Phosphorus Imbalance in the Terrestrial Biosphere Processes from Root to Globe
March 7th, 2014

Land cover mapping and phenology in French guiana using remote sensing

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Forest ecosystems goods and services
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Context

- Tropical humid forests have a crucial role in the climatic and biologic equilibrium of the Earth

- These forests are not homogeneous in terms of structure and functioning

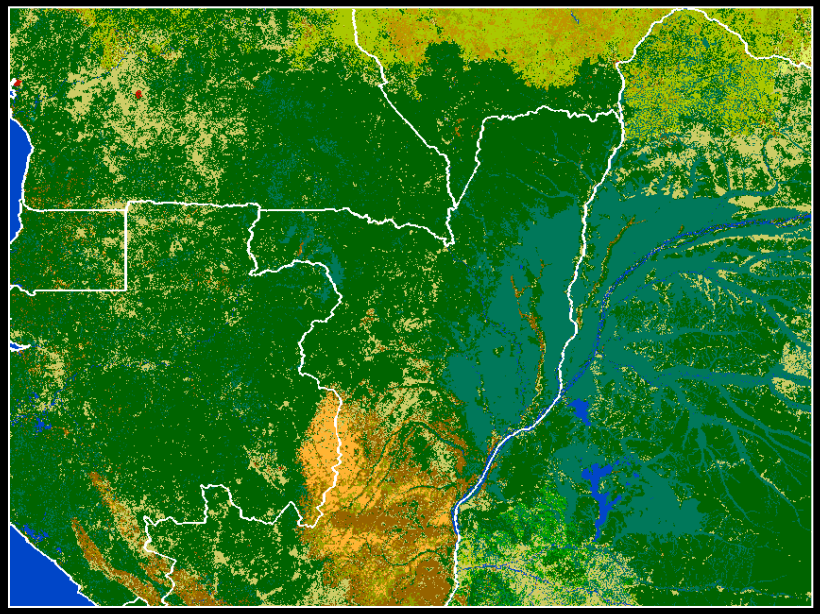
Question

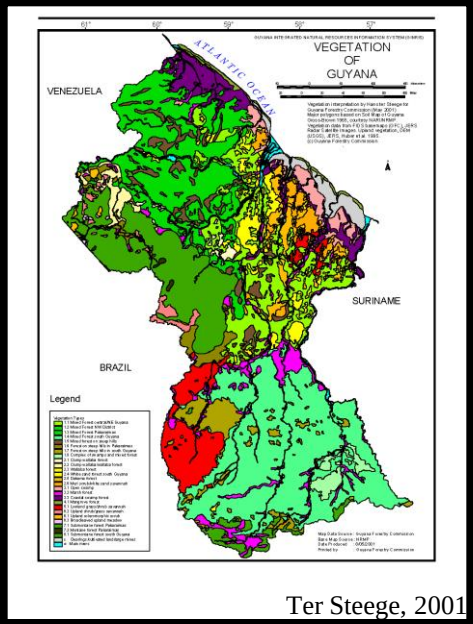
- What is the spatial organization of these tropical humid forests ?

Hypothesis

- The use of remotely sensed data helps to monitor spatial and temporal patterns

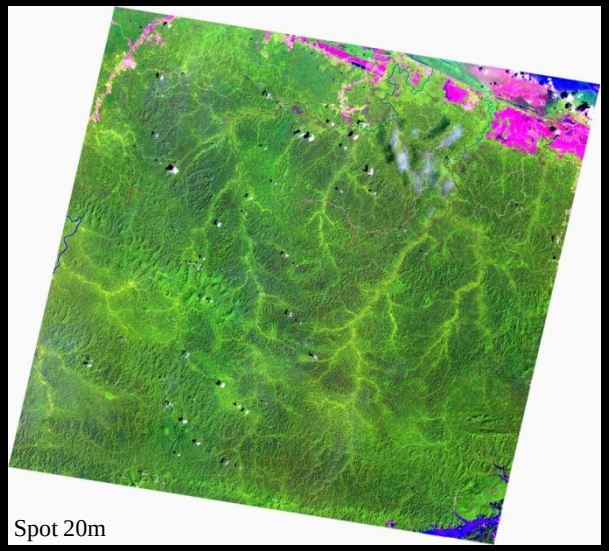
From global to local





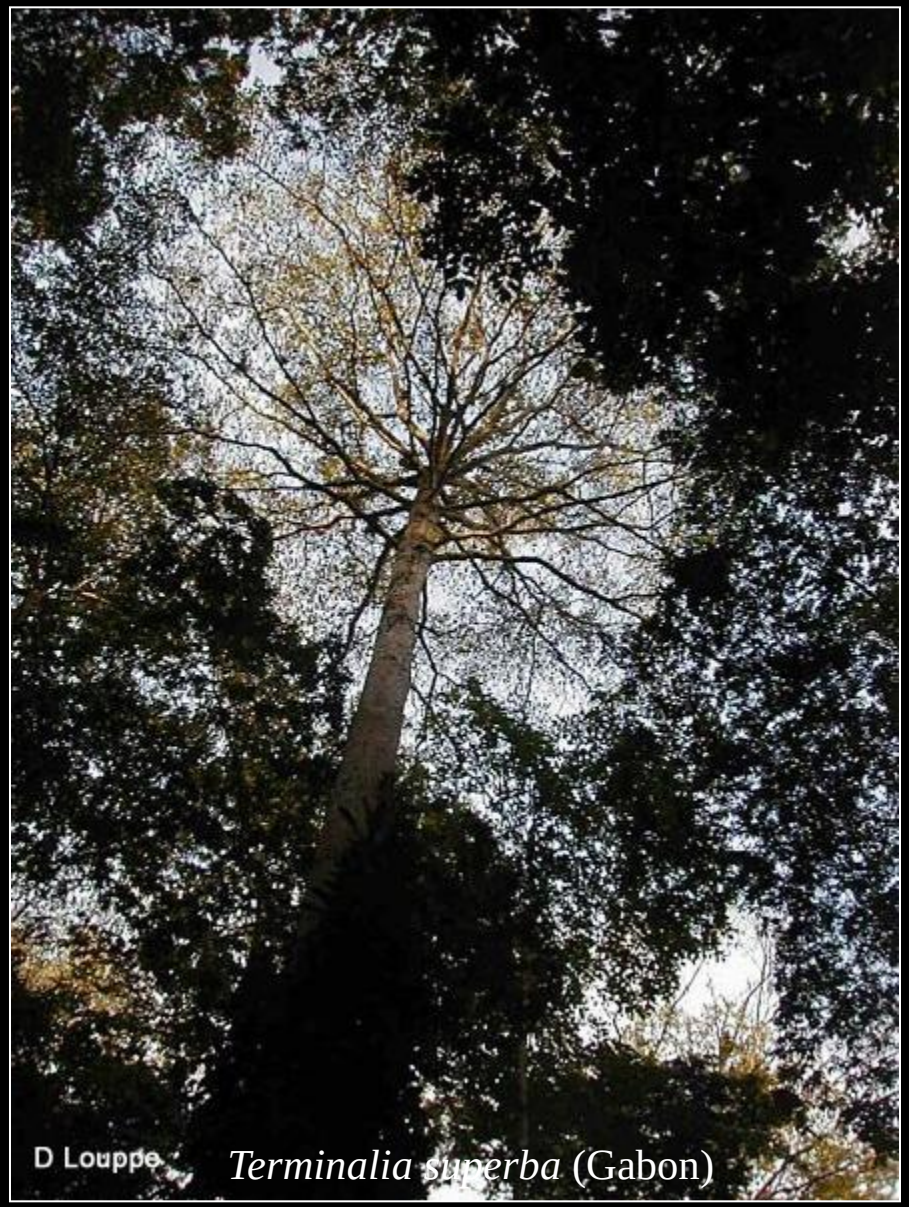
Ter Steege, 2001

Behind the green layer of the global maps, there are various tropical forest types



