



Observatories , LMIs & PPRs: An array of instruments for global change research in West Africa

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Articulating Science and Partnership

Observatories

The need for observing transitions in the Earth System

- Detection and Attribution
- Process studies
- Model validation



LMIs

Anchoring the partnership

- Building a common scientific vision
- Meeting local needs
- Sharing responsibilities

PPRs (*Plate-formes Pluridisciplinaires Régionales*)

A tool for integration and fund raising

1. Observatories

Documenting transitory states related to global changes

Atmospheric monitoring from Met. Networks

Continental Surfaces Global change perspective

AMMA-CATCH

- Meso sites and regional upscaling
- Water cycle and Vegetation

Continental Surfaces Hydrological processes

BVET

- Small Catchments (Cameroon)
- Bio-Geochemical cycles & Erosion



Water Cycle & Land Use Changes interacting with Climate Change

Meso Scale Sites

IRD/CNRS Involvement

- 3 labs (HSM, GET, LTHE)
- About 20 People + 10 occasional
- 120 to 150 k€/year for operations

African Partnership

- Universities in Benin and Niger

Coll. with German Teams

- Science and Field Work : **Impetus**
- Training and Education : **Wascal**
- Opportunity : **Daciwa**
- Future Prospect : **Tereno**



Regional Upscaling

Other Obs. & Models

- Climatology : Intensification
- Modeling : ALMIP

The AMMA Project (2002-2009)

- European Project (*Hot Spot in the Earth Climate System*)

AMMA Phase # 2 (2010-....)

- Science and Field Work : **Daciwa**
- *Looking for opportunities at the European level*



Objectives



Documenting the water and ecological cycles in West Africa :

- **Detect** what is changing and how fast
- **Determine** the cause of these changes
- **Interpret** these changes: are they in the range of historical variability?
enable policy makers and public actors to know whether they should act

3 thematic axes

- Long-term evolution of eco-hydro-systems at regional scale
- Study of processes
- Meeting socio-economic and development needs



Observation strategy



3 meso scale sites (10 000 km²)

- Mali (300 mm/year)
- Niger (600 mm/year)
- Bénin (1200 mm/year)

