Combining satellite, aerial and ground measurements to assess forest carbon stocks in Democratic Republic of Congo

Benjamin Beaumont (1, 2), Tom Akkermans (1), Alban Bouvy (1), Nathalie Stepheinne (2), Pierre Mathoux (3), Jean-François Bastin (4,5) and Yves Baudot (6)

EO4REDD – BUILDING AN INNOVATIVE REDD+ MONITORING SERVICE

A SERVICE IN THREE STEPS

The EO4REDD project aims at developing a robust, operational and cost-effective service for monitoring carbon stocks changes at regional scale.

[1] Forest Cover Changes Mapping

[2] Above Ground Biomass Quantification

[3] Carbon Stocks Changes Assessment

Very high resolution satellite data

Aerial Images & Ground Measurements

A SERVICE IN THREE STEPS

CONCLUSION & OUTLOOK

Object-based semi-automatic change detection methodology developed on ≈ 3,000 km² of RapidEye images (2011-12-13; 5 m spatial resolution)

Detection of deforestation & forest degradation with high accuracies:
- 36.7 % of the forest cover losses are due to degradation
- Forest accuracy = 99.7 %, Producer and user accuracy = 80 % for deforestation and = 77% for degradation

Allometric linear model developed for Above Ground Biomass measurements in Mal Ndombe (with R² = 0.7) [UCL] based on dendrometric parameters (tree crown areas and heights) extracted from more than 1000 airborne stereoscopic image pairs acquired in September 2013 and calibrated using ground measurements of individual trees on a data set of 18 one-hectare plots [ULg & ULB].

Combining (1) & (2) to measure carbon stocks changes at national/regional scale

EO4REDD – BUILDING AN INNOVATIVE REDD+ MONITORING SERVICE

A CASE STUDY IN DEMOCRATIC REPUBLIC OF THE CONGO

- West of Mal Ndombe region – North of Kinshasa, Capital city of DRC
- Emission Reduction Program Idea Note (ER-PN) & Program Document (ER-PD) development area of DRC
- Many scientific studies
- High pressure on the environment (proximity to Kinshasa) and high diversity of deforestation and forest degradation drivers.

From intact forest... to degraded forest ...

Carbon Stocks Changes Assessment

A CASE STUDY IN DEMOCRATIC REPUBLIC OF THE CONGO

CONCLUSION & OUTLOOK

Given the high accuracies obtained in [1] (> 80% for deforestation and = 77% for forest degradation) and the suitable model (R² of 0.7) obtained in [2], EO4REDD products can be seen as a valid and replicable option for carbon stocks monitoring in tropical forests.

Further developments are needed to strengthen the cost effectiveness value and the REDD+ suitability of the service. These developments (including the use of Sentinel data time series, mapping of the “x” of REDD+, application to other geographical contexts ...) will be assessed in future projects.

Acknowledgments: The authors would like to thanks the Walloon Region for the funding of this project as well as all partners, collaborators and subcontractors who took part to EO4REDD. Publication: 17.04.2015.