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Characterizing the seasonal dynamics and inter-annual variability of vegetation types in Central Africa with Spot- VEGETATION NDVI times series

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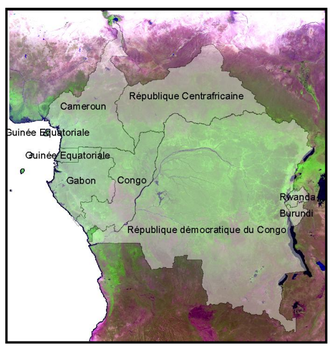
Context

In a global change context, it becomes essential to develop a following capacity of the behaviour of ecosystems and of their variability in relation with climatic variability. Land phenology, which can be estimated with remote sensing time series, is expected to be an useful and easily observable climate-sensitive variable. Study of the vegetation in tropical areas in particular can benefit from this long term source of data. As recent studies have shown for the Amazonian forest on MODIS data, the forest cover presents a seasonality in response to the solar radiation that effects the leaf area index (Huete *et al*., 2006; Myneni *et al*., 2007). Exploration of 10 years of VEGETATION data over central Africa will certainly improve our understanding of the seasonal dynamic of the forest and savannas ecosystems of this region.

Objectives

1. Set up a methodology to measure and analyse the evolution of the vegetation cycle (seasonal dynamic, inter-annual variability, trends) of forests and savannas ecosystems in central Africa as observed by remote sensing
2. Can we highlight some variability in seasonal and/or inter-annual behaviour of the African dense forests with time series of Spot VEGETATION ?
3. Linking remote sensing observations with meteorological data and field observations

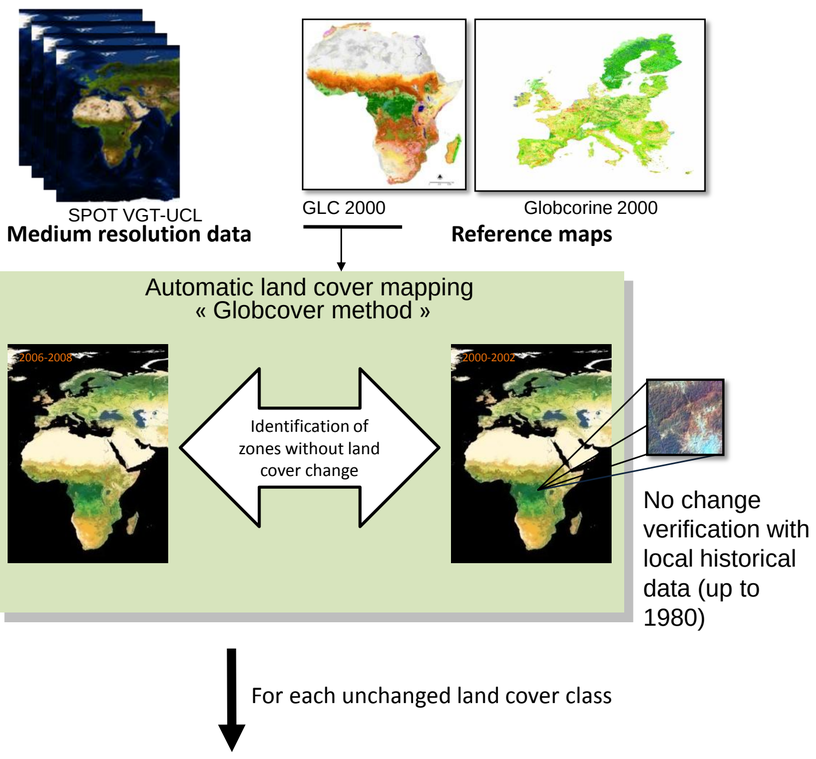
Study area



Methodology for extracting and analyzing land cover-specific seasonal profiles

OVERALL

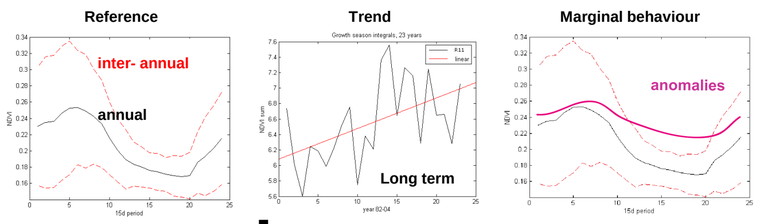
1. Identifying and mapping at a regional scale the vegetation types of interest