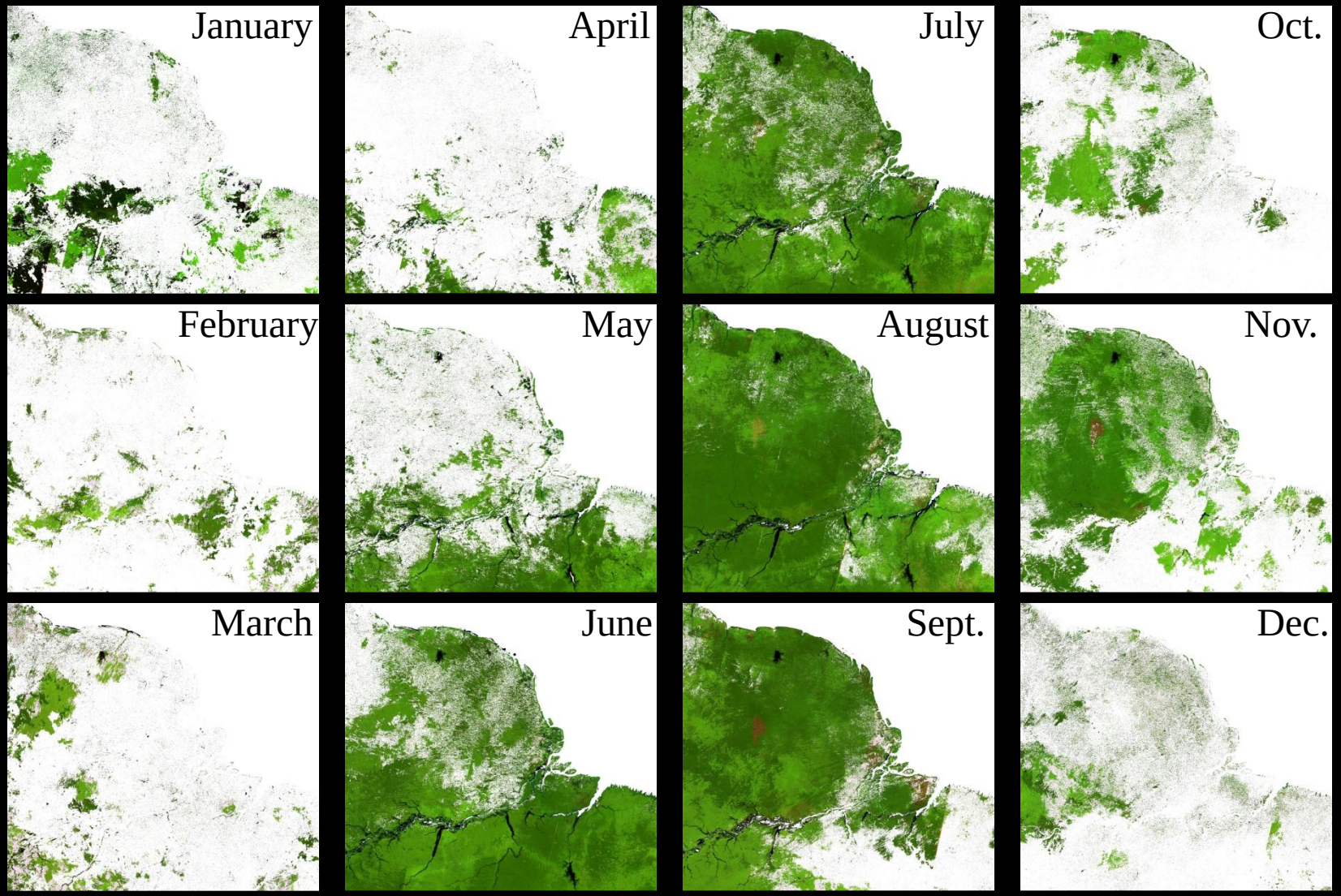
Spot 20m

Forest phenology



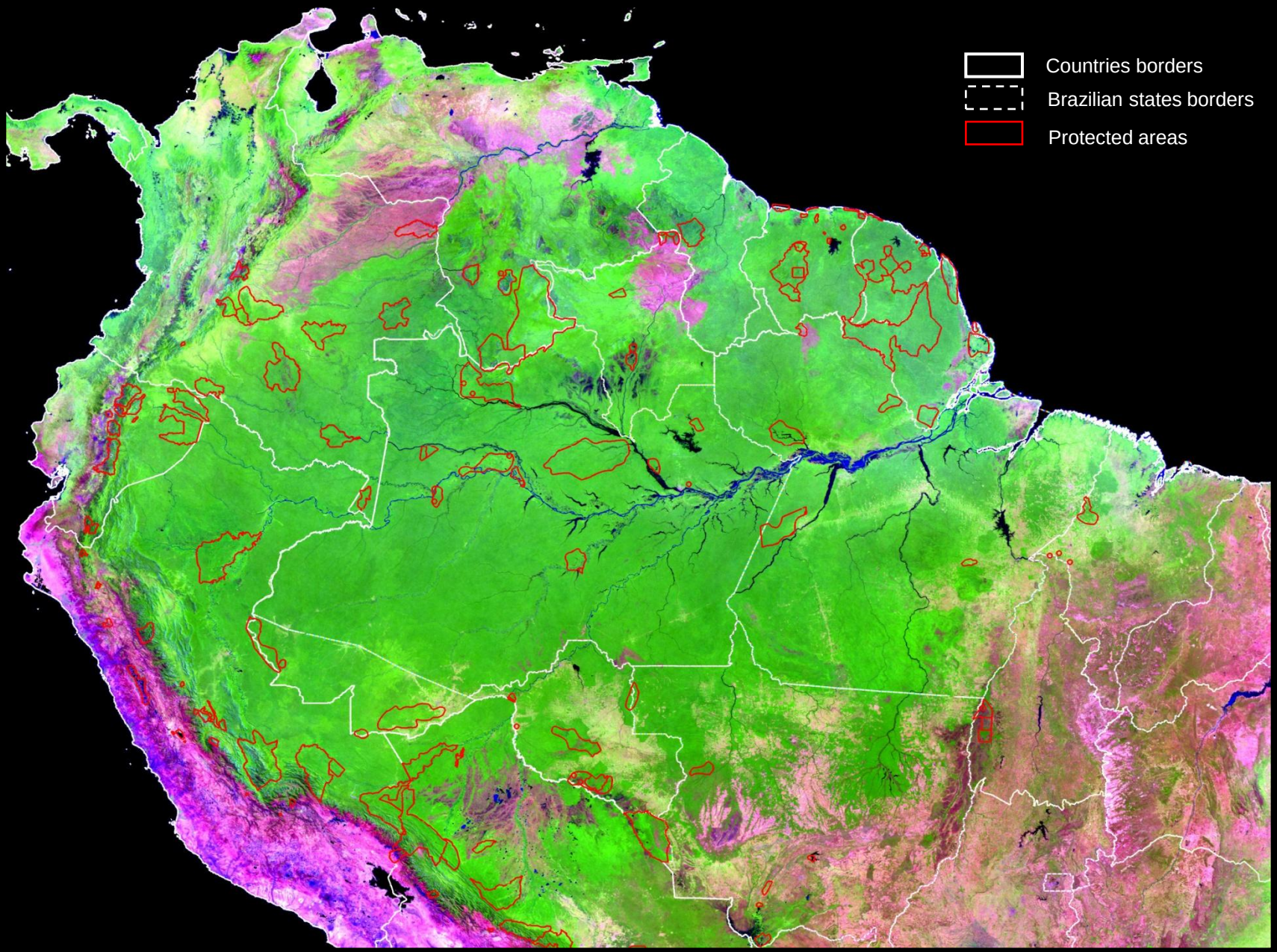
Terminalia superba (Gabon)

Monthly temporal monitoring



Monthly synthesis from daily data (2000)

Spatial patterns on annual synthesis SPOT/VGT data

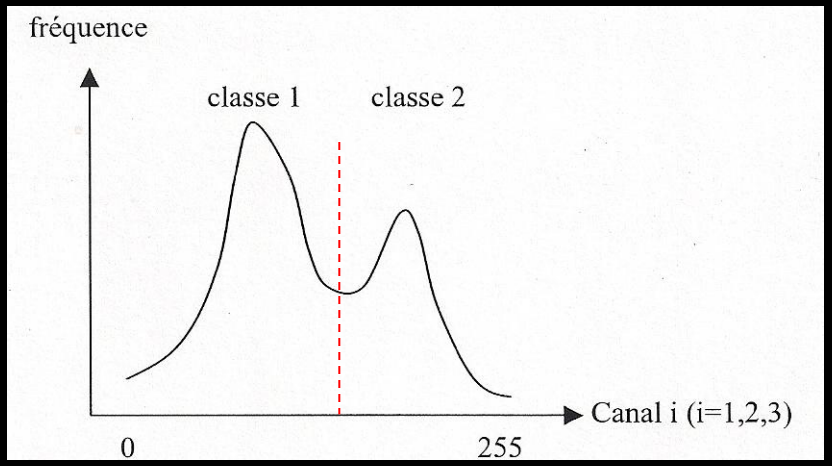


Spot-VEGETATION

ISODATA classification

(Iterative Self-Organizing Data Analysis Technique)

- Iterative method grouping pixels within the radiometric spaces to the closest gravity center

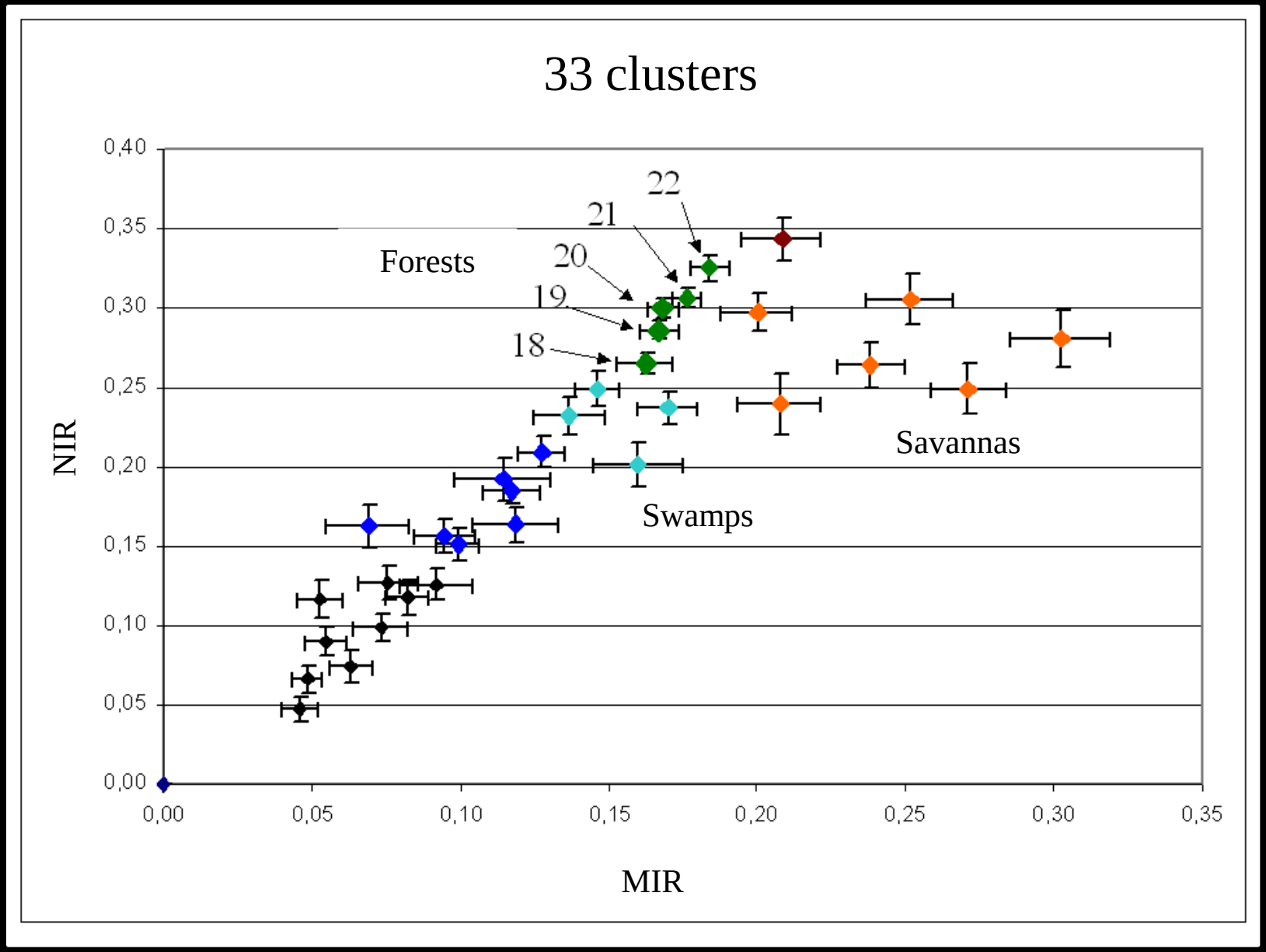


-The user chooses the number of iterations and of classes [min – max]

