MAPPING AND QUANTIFICATION OF THE RESIDUAL LAND SINK AND OTHER FOREST FLUXES OF THE GLOBAL CARBON BUDGET BASED ON INSAR DATA FROM UGANDA, TANZANIA AND COLOMBIA

Svein Solberg, Johannes May, Stefano Puliti
NIBIO, Norway
(Norwegian Institute for Bioeconomy Research)

FINAL GLOBBIOMASS USER CONSULTATION MEETING
11-13 SEPTEMBER 2017, FAO - ROME, ITALY
Global carbon dioxide budget
(gigatonnes of carbon per year)
2005-2014

Fossil fuels & industry
9.0 ± 0.5

Atmospheric growth
4.4 ± 0.1

Land-use change
0.9 ± 0.5

Land sink
3.0 ± 0.8

Ocean sink
2.6 ± 0.5

LARGE AND UNCERTAIN VEGETATION C FLUXES

InSAR data

2000: SRTM C and partly X

~2012: TanDEM-X
CASE STUDY: UGANDA
HEIGHT DIFFERENCING TANDEM-X AND SRTM C-BAND
ANOVA RESULTS:

\[
\Delta H_{1} = \Delta H_{1} - C_{\text{artifact}}
\]

\[
R^2 = 0.18
\]

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F Value</th>
<th>Pr &gt; F</th>
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PENETRATION DIFFERENCE

DEPENDING ON FOREST COVER AND LAND COVER TYPE

X-band

C-band
CORRECTING FOR PENETRATION DIFFERENCE
HEIGHT CHANGE VERSUS COVER CHANGE

ΔH_time

-10

10

Lake Albert

Lake Victoria

GFC 2000-2012

gain

loss
* COMPARISON AND SYNERGY WITH LANDSAT
* MAPPING C SEQUESTRATION
* CONSERVATION FLUX INTO REDD+
* LEAKAGE

InSAR

Landsat
FIELD INVENTORY

Miombo woodland

Evergreen broadleaved submountaineous forest

Photo: Endre Hofstad Hansen

Photo: Endre Hofstad Hansen
Puliti, et al. (in review) Modelling above ground biomass in Tanzanian miombo woodlands using TanDEM-X WorldDEM and field data
RECALCULATION FROM $\Delta H$ TO $\Delta AGB$
UGANDA: CHANGE 2000 - 2012

Forest height decrease 2000 – 2013:
\[ \Delta H = 33 \text{ cm} \]

Corresponding CO\(_2\) emission
\[ \Delta \text{CO}_2 = 27 \text{ mill t/year} \]

95% confidence interval = \(\pm 10.5\) mill t/year
# INSAR CHANGES VERSUS LANDSAT CHANGES

**UGANDA 2000-2012**

<table>
<thead>
<tr>
<th>MODIS Land cover type</th>
<th>ΔH, m</th>
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<th>ΔAGB, t/ha</th>
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<tr>
<td></td>
<td>loss</td>
<td>no change</td>
<td>gain</td>
<td>loss</td>
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<tr>
<td>Evergreen broadleaf forest</td>
<td>-8.8</td>
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<td>Woody savanna</td>
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<td>Savanna</td>
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<td>Grassland</td>
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<td>Croplands</td>
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<tr>
<td>Cropland and natural vegetation mosaic</td>
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<tr>
<td>Others</td>
<td>-3.6</td>
<td>0.4</td>
<td>1.4</td>
<td>-51.0</td>
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</table>
CASE STUDY: TANZANIA IN DETAIL

Hansen et al. (2013)

Gain
Loss

InSAR height change (m)
-10
-5
0
5
10

Satellite view
CASE STUDY: COLOMBIA, DETAIL AT ORINOCO RIVER

Conclusion: Promising method for temporal AGB changes, however, with some limitations.

Thank you for your attention