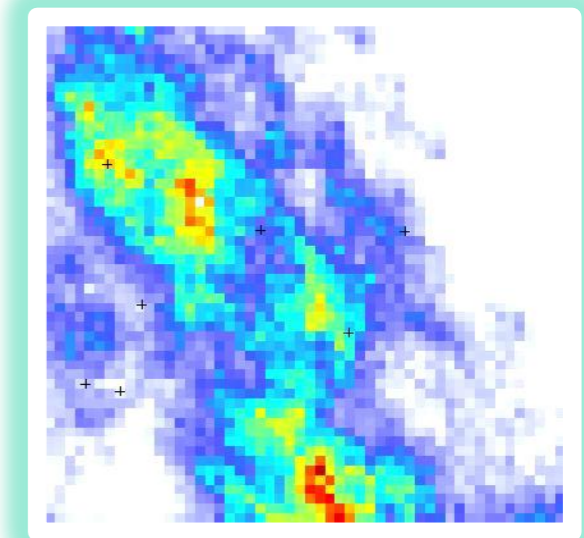
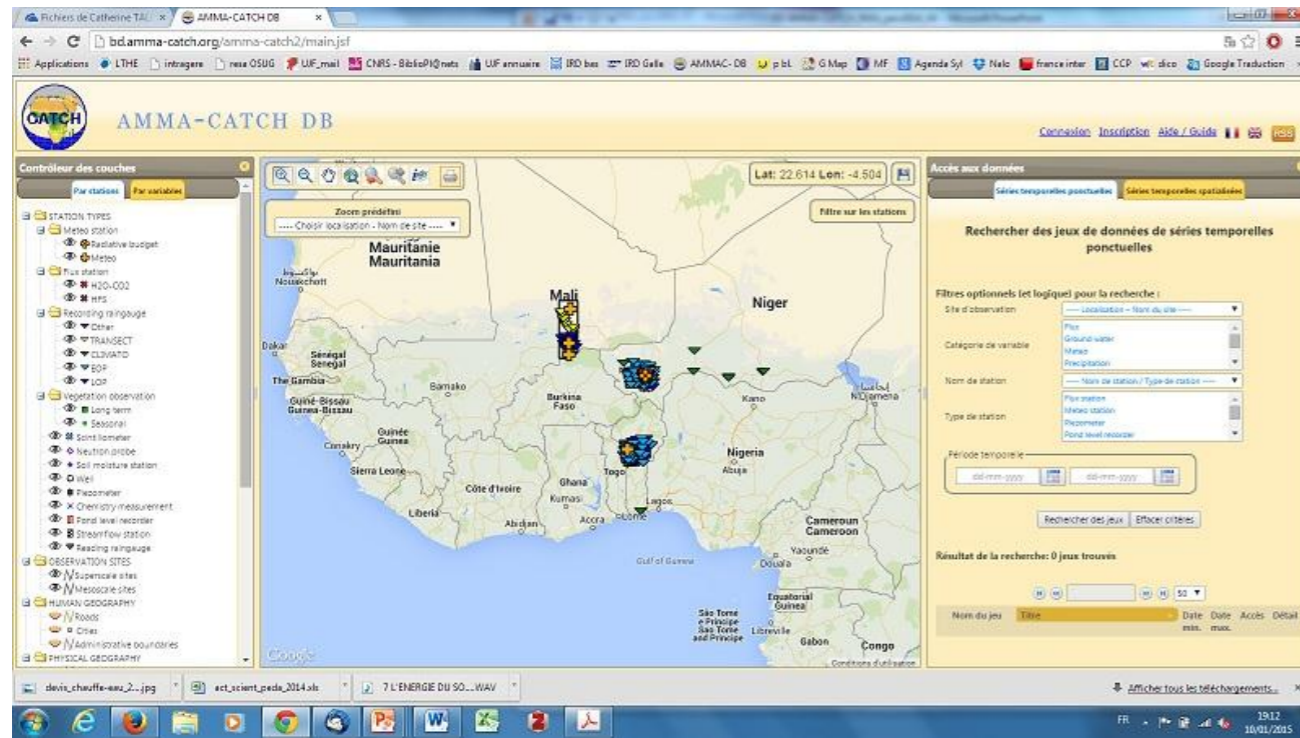
- Sampling the **eco-climatic gradient**
- **multi-scale** approach
- **homogeneous data set** on the 3 sites

Measured variables : Rainfall, Surface Met., Radiative Budget, Turbulent Fluxes, Soil Moisture, Aquifers, runoff, Vegetation

First measurements : **1990**, collaboration with **IMPETUS in Benin (2000-2009)**



Data base and projects



The AMMA-CATCH data web portal provides

- data directly collected by the AMMA-CATCH funded instruments (in situ data)
- value-added gridded products elaborated by the AMMA-CATCH teams

Some recent projects of the AMMA-CATCH Team

- Almip (AMMA Land Surface Model Intercomp. Project) : 9 countries, 24 models
- Cal/Val of Megha Tropiques , SMOS and SMAP satellite missions
- Member of the eLTER (european Long Term Ecological Res. Network (H2020/INFRAIA 2015) with **TERENO** (Towards a European network on the Critical Zone)
- Participation to education with **WASCAL** and organisation of field school
- Co-supervision of thesis with **WASCAL**