- In this study, 10 iterations and from 40 to 50 classes gave optimal results

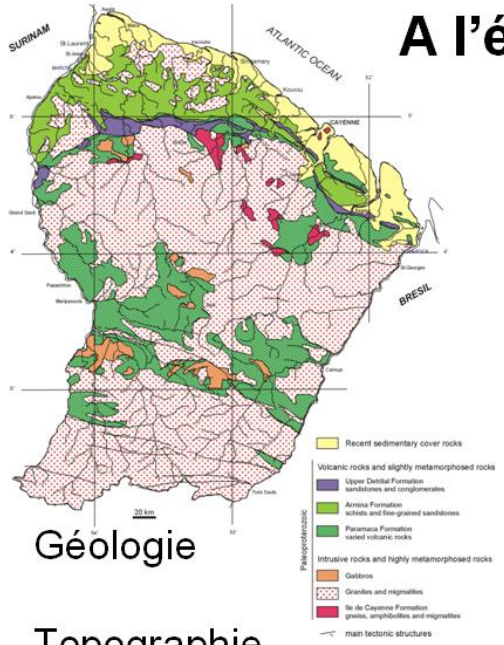
- The final result was chosen by comparison with local maps (TerSteege *et al.*, 2001), experts knowledge (Botanist, forester, etc.) and regional maps (IBGE, Eva *et al.*, 2004).

Cluster distribution



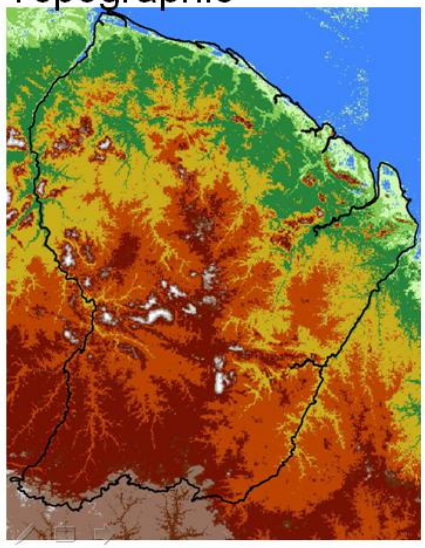
Statistics with environnemental parameters

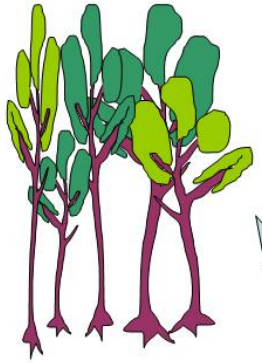
A l'échelle de la Guyane



Géologie

Topographie



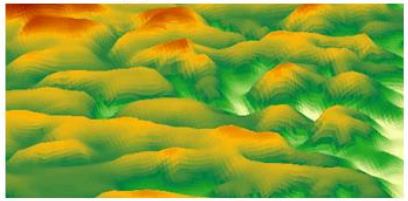


Stature de la forêt ?

Espèces dominantes ?
Epèces remarquables ?

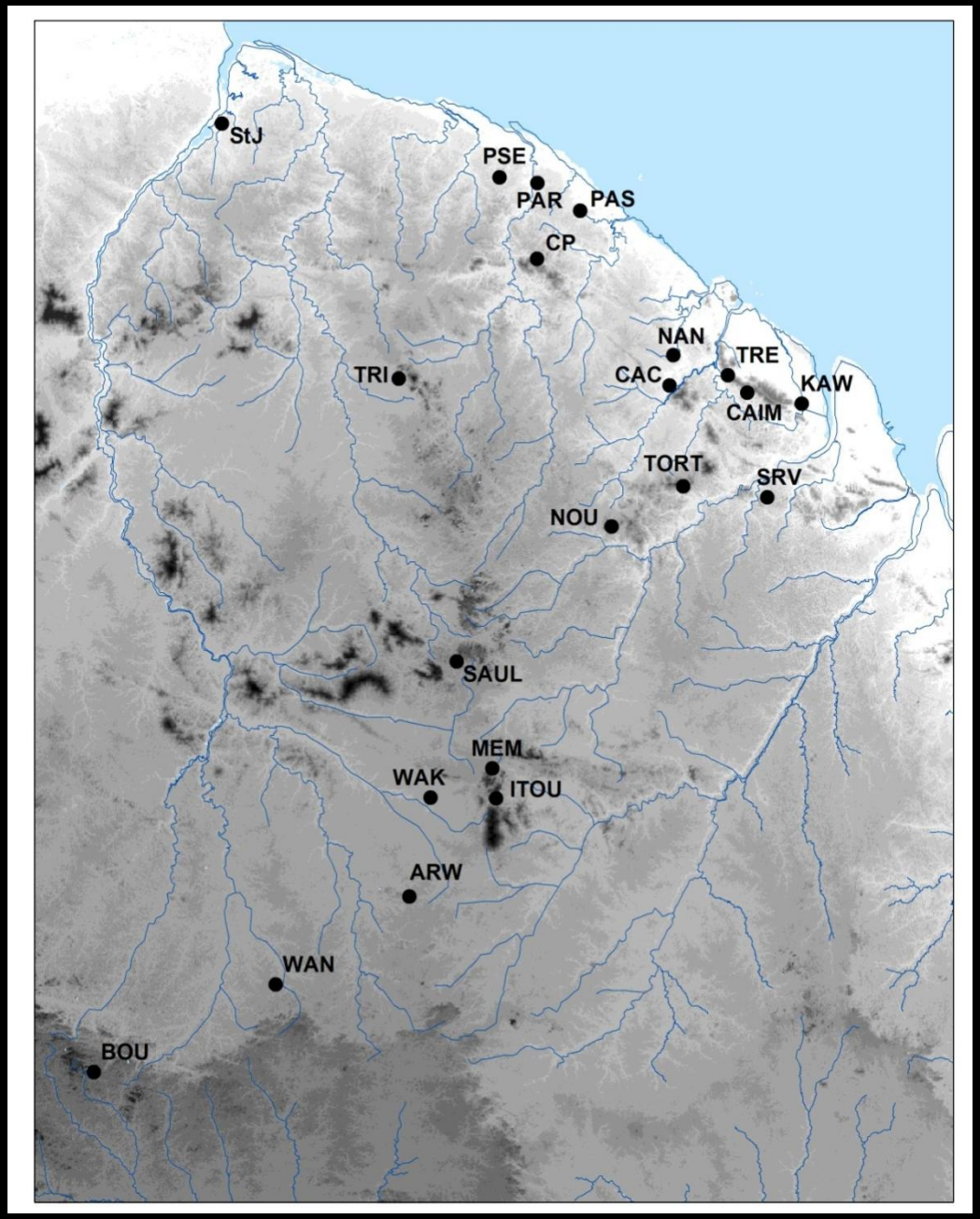
Système-sol
dominant d'une région

Régions
géomorphologiques



Géomorphologie
caractéristique
(formes des reliefs)