2. Application of a buffer for the selection of “pure” land cover pixels

3. Extraction of NDVI temporal profiles

4. Characterizing the leaf phenology, the inter-annual variability and any trends in the evolution of the vegetation



5. Linking the remote sensing results with meteorological data and field observation

PRELIMINARY RESULTS FOR CENTRAL AFRICA

New 300 m reference vegetation map

A. 2 DATA SOURCES

MERIS **300 m**

december 2004 - june 2006

+ Higher spatial resolution → Better patterns discrimination (e.g savanna/forest)

SPOT VEGETATION **1km**

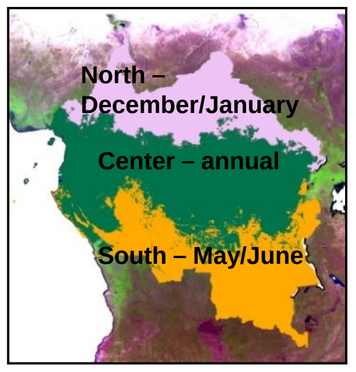
2000-2007

+ Higher temporal resolution → Better temporal discrimination

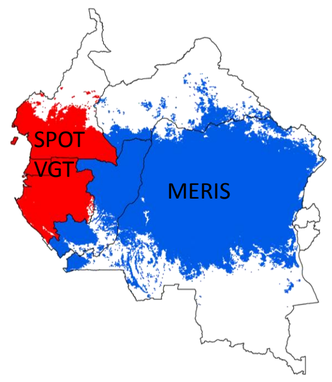
+ Longer data set → Better spatial discrimination in cloudy areas

