



Assessment of Fire impacts on semi-arid vegetation using MODIS data

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West Africa Regional Network (WARN) GOFC-GOLD

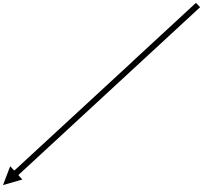


Climatic zones

(Source: WMO 2001)

- Humid
- Sub-humid Humid
- Sub-humid Dry
- Semi-arid
- Arid
- Hyper-arid

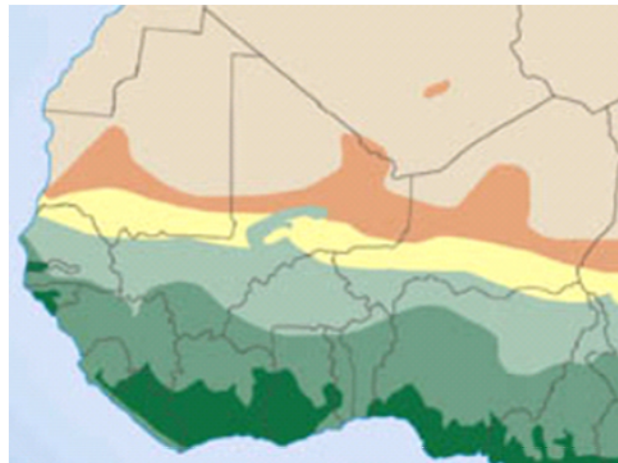
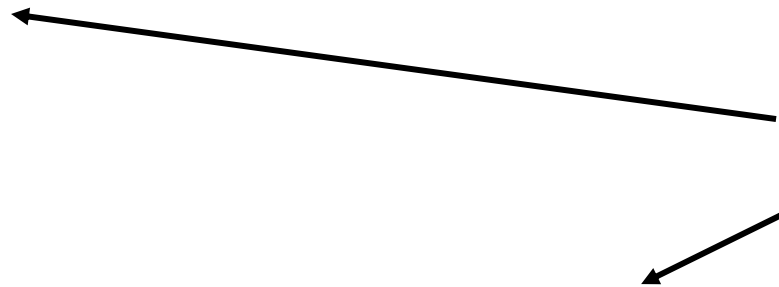
Sahel Zone



Climatic Transition Zone:

Irregular spatio-temporal rainfall (< 600 mm/year) and contrasted seasons)

West Africa is characterized by:

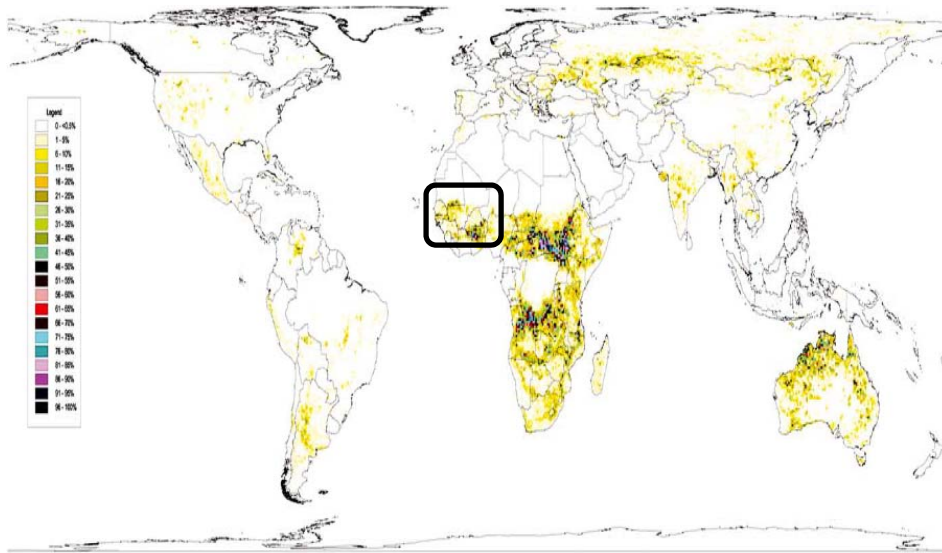


Vegetation types:

- Desert
- Semi-desert
- Steppe
- Savanna grassland
- Deciduous forest –Woodland Savanna
- Tropical rain forest

Savanna Ecosystem

West Africa = One of the major zones, regularly burned in the world



Global burned area map of the year 2000 (*Tansey et al. 2004*)

Fire as tool:

- Natural resources exploitation (Agriculture, Hunting, pasture...)
- Ecosystems Monitoring and Management (Protected Areas)
- Traditional rites, etc

In the context of **global climatic changes**, what is the role of **fire** on savanna **ecosystems** characterized by **pluviometric and edaphic constraints**.

We need to elaborate a **Fire history map** = a priceless source for an integrated modeling of fire-prone vegetation dynamic in the tropical savanna areas on a wide spatio-temporal scale (Hill *et al.* 2006) (**Lag-effects of vegetation**).

By the way that **Fire = Temporal dynamic phenomenon**

Only **MODIS data** with High temporal resolution and availability at free of cost

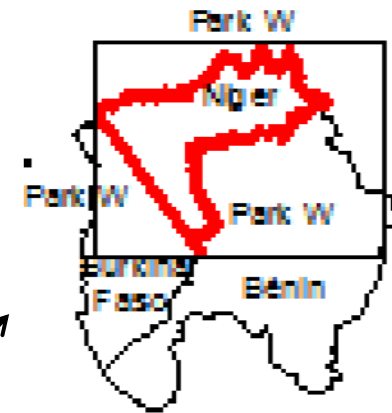
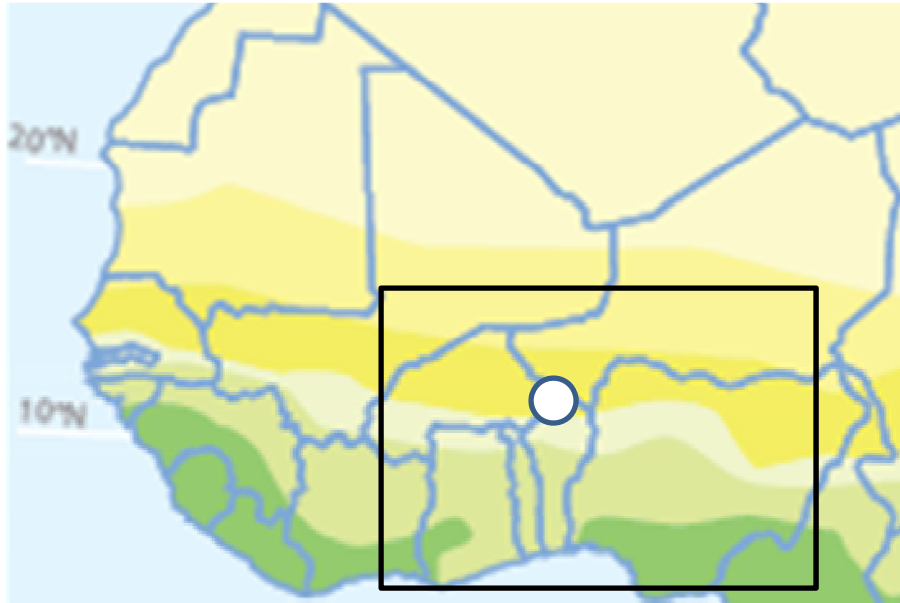
Field data : - Floristic and dendrometric parameters
 - Edaphic and topographic conditions, etc....
 30x30m or 50x50m plot (Savanna features spatial extend)

MODIS Data commonly used (**Active Fire MOD14 and Burned Area MCD45A products**) to analyze the fire spatio-temporal distribution:

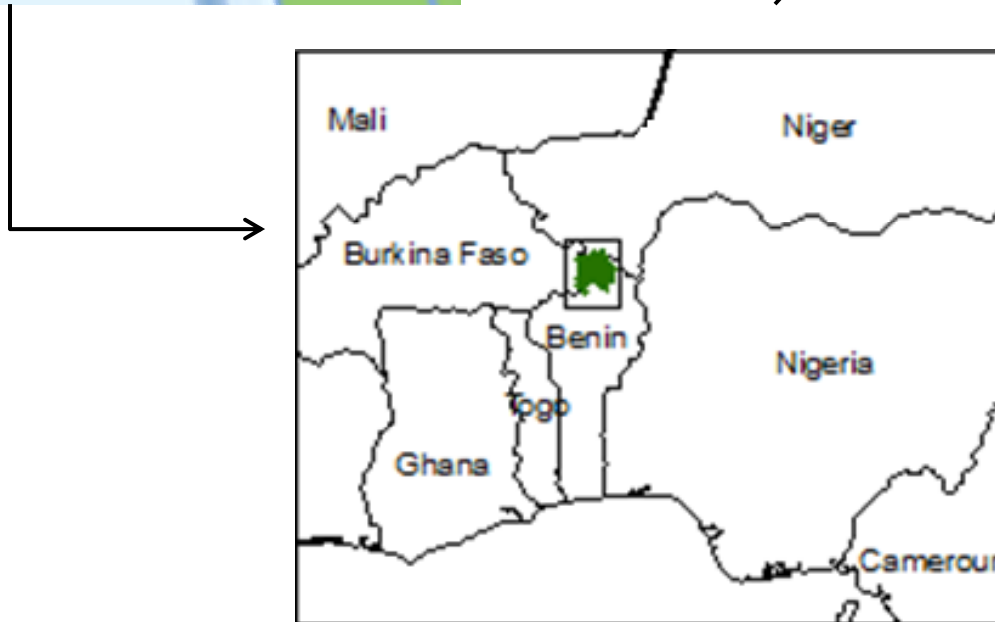
- Pixel size (1km and 500m vs 50m)
- biais related to fire detection (% surface in a pixel)

W Regional Park Case : a Transboundary Protected Area

Fire = main tool of management



Niger part of W



Aqua MODIS daily surface reflectance image with 250m spatial resolution (Product MYD09GQK, collection 5, level 2 (L2G), tile h18v07, channel 1 (red) and 2 (near-infrared))

Period: October 2002 to Mars 2009 (**7 years**)