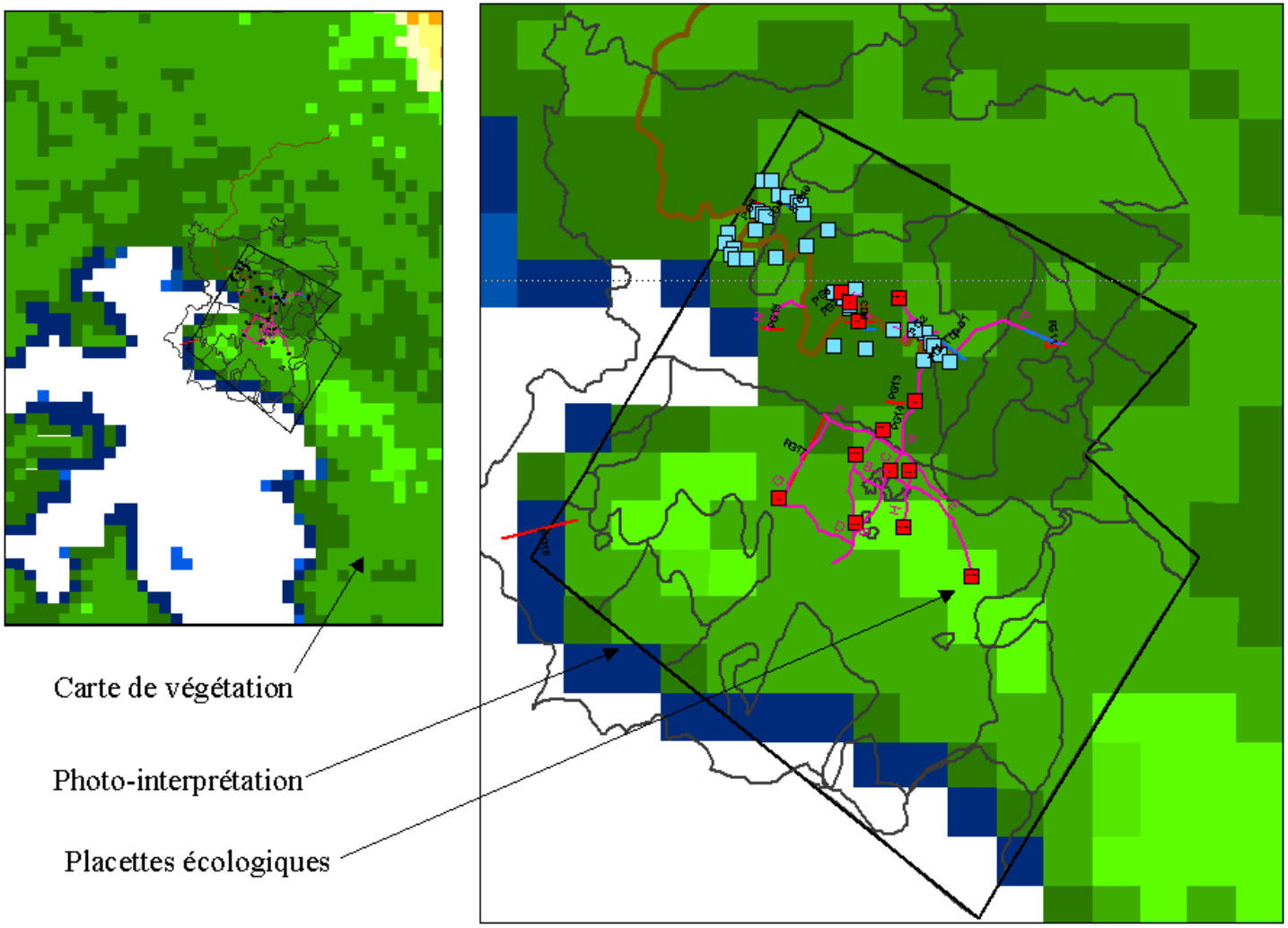
Sampling sites



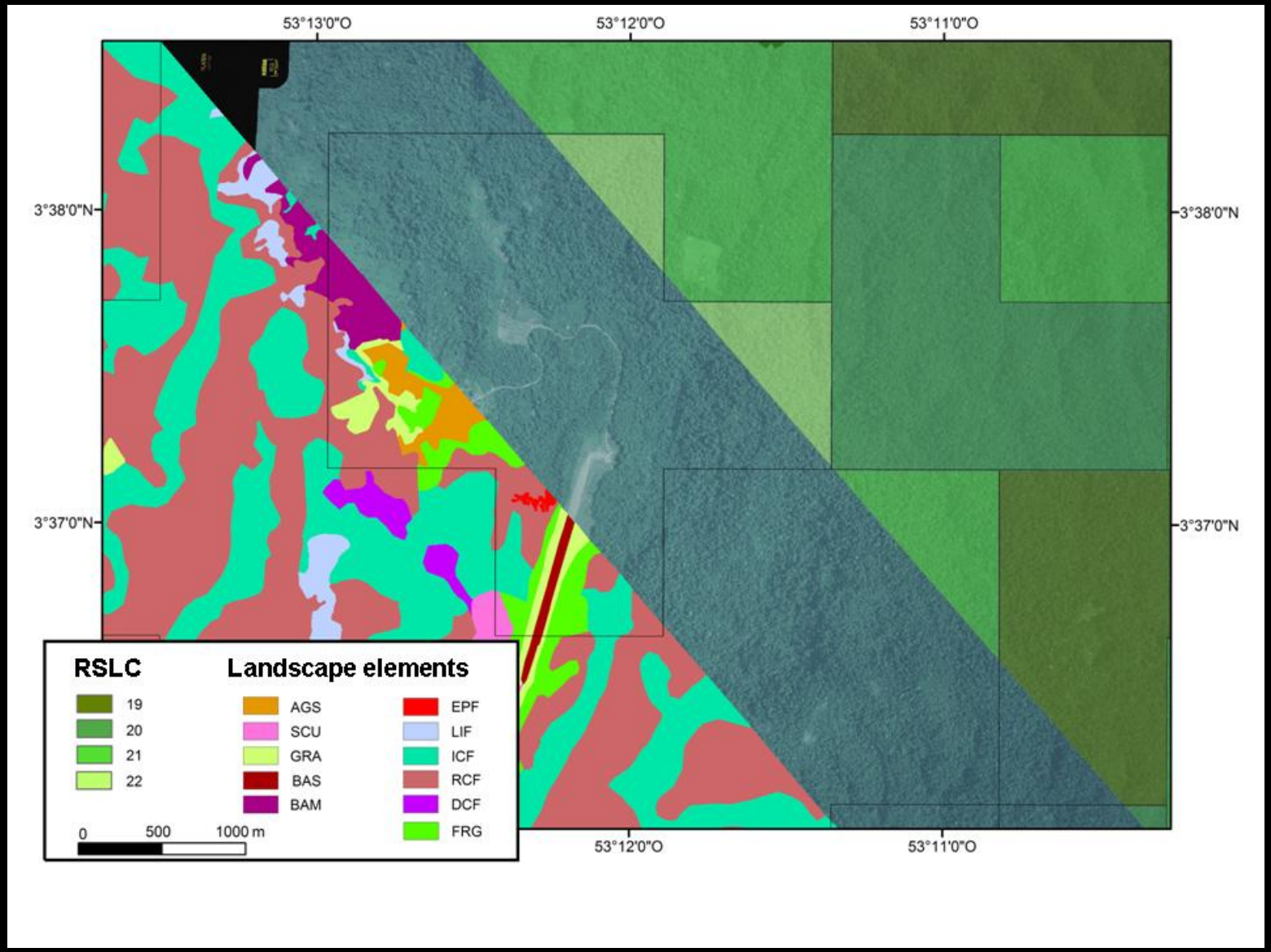
Botanical and canopy structure description

SRTM data

Sampling site description



Sampling site, photo-interpretation, validation



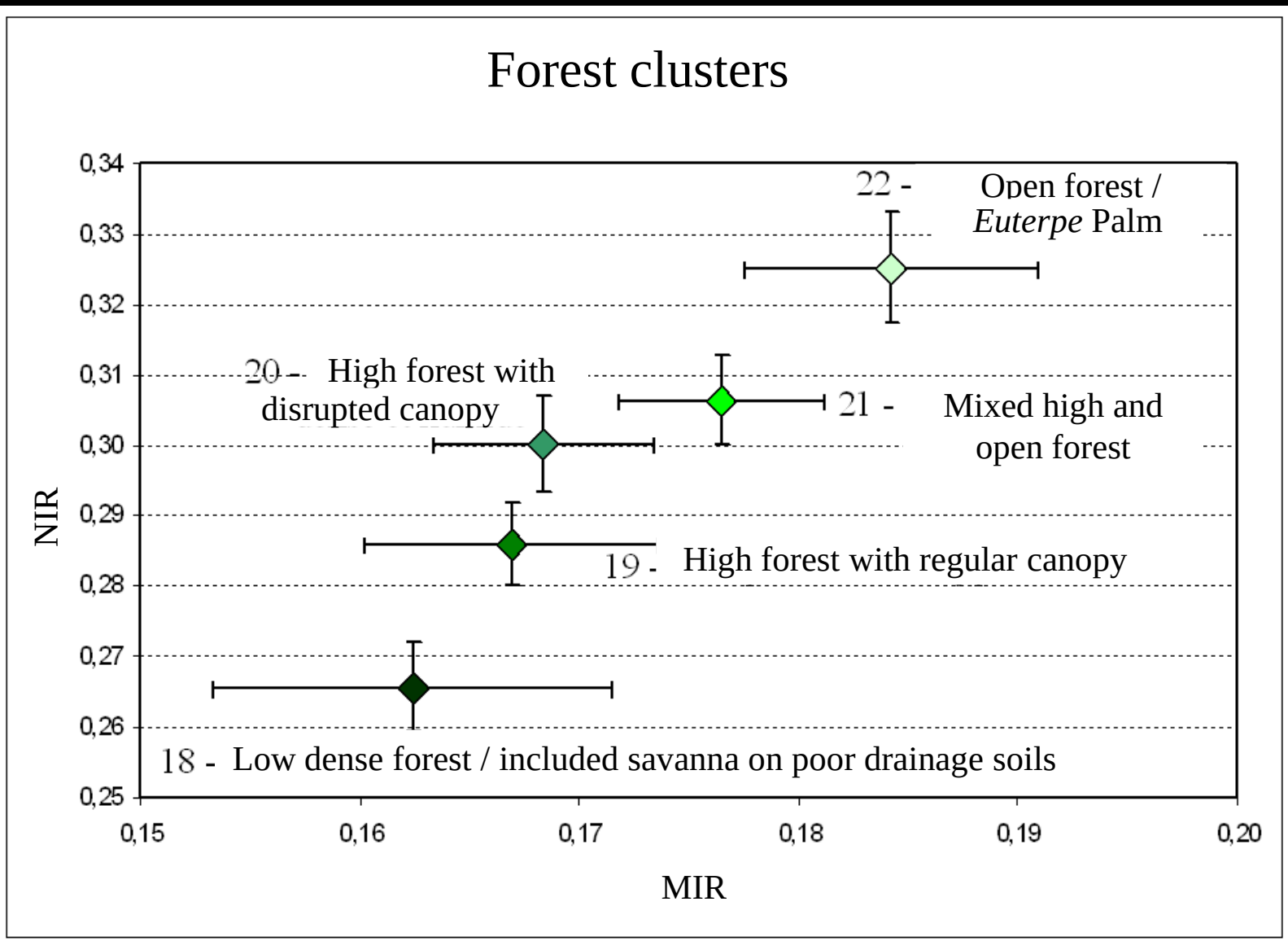
Field work on several validation points

Photo : Daniel Sabatier

Transects for validation

Photo : Valéry Gond

Cluster distribution



Land cover : Low dense forest / included savanna on poor drainage soils (LC 18)