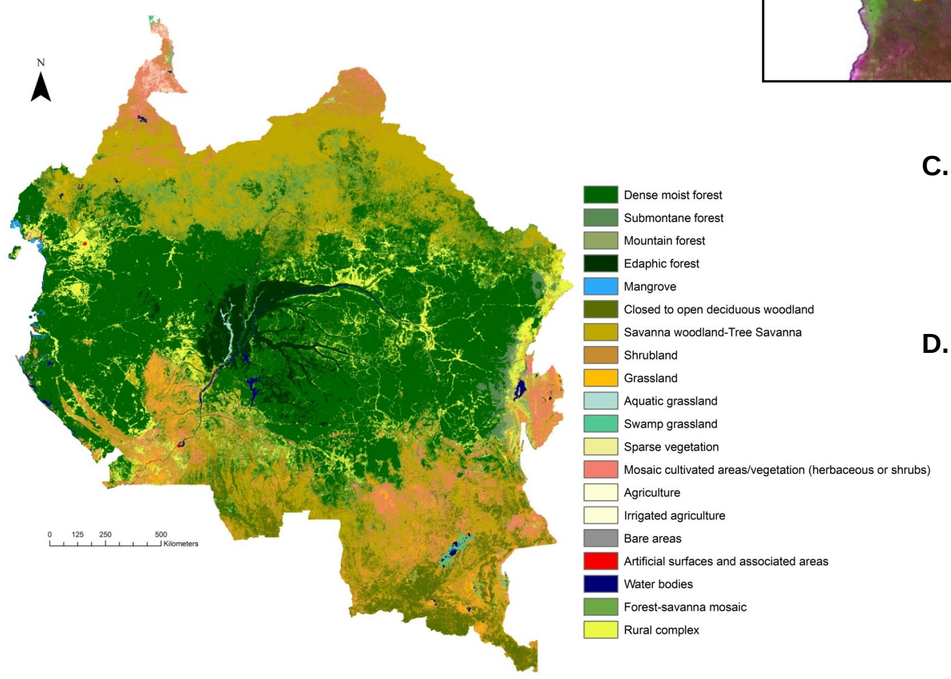
B. STRATIFICATION

3 seasonal zones



2 « clouds » zones





C. CLASSIFICATION

ISODATA +/- 400 classes

D. SEMI-AUTOMATIC LABELLING

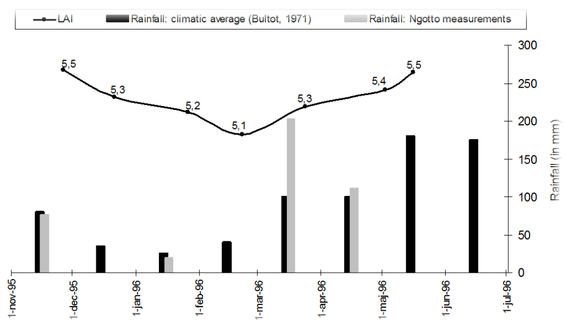
- National experts comments

  ➔Validation of the map
- Reference maps
- Vegetation seasonal profiles

N’gotto tropical forest seasonality– in-situ and remote sensing

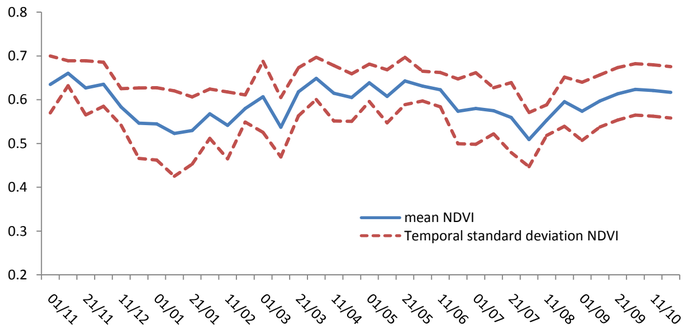
- 60 000 ha tropical semi-deciduous closed forest
- Sandy soil
- Drier season -December to February- and wet season -March to November-
- Forest adaptation to the climate conditions

Seasonality in LAI ground measurements



Evolution of the LAI and the rainfall distribution (measured and estimated from climatic atlas (Bultot, 1971)) (de Wasseige *et al*., 2003)

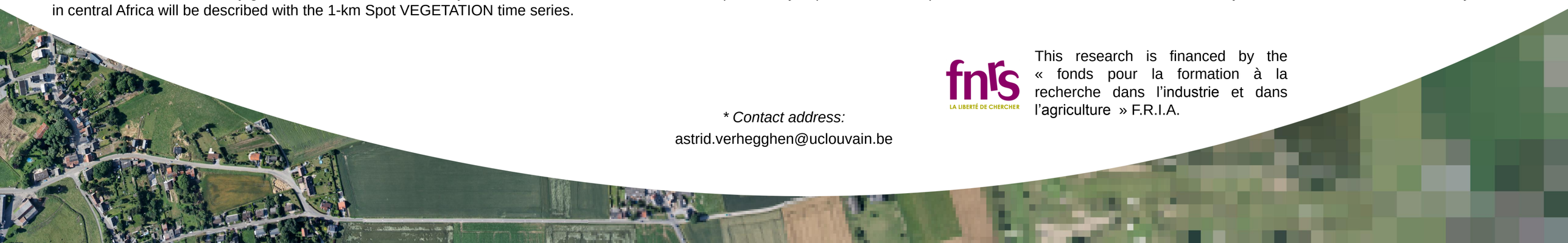
Seasonal signal in VEGETATION time series



Evolution of the decadal NDVI distribution for the dense forest of N’gotto averaged on 10 years of VEGETATION data (November to october)

Conclusions and perspectives

The 300 m reference map produced will improve the discrimination of the different vegetation types in Central Africa. The preliminary study for the N’gotto forest shows that the compositing of the 10 years of Spot VEGETATION data allows to reduce the noise in the signal and to notice a seasonal decrease of NDVI during the dryer season similar to the LAI decrease observed by de Wasseige et al. (2003) on ground measured data. The high number of valid observation for the satellite at that time suggests that this is not an artefact in the signal. On the other side, the decrease in the signal observed in early august, could be overestimated due to the very few valid observations at that time (high cloud cover due to the wet season). Time series from other captors should be investigated in order to confirm this findings. The same experiment could be reproduced on other LAI in situ data, unfortunately ground measurements are really scarce in central Africa. Based on this preliminary exploration of the Spot VEGETATION data, the seasonal variability of the forests and savannas ecosystems in central Africa will be described with the 1-km Spot VEGETATION time series.



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