Fire season (October to Mars) = Dry season

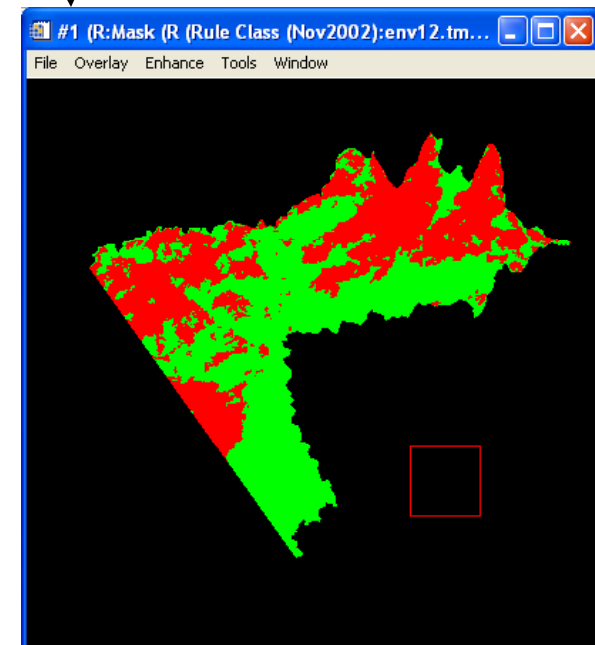
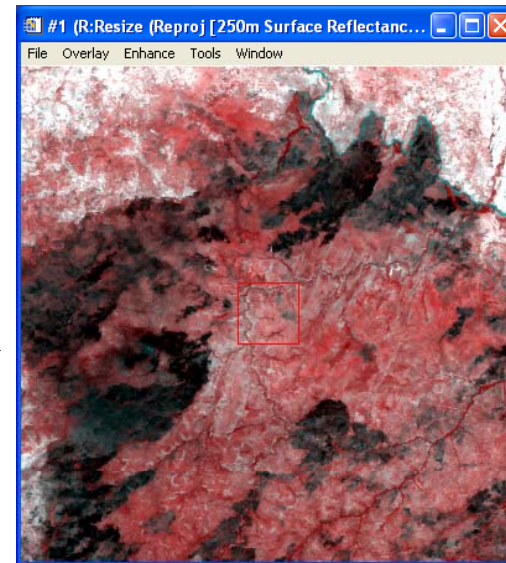
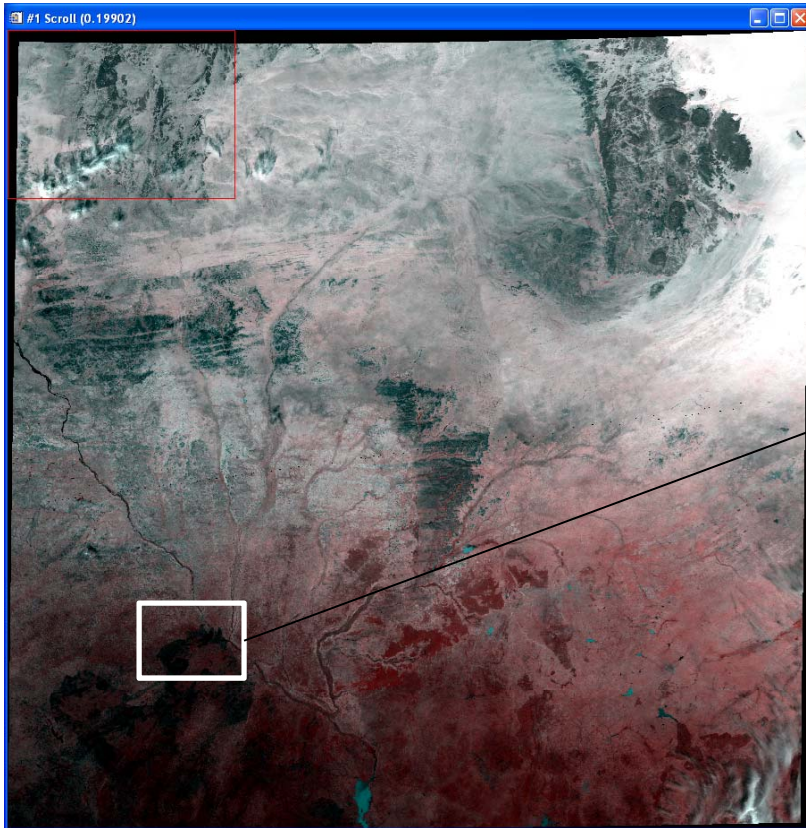
Early dry season Fire (October to December)

Late dry season Fire (January to March)

} **Vegetation
weather
conditions**

2 images/month (interval 10-15 days) after scanning for cloud-free and near nadir acquisitions : total 84 images

fire scars extraction: Classical methods (Image by image)