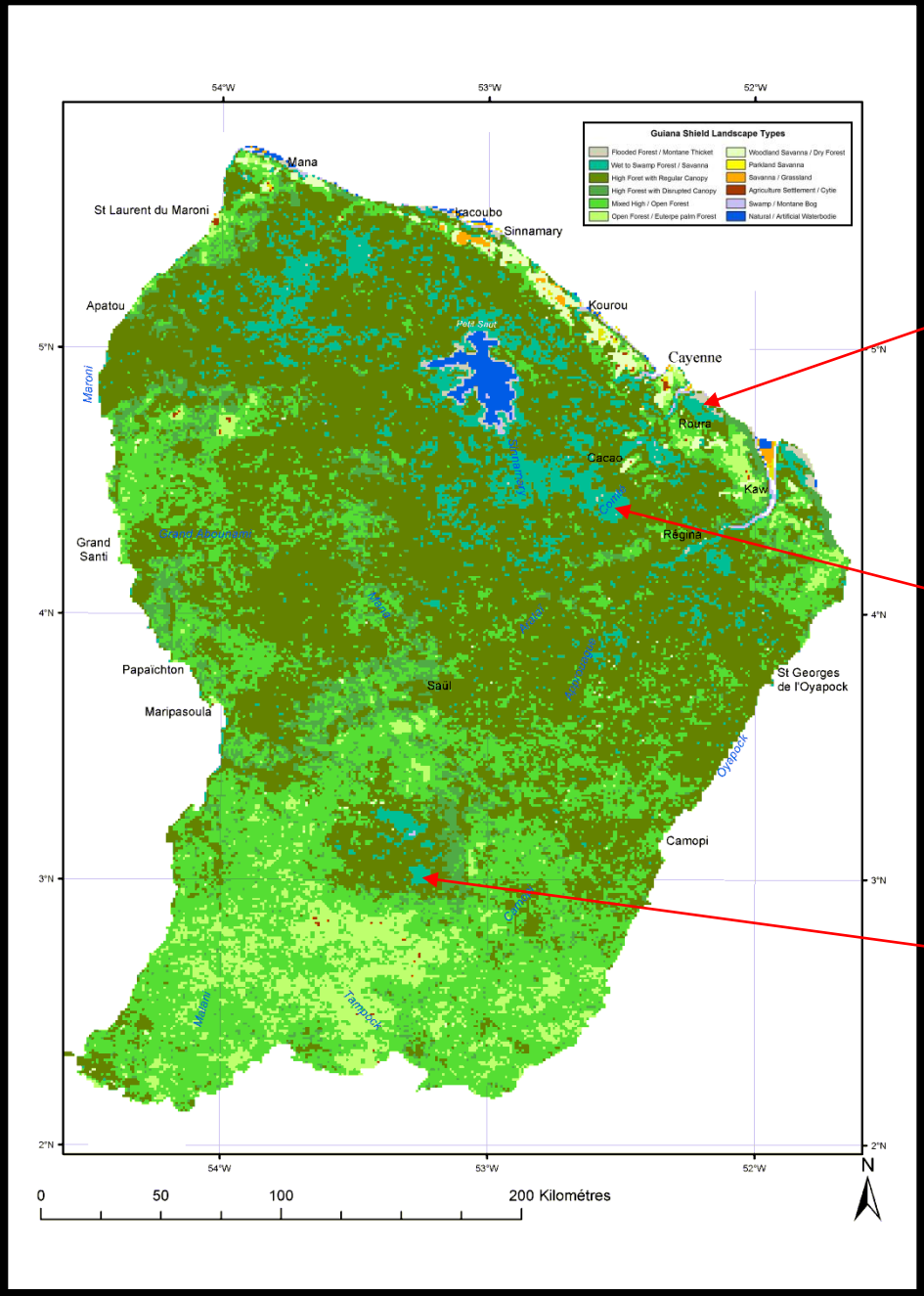


Photo : D. Sabatier et K. Jousseaume

Land cover : High forest with regular canopy mostly on *terra firme* (LC 19)

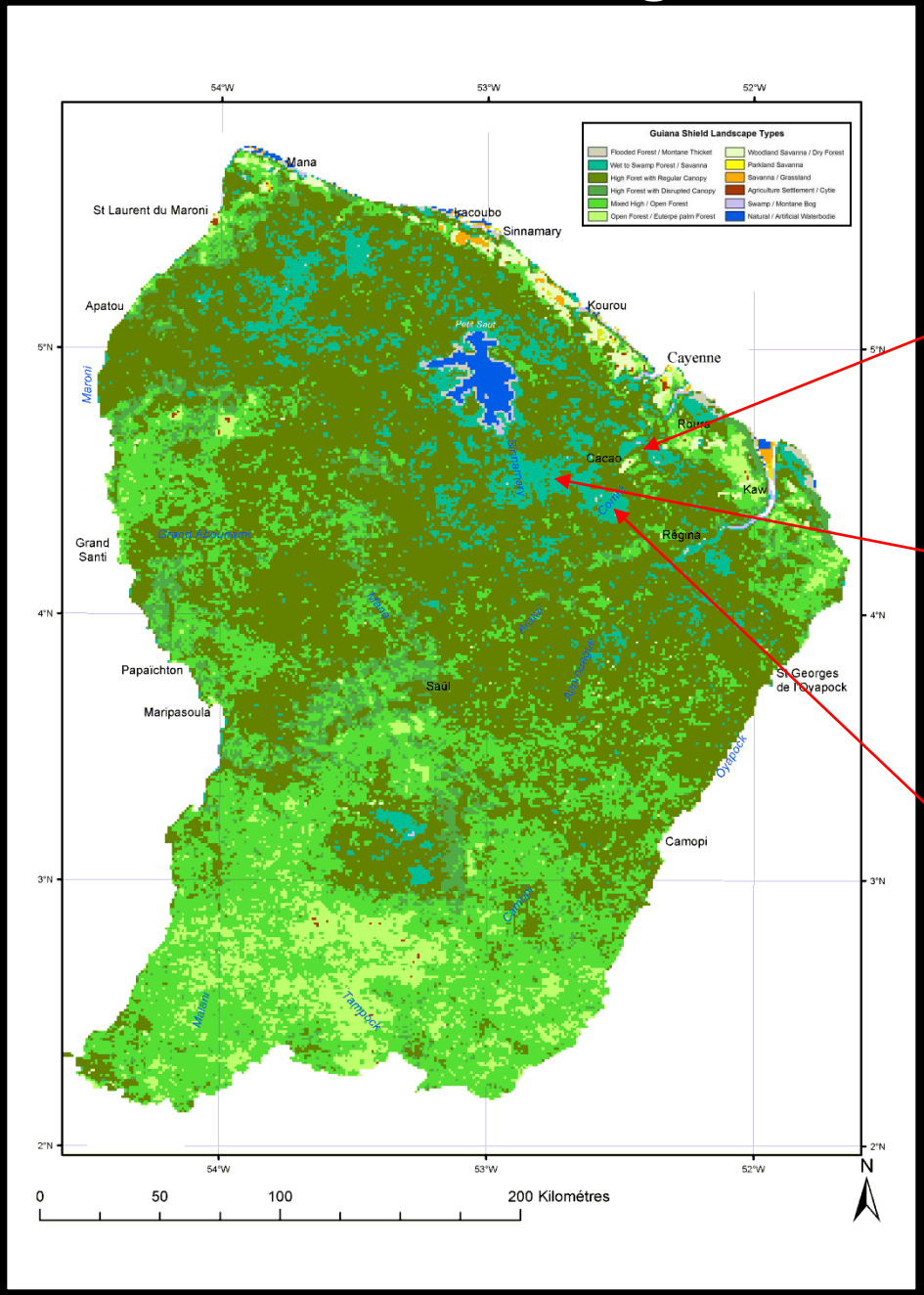


Photo : D. Sabatier et V. Gond

Land cover : Mixed high and open forest (LC21)