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Ocean Climate perspective

PIRATA

- Tropical Atlantic
- Surface conditions & ABL

Continental Surfaces Hydrological processes

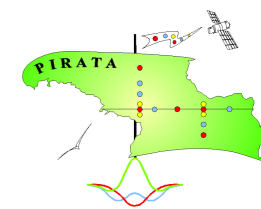
BVET

- Small Catchments (Cameroon)
- Bio-Geochemical cycles & Erosion

Ocean Sea Surface Salinity

SSS

- ThermoSalinoGraph (TSG)
instruments on ships



Currents, temperature, Air-sea Interactions

PIRATA Moorings

IRD/CNRS/IFREMER

- LEGOS, IMAGO & CNRM
- About 15 People + Occasional
- 100 k€/year + Ship Time

African Partnership

- Universities in Benin and Senegal

Coll. with German Teams

- Servicing an equatorial mooring :
GEOMAR (RV Meteor)

Associated Programs

The AMMA Project

- EGEE Ship Campaigns (*Hot Spot in the Earth Climate System*)

PREFACE (FP7) (2013-2017)

- Heat and freshwater budgets, air-sea interactions

ATLANTOS (H2020) (2015-....)

- Additional sensors on PIRATA moorings



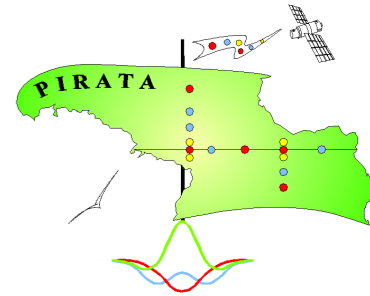
Collaborations between IRD/LEGOS (France) & GEOMAR (Germany)

(Bernard Boulès, IRD/LEGOS & colleagues / Peter Brandt, GEOMAR & colleagues)

Context: Ocean circulation & Climate in the Tropical Atlantic

=> *several programs from the early 90s...*

(*Tropical Atlantic Variability Group -US partners- / CLIVAR-Atlantic*)



then:

2005-2007: AMMA & EGEE (partners in AMMA-EU)

=> simultaneous oceanographic cruises in 2006

=> research collaborations



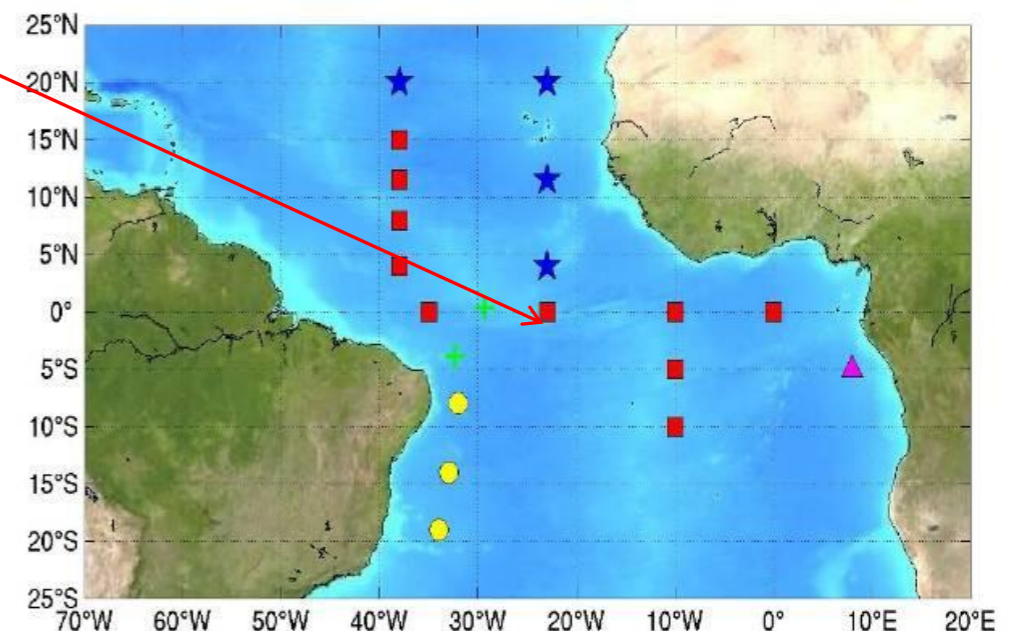
From 2006:

GEOMAR contribution in **PIRATA**

by servicing an equatorial mooring
(currentmeter at 23W-0N, French
component of the network)

METEOR RV Vessel

Fr-Br-US Pirata moorings network



From November 2013: EU-FP7 PREFACE program :



⇒ Collaborations through:

- operations at sea (PIRATA moorings servicing, new sensors...)
- scientific operations in common PREFACE Working Packages:

(e.g.: WP3: Heat and freshwater budgets, air-sea interactions &
WP4: Circulation and wave response)

From April 2015: EU-H2020 AtlantOS program :



⇒ Collaborations through additional sensors on PIRATA moorings
in the « WP3 = “Enhancement of autonomous observing networks”

⇒ *Common PIRATA & PREFACE yearly meeting
in CapeTown, 24-28 August, 2015.
including Clivar-Atlantic & AtlantOS related discussions*

⇒ *Several common publications with IRD & GEOMAR co-authors*

2. LMI: *Laboratoire Mixte International*

Anchoring the partnership between IRD and African research teams

A Network covering a large array of themes and countries

2 LMIs in Africa related to the Observatories

Climate & Ocean

ECLAIRS

West African Climate and its Regional Impacts : Understanding & Prediction

- Link with *PIRATA & AMMA-CATCH*
- Senegal, Benin, Ivory Coast
- France : IRD, CIRAD, 4 Universities
- 55 k€/ Year not including salaries

Hydrology & Water Resources

Picasseau

Impact of Climate and usages on water resources in SubSaharan Africa

- Link with AMMA-CATCH
- Benin, Burkina, Cameroon, Ivory Coast
- France : IRD, 3 Universities
- 40 k€/ Year not including salaries

Member Institutions

In Senegal,

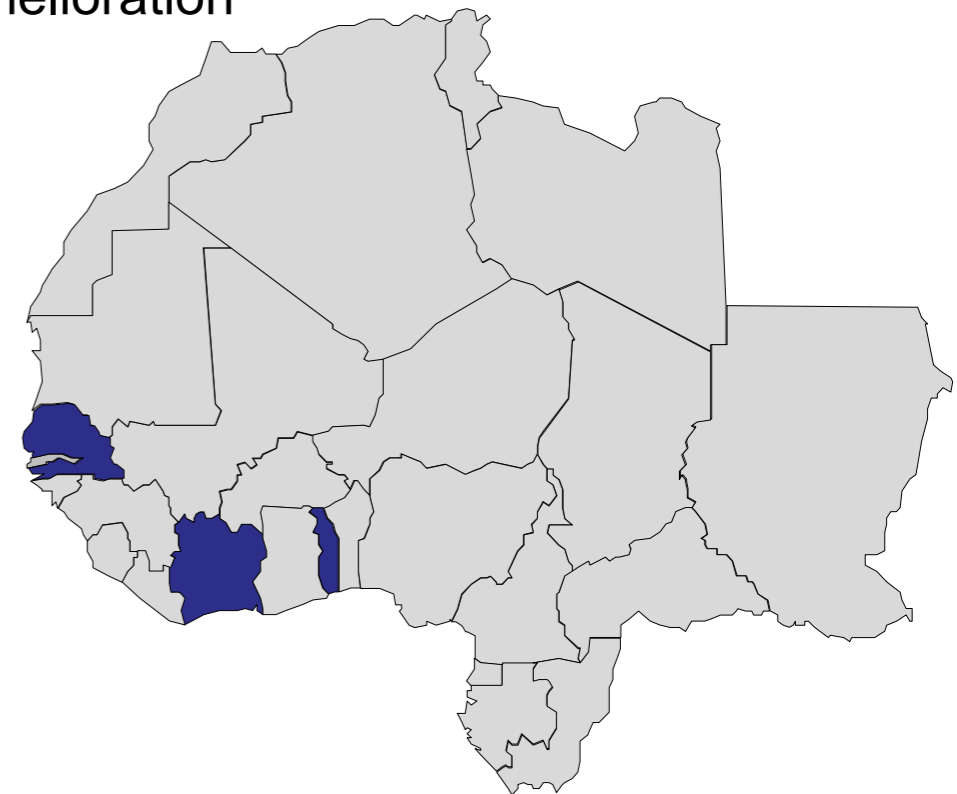
Institut Sénégalais de Recherche Agricole (**ISRA**),
Universities A. Seck at Ziguinchor, and Cheikh Anta Diop at Dakar (**UCAD**),
Agence nationale de l'aviation civile et de la météorologie (**ANACIM**), Centre
de Suivi Ecologique (**CSE**) and Centre d'Etude Régional pour l'Amélioration
de l'Adaptation à la Sécheresse (**CERAAS**)