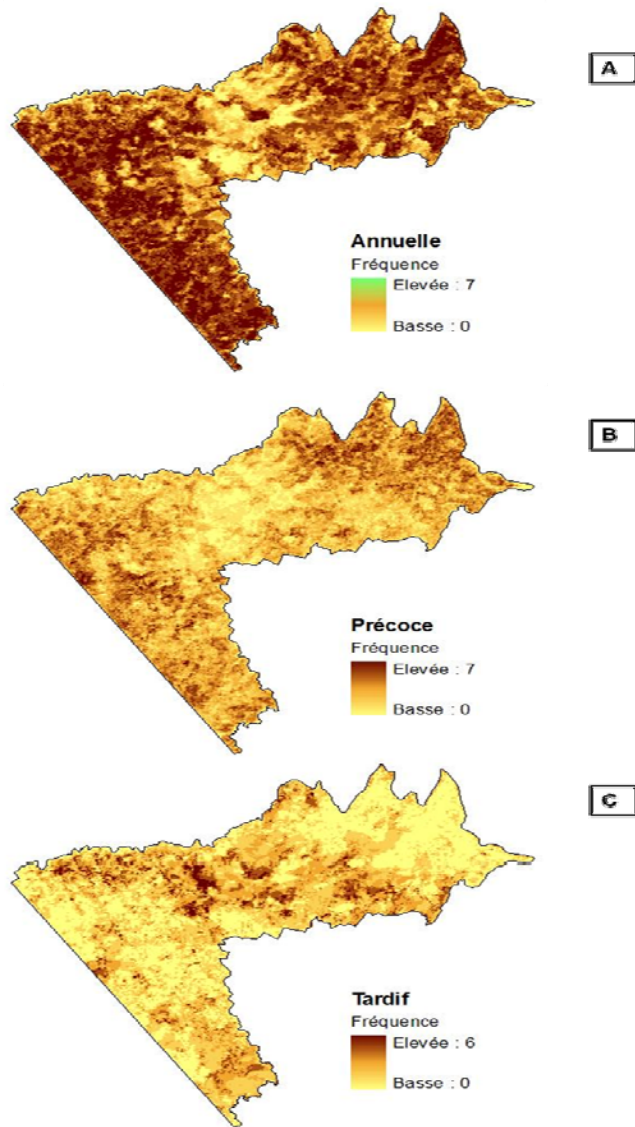


November 27, 2002

- Re-projection: WGS84/UTM 31 N
- Image Composition (2-2-1)
- Spatial subset
- Maximum likelihood classifier (Burned and unburned)

WARN 18-19th October 2011 Stresa, ITALY

Fire maps elaboration: Surimposition of monthly fire-affected areas



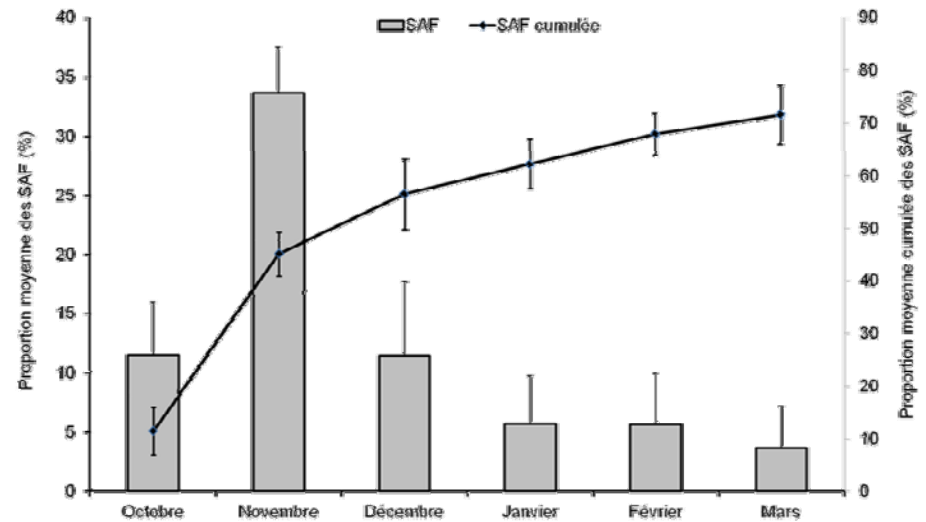
Fire seasonality and frequency maps

Mosaic patches according to fire frequency

A = Fire history map (7 years)