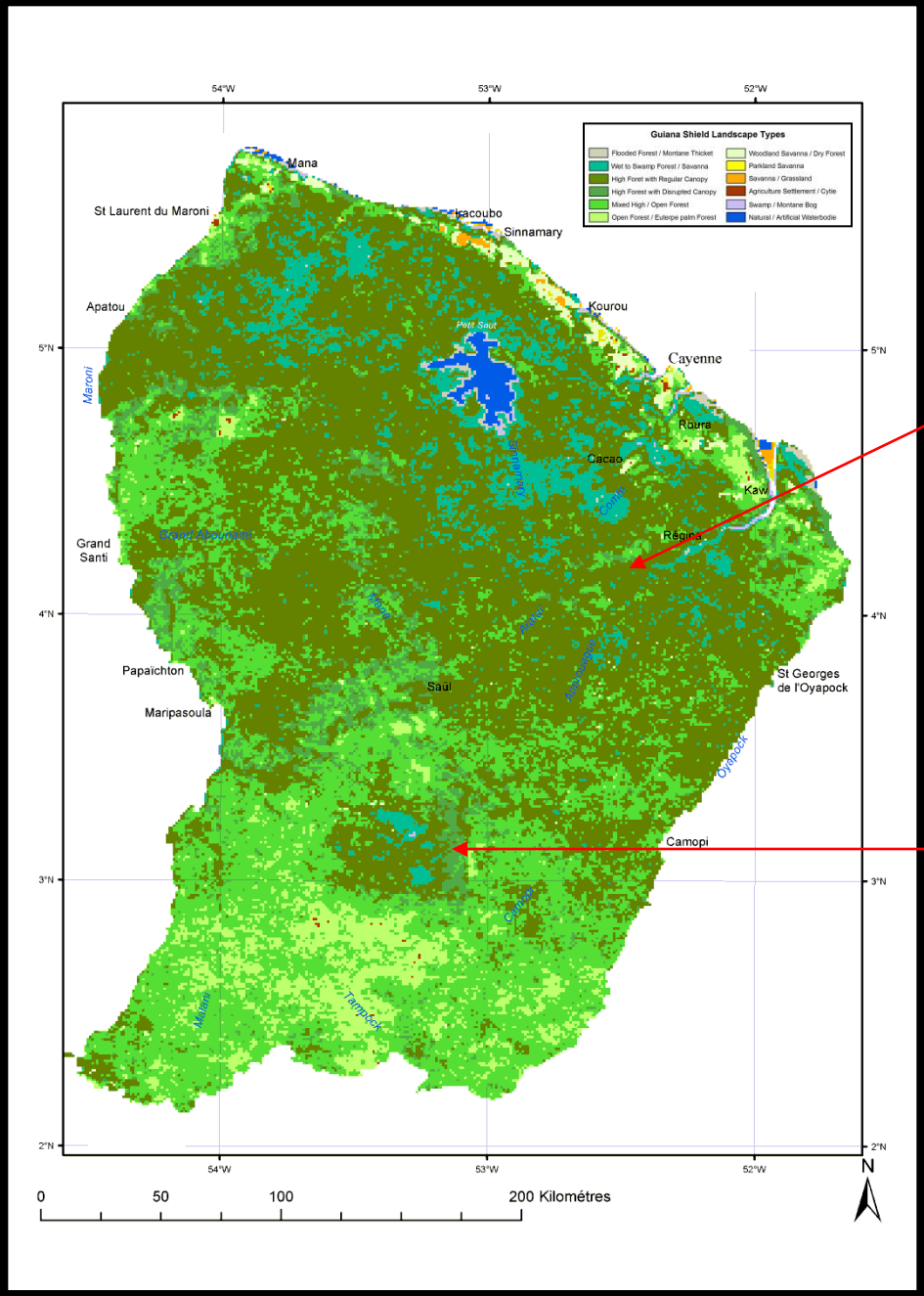


Photo : D. Sabatier et V. Gond

Land cover : open forest / *Euterpe* palm forest (LC22)

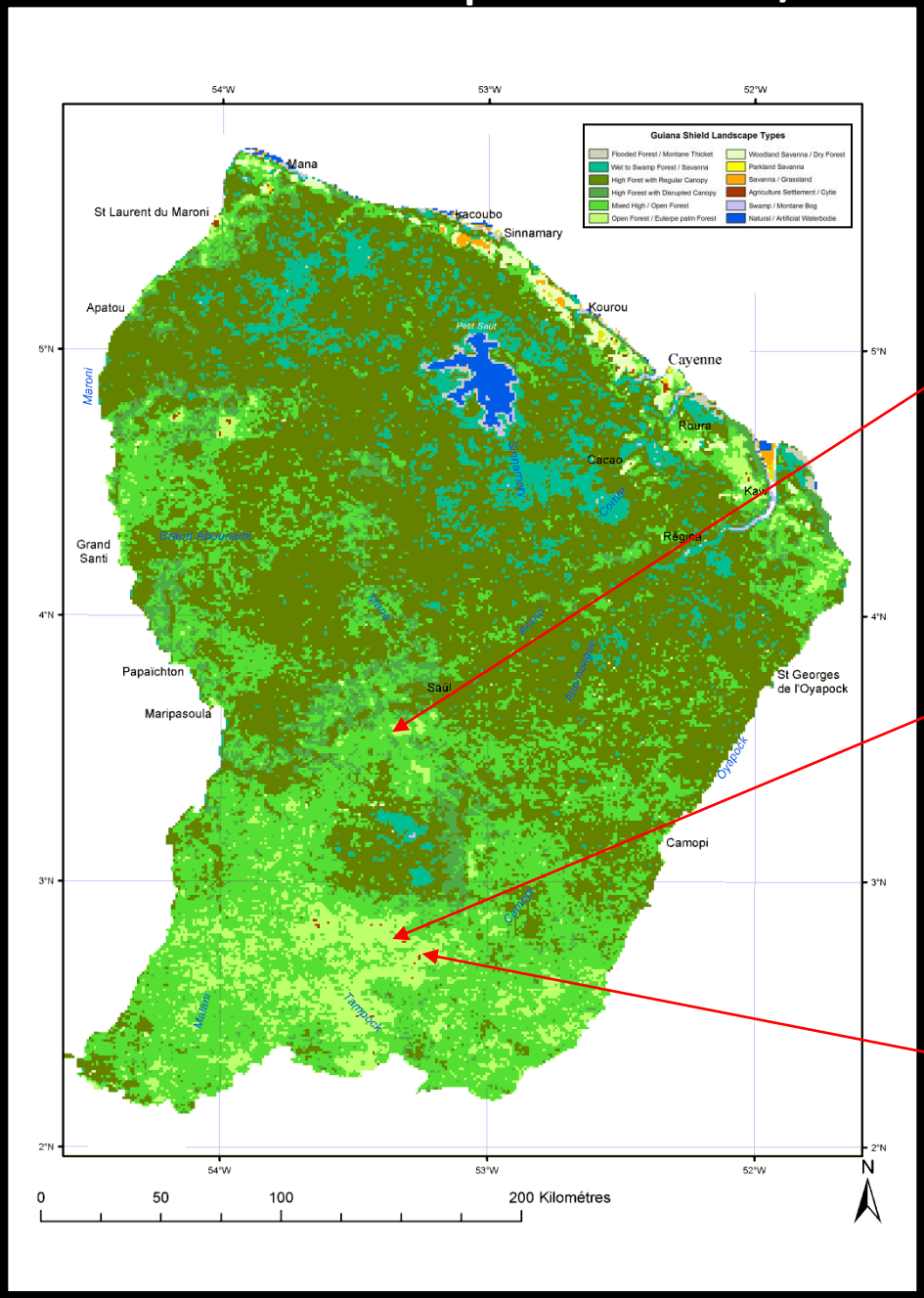
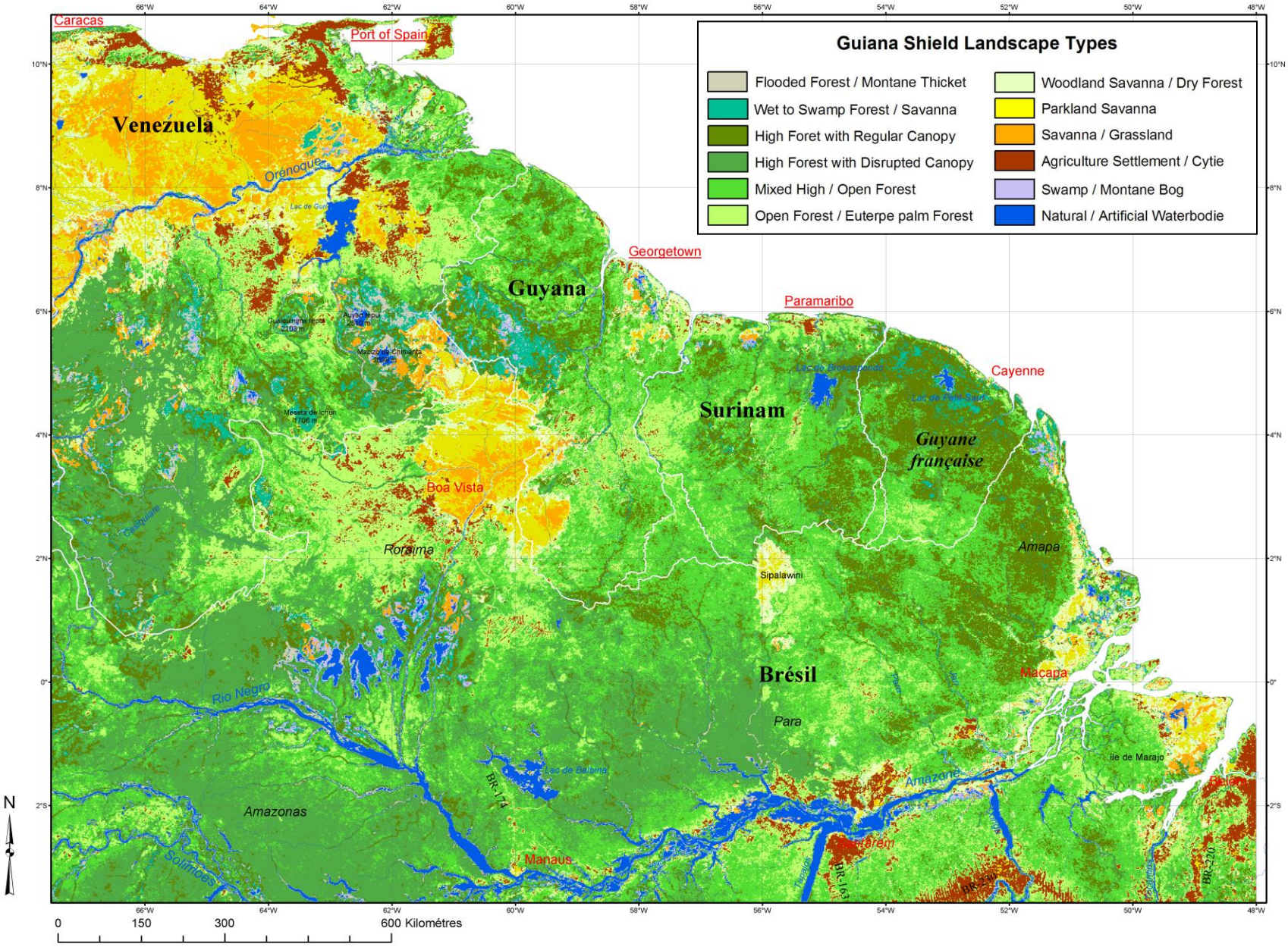


