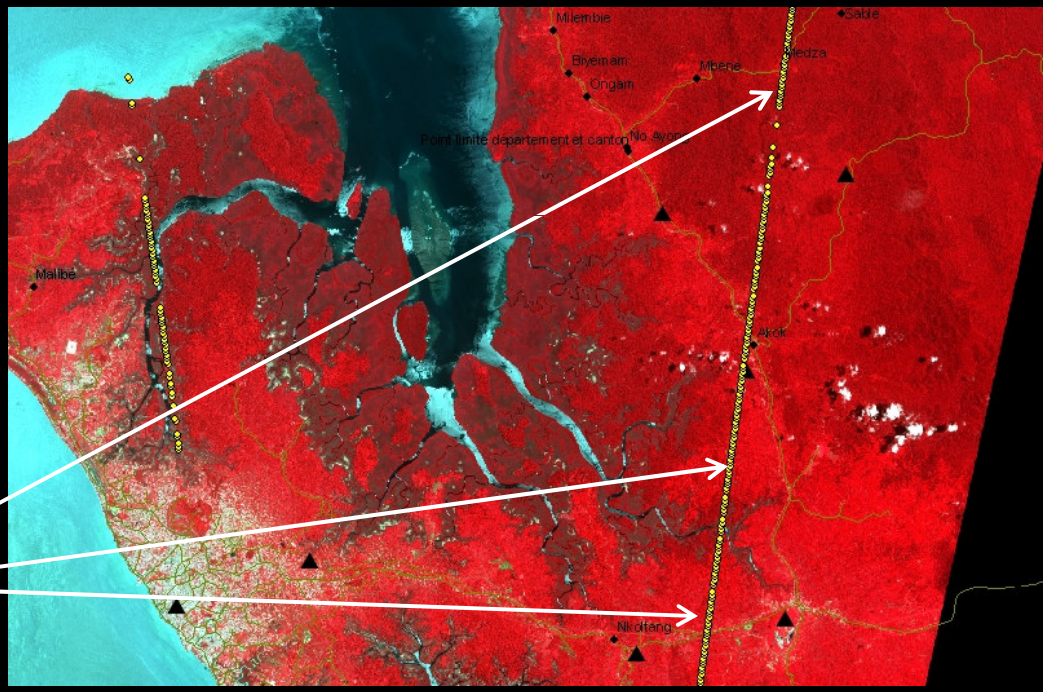


Campagne de terrain GABON

Images satellitaire : SPOT5 – 15 m (2005)

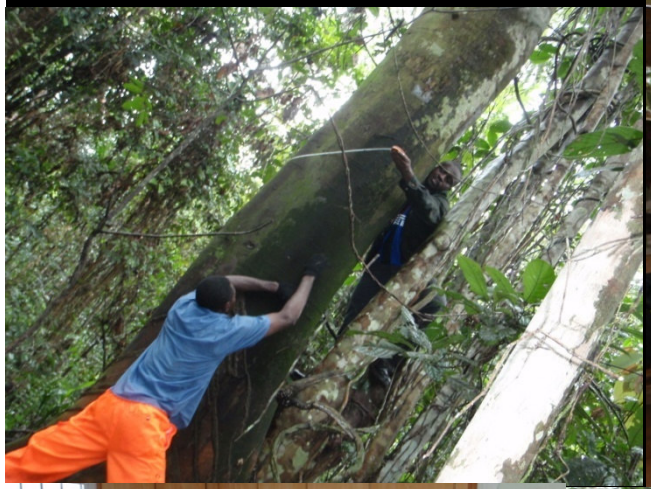


Données lidar de GLAS (Geoscience Laser Altimeter System)



Données d'inventaires forestiers :

- DHP
- Hauteur
- Densité des arbres
- Fermeture du couvert, sous-bois

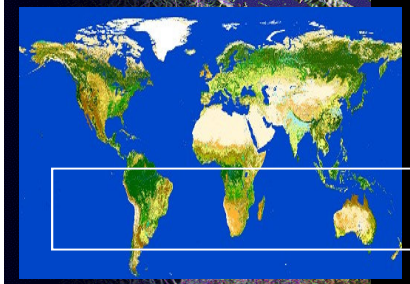












Conclusions Gabon

La télédétection est un outil incontournable pour la cartographie et l'estimation de la biomasse /carbone

-> en raison du coût et des surfaces à inventorier

-> la calibration des données Lidar à partir des mesures de terrain permet une expansion du nombre d'échantillons

- Les inventaires forestiers permettent de calibrer les informations issuent des satellites et d'estimer la biomasse/ le carbone
  - -> importance d'avoir des échantillons représentatifs de faible à plus hautes biomasse

Conclusions –générale

- Assurer le renforcement des capacités (transfert des technologies) à long terme
- Mener des études comparatives pour les différentes approches
- Établir des équations allométriques appropriées à la forêt du bassin du Congo

Remerciements

- La NASA , les foundations Moore, Google & Packard pour leurs support.
- Le collaborateurs africains , et les communautés locales pour leur assistance avec le travail de terrain et les ateliers de formation
- Planet Action – données Haute résolution

Merci de votre attention