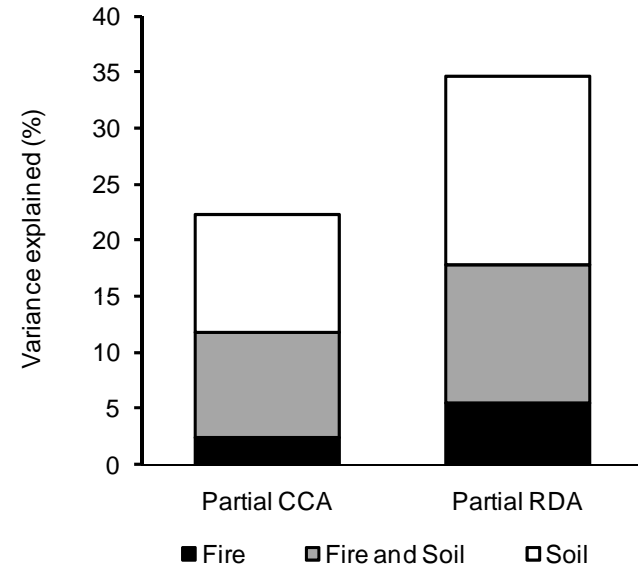
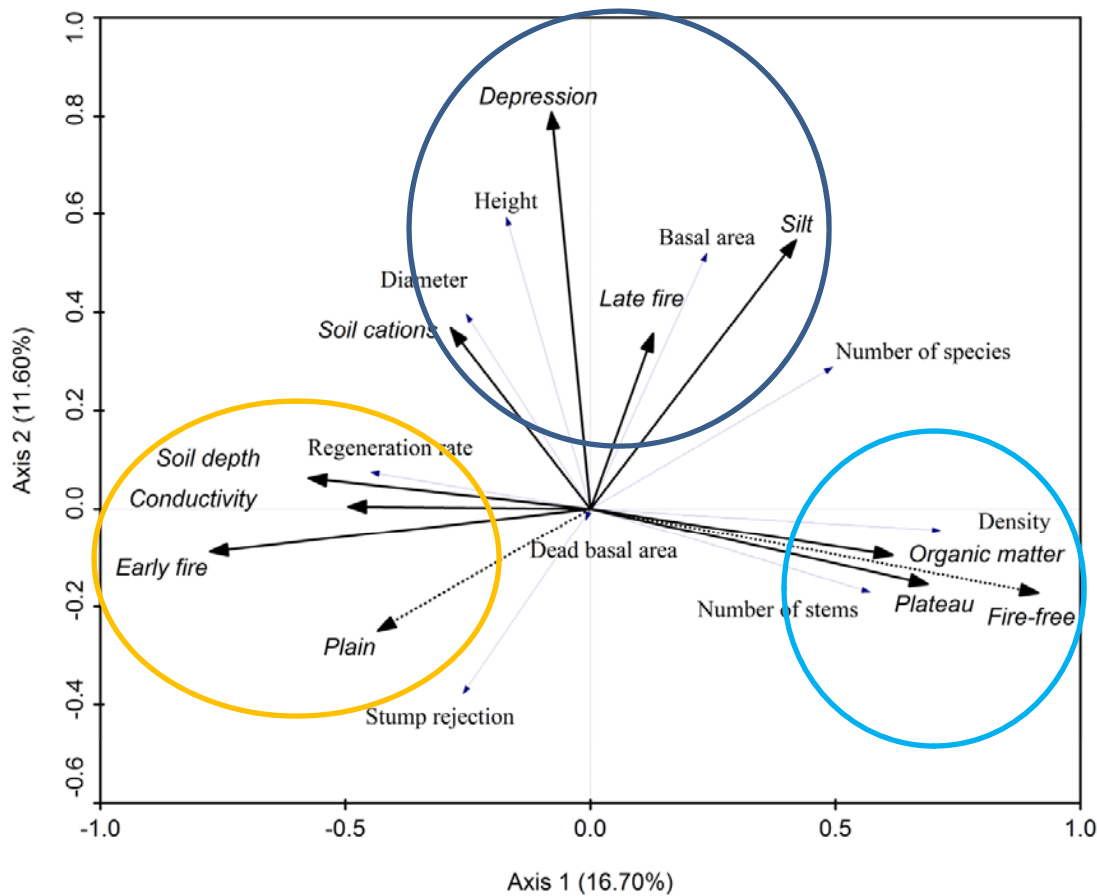
B = Early dry season fire

C = Late dry season fire



Same spatio-temporal distribution of fire as based on Active fire (Gregoire & Simonetti, 2010)

Multivariate Analysis: fire-soil-vegetation relationships



strong influence of natural factors such as vegetation characteristics, climate conditions and topography on fire distribution (Mbow et al. 2003)

High temporal and spatial resolution data:

- well categorize the Fire activity
- Best Estimation of burned biomass, consequently gases emission
- Performing Fire management

THANKS!!!

Sorry again for my english