In Ivory Coast

University Houphouet Boigny, Soc.
d'Exploitation et de Dpt
Aéroportuaire, Aéronautique et
Météorologique (**SODEXAM**), Centre
de Rech. océanographiques (**CRO**)

In Benin,

University Abomey-Calavi (**UAC**),
Centre de recherches
océanographiques (**CRHOB**)



3. PPR: *Plate-forme Pluridisciplinaire Régionale*

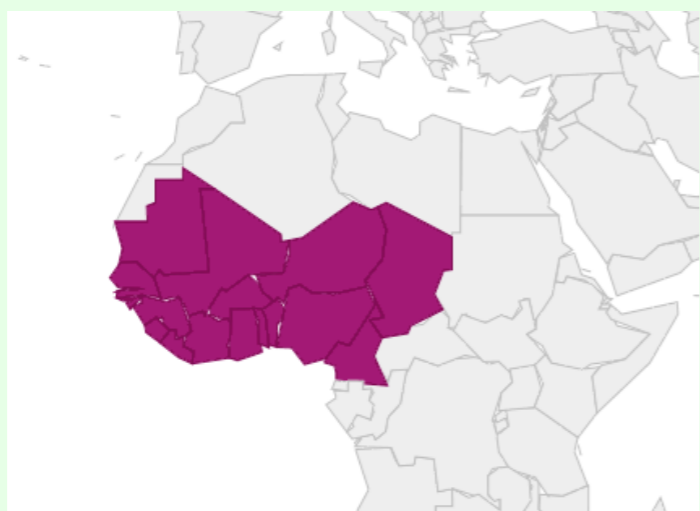
Contributing to the elaboration of regional programs

<http://www.ird.fr/la-recherche/programmes-pilotes-regionaux-ppr/>

SREC

Sociétés Rurales, Environnement et Climat en Afrique de l'Ouest

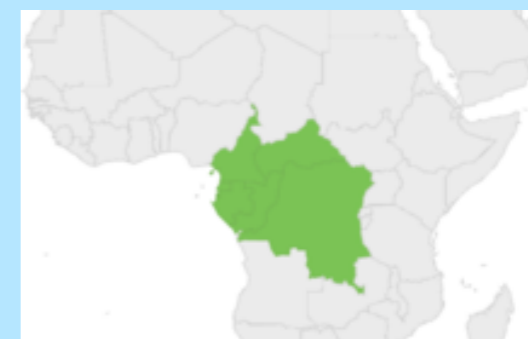
- Around 300 scientists
- 45 Partner teams in Africa
- 42 Partner teams in Europe