Photo : D. Sabatier et V. Gond

Land use mapping using SPOT/VGT time series data

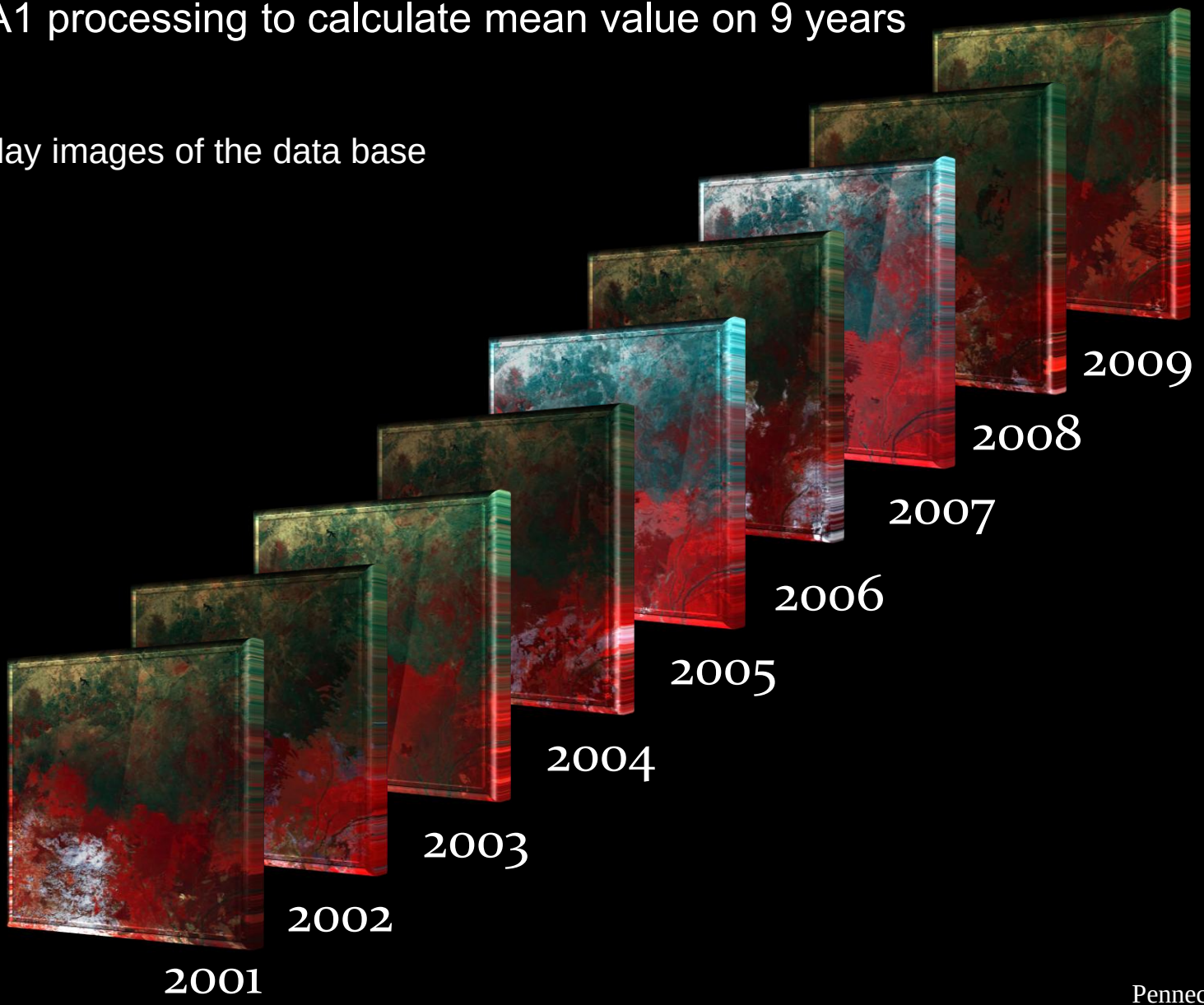


Gond, *et al.*, 2011

Phenology analysis using MODIS data time series

- MOD13A1 processing to calculate mean value on 9 years

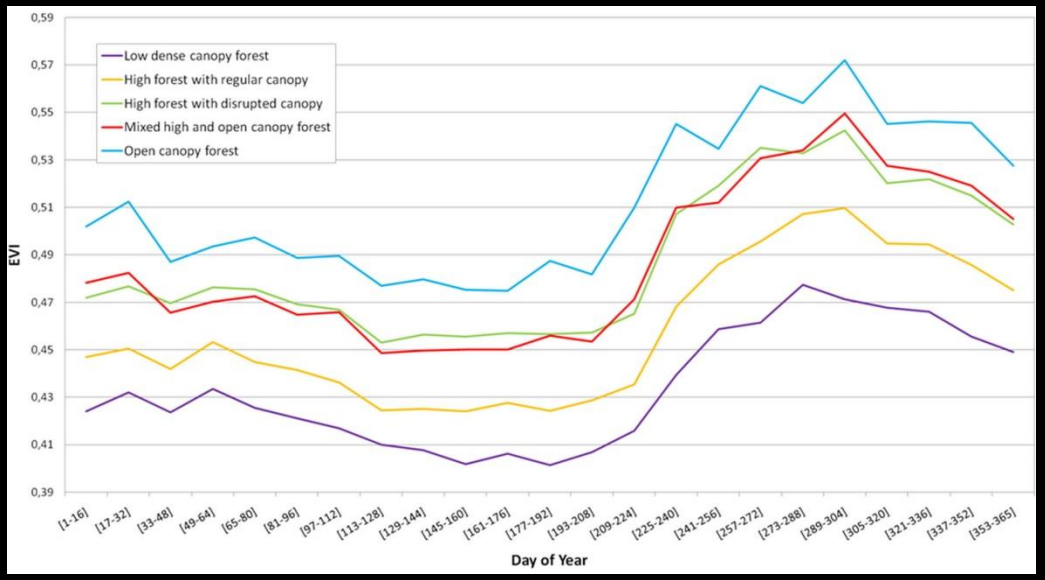
1st 16-day images of the data base



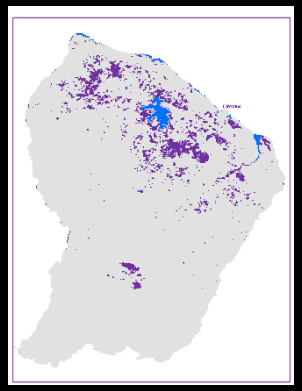
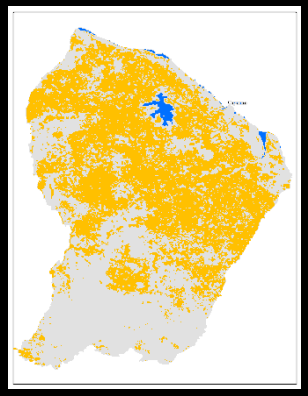
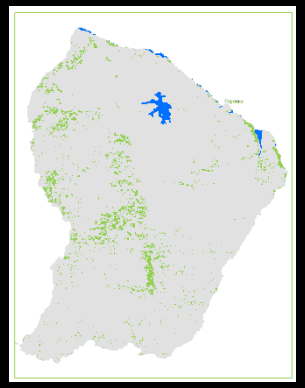
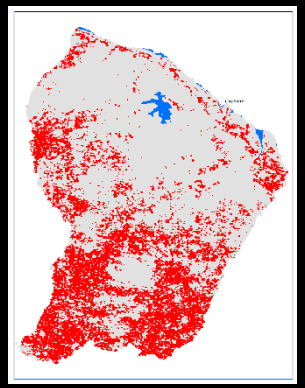
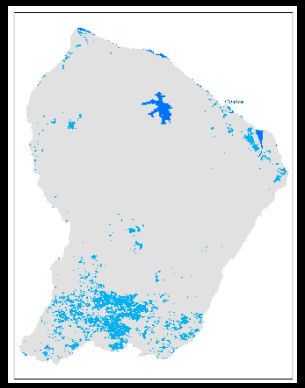
Pennec *et al.*, 2011

