Spot-4 (Take 5) workshop November 18<sup>th</sup> & 19<sup>th</sup> 2014, Toulouse

## Phenological monitoring of tropical forest ecosystems (North of Congo)

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## CONTEXT

- Central African forests cover 1,6 Mkm<sup>2</sup> and are of prime importance at the atmosphere/biosphere interface

- At this time we have a poor knowledge of these forest ecosystems

- These ecosystems are complex with spatial (forest types) and temporal (phenology) heterogeneities

## HYPOTHESIS

- Without accurate characterization of these ecosystems we will be poorly prepared to adopt sustainable management to face global changes (social changes and climate changes)

## OBJECTIVE

- Improve Central African forests knowledge by mapping spatial patterns of structure and greenness using satellite images



## Central African forests characterization



## Different phenologies for different forest types



Spot-4 (Take 5)

Congo 1

of forest types are identified with 37.898 inventory plots (1/2 ha)

Spot-4 (Take-5) data, Congo-1





## Geology, Congo-1





## Forest types (from MODIS), Congo-1



Evergreen forests (<30% deciduous)

Semi-deciduous forests (>40% deciduous)



## MODIS and Spot-4 temporal acquisitions (Take-5), Congo-1

### **Temporal acquisitions, Congo-1**





## Available inventory plots and cloud contamination





## Conditions of measurements



Spo

Angles (en degré)

9

Spot-4 (Take 5) Congo 1

## Comparison with MODIS measurements

SPOT-4 / MODIS (daily and 16-day period)



Stable daily measurements



## Comparison with 10-years MODIS data

SPOT-4 / MODIS (10 years)



Questionable year to year dynamic

Spot-4 (Take 5) Congo 1

## Detection of start and end of vegetation cycles



Faster starting period for deciduous forest on alluvions

Deeper decrease period for deciduous forest on alluvions

Regular dynamic for evergreen forest on sandstones





Specific conclusions with Spot-4 (Take-5) data, Congo-1

Very satisfactory Spot-4 (Take-5) data set acquisition

- Photosynthetic activity measurements are effectively a biologic signal (Morton et al., 2013). Significance de-correlation with R<sup>2</sup> from 0,2 to 0,4.

- More accurate monitoring compared to MODIS of phenological signal and good differentiation of evergreen and semi deciduous stands.

- Good identification of the start and the end of the vegetative activity for both stands.

Next questions are:

- Is it possible to monitor human activities?
- A focus on degraded forest characterization has to be done



## Monitoring logging activities : forest tracks





# Next steps

Involve in SPOT-5 (take-5) in 2015:

- Focus on a temperate mountainous forest in north-Iran
- Be aware about the relief and slope influences on measurements
- Keep going on phenology monitoring

- Analyzing for each forest types phenological phases and determining the ecological process

- Developing forest management recommendations at timber plot scale within the continuous acquisition data program at high temporal and spatial resolution (Sentinel-2)





# Thank you for your attention