FTH

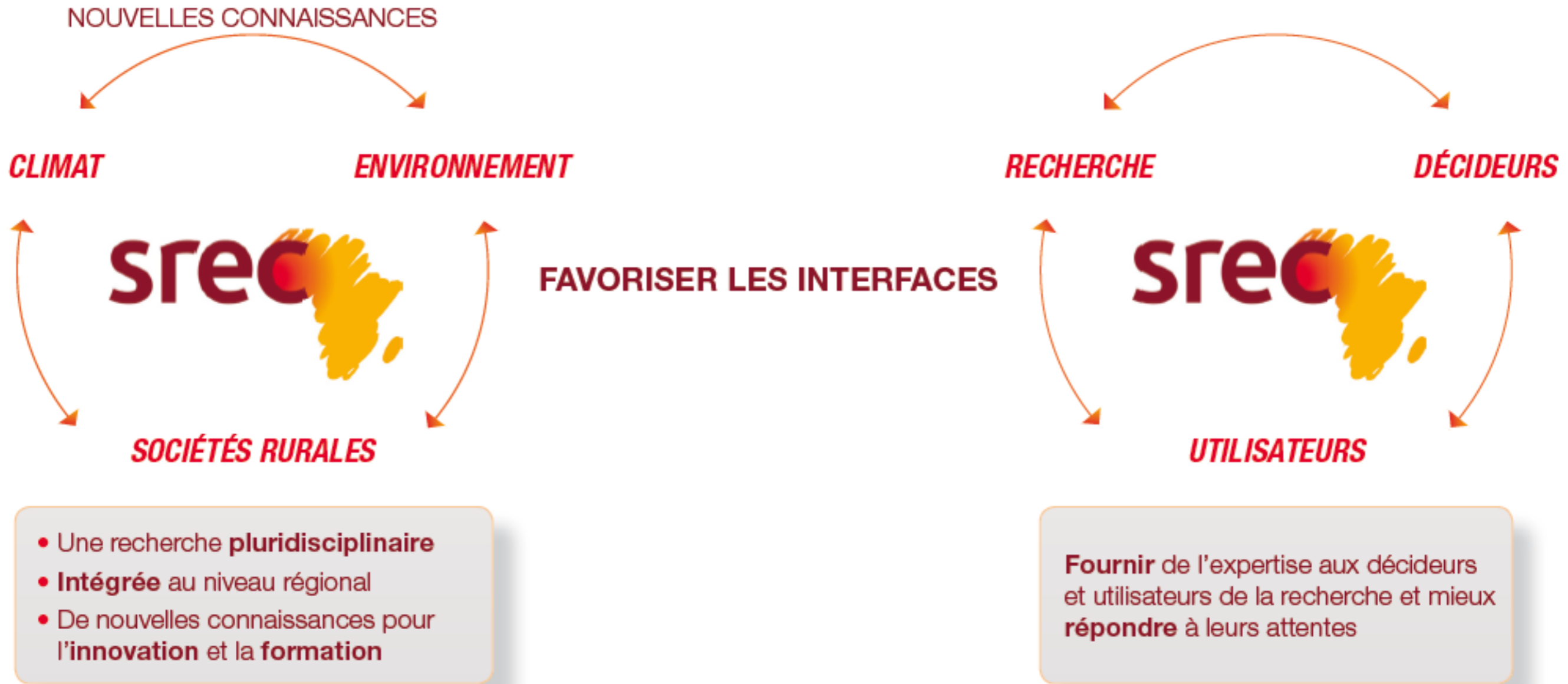
Global change, Biodiversity and Health in Central African Forests

- 300 scientists having declared their interest
- 45 % from African institutions
- 30 % from IRD (20 Units)



Observatories & LMIs, key tools for climate change research in SubSaharan Africa





Looking forward

Observatories

- A long history of bilateral cooperation between German and French Labs ...
- Fostered by opportunities created by the Observatories
- A long term commitment that requires deeper multilateral cooperation
- Scientific and operational challenges: data access, data mining, upscaling

LMIs

- A new tool with limited funding
- Achievements in the domain of formation and training
- Seeding instrument for building regional research centers (see Wascal)

PPRs

- Typically a framework for building regional strategies jointly with various partners in various countries

Observatories & LMIs, key tools for climate change research in SubSaharan Africa