Temporal analysis on the spatial data base from SPOT/VGT

- MODIS temporal dynamique on SPOT/VGT classes

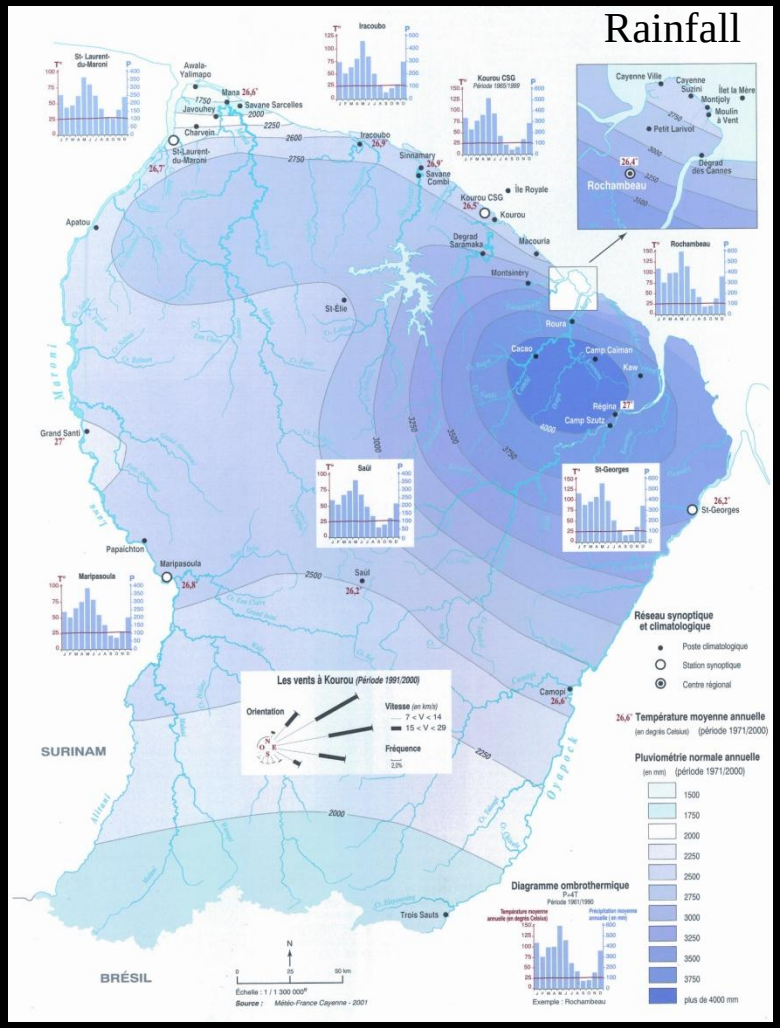


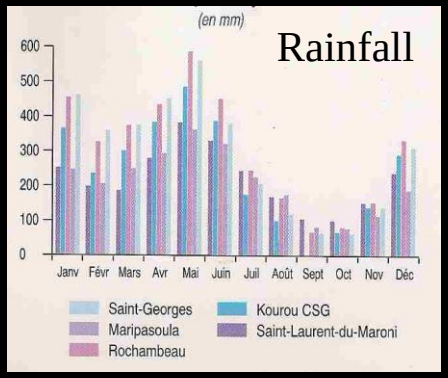
SPOT/VGT classes locations

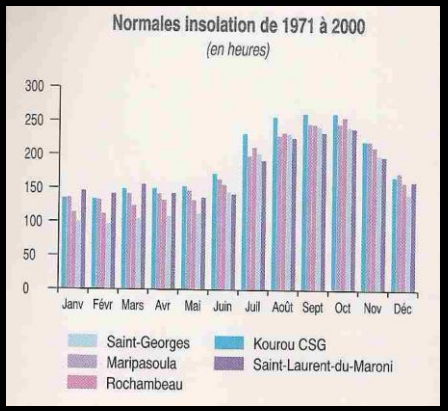






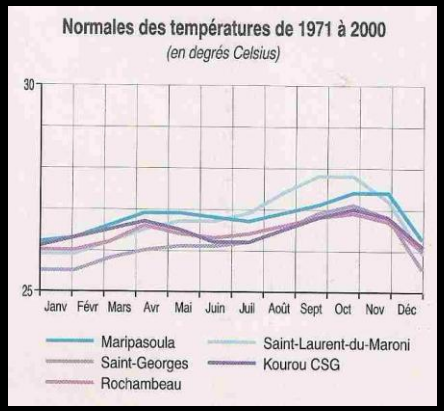
Pennec *et al.*, 2011

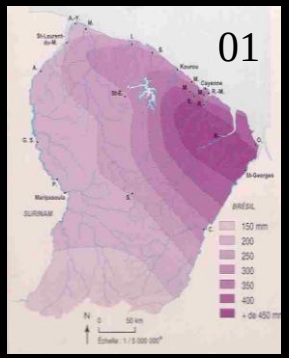
Meteorology

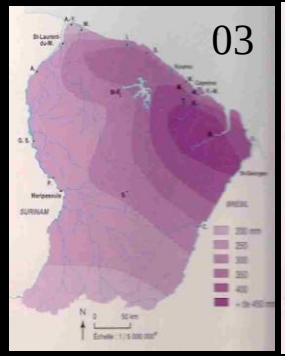


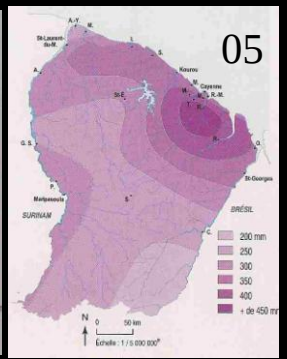


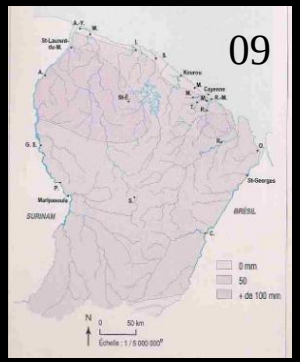




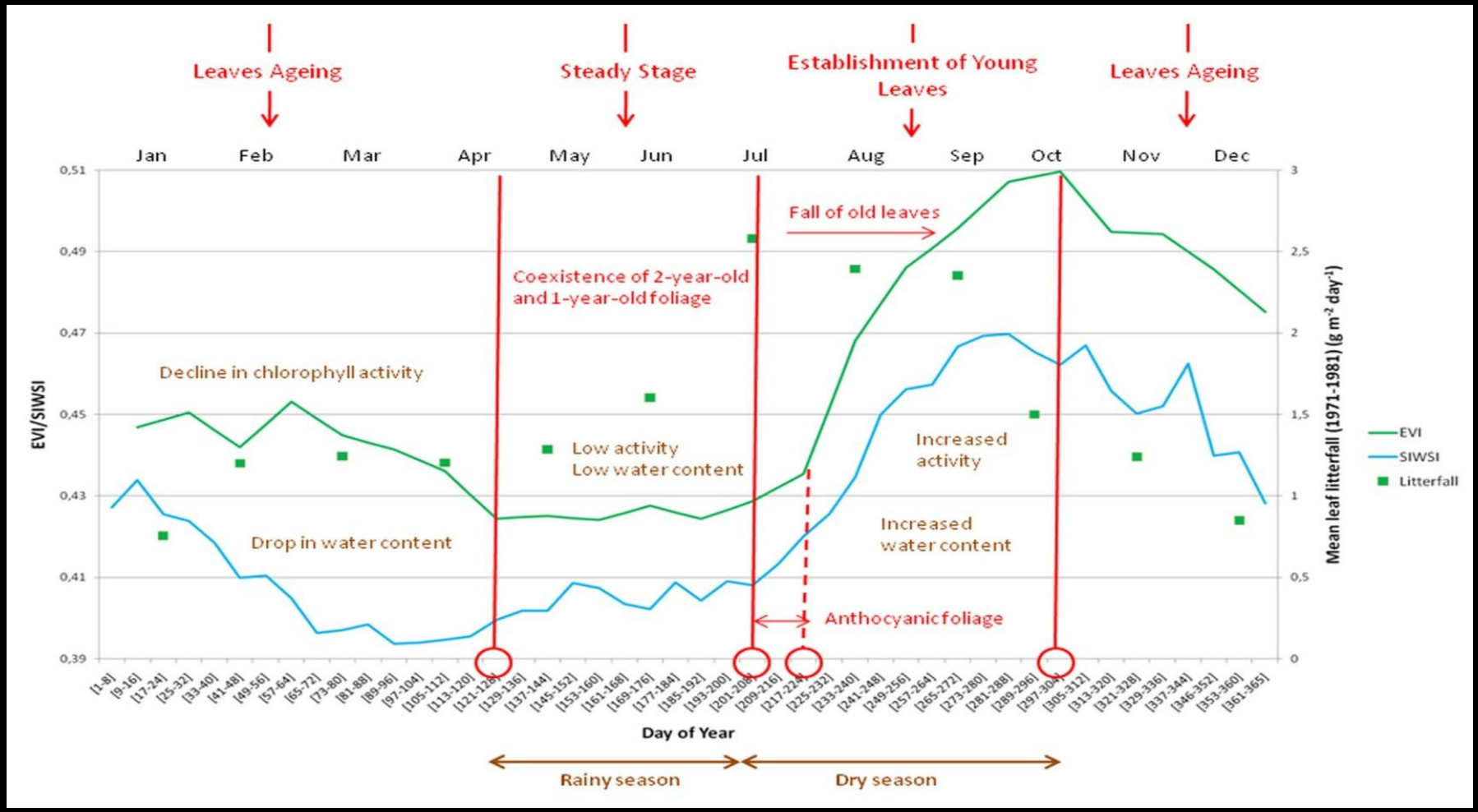








Phenological interpretation



Pennec *et al.*, 2011

Conclusion

- Remote sensing allows to characterize spatial organization and phenology of the tropical humid forests of the Guiana Shield

- These information are important to better estimate forest biomass and carbon storage

- The mapping of these ecosystems give a more precise idea of their vulnerability in face of the global changes

Thank you

Gond, V., Freycon, V., Molino, J.-F., Brunaux, O., Ingrassia, F., Joubert, P., Pekel, J-F., Prévost, M.F., Thierron, V., Trombe, P-J., Sabatier, D., 2011, Broad scale patterns of forest landscape in Guiana Shield rain forests, *International journal of Applied Earth Observation and Geoinformations*, **13**: 357-367.

Pennec, A., Gond, V., Sabatier, D., 2011, Characterization of tropical forests phenology in French Guiana using MODIS time-series, *Remote Sensing Letters*, **2**(4): 337-345.

Tritsch, I., Gond, V., Oszwald, J., Davy, D., Grenand, P., 2012, Dynamiques territoriales des Amérindiens Wayãpi et Teko du moyen Oyapock, Camopi, Guyane Française, *Bois et Forêts des Tropiques*, 311: 49-61.

Guitet, S., Pithon, S., Brunaux, O., Jubelin, G., Gond, V., 2012, Impacts of logging on the canopy and the consequences for forest management in French Guiana, *Forest Ecology and Management*, 277: 124-131.

Pithon, S., Jubelin, G., Guitet, S., Gond, V., 2013, Statistical based method for logging-related canopy gap detection using high resolution optical remote sensing, *International Journal of Remote Sensing*, 34: 700-711.