Remote Sensing for Wetlands Characterization, Flood Forecasting and Water Resources Monitoring in Nakambe Basin in Burkina Faso

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**AGRHYMET: Situation & mandate**

**Situation:** Specialized Institute of CILSS, based in Niamey (Niger)

**Establishment:** December 1974

**Member countries:** Burkina Faso, Cape-Verde, Chad, Gambia, Guinea-Bissau, Mali, Mauritania, Niger, Senegal

**Mandate:** «Promoting information and training in food security, desertification control, natural resource management, and environment in the Sahel »
The AGRHYMET Regional Centre is structured into a pyramidal network with:

- The Major Programs (2) «Training and Information» based in Niamey
- The «National AGRHYMET Components», The technical partner in each country
Data acquisition, processing management, and analysis...

Dissemination of information on regional policies: food security and early warning

Training and transfer of tools, methods and know-how in Food security and Natural Resources Management:
Climatology, Agrometeorology, Hydrology, Crop protection, GIS, Remote sensing....
Water Resources problems in the Sahel (General view)

- **Hydrological regime**: Change of flood discharges as from the years 1970
- **Streamflows**: Decrease of 20 to 60% since 1970
- **Surface Water**: Decrease of 40 to 60%

[Diagram showing variation of standardized annual discharge on the Chari River]

[Map showing water bodies dynamic over time]
Water Resources problems in the Sahel (e.g. Burkina Faso)

- Seasonnal and interannual variability of water resources
- Increasing pressure on available water resources
- Insufficient of data collection systems (less than 100 observed stations)
- Many different technical stakeholders
Needs with regard to Water Resources problems (e.g. Burkina Faso)

- Wetlands localization, characterization and monitoring
- Flood discharge prediction
- Waterlogging risk assessment
- Information systems with harmonized data
Global Objectives:

- To promote an Information system for identification and characterization of wetlands, for flooding forecast

Expected Results:

- Operational methodology for recognition, discrimination and mapping of wetlands in Burkina Faso is developed.
- Information system on waterbodies seasonal dynamics is setting up.
- DIRH staff is trained to the use of remote sensing for water resources assessment and monitoring.

Bassin du Nakambé

- Superficie: 4083.50 km²
- Length: +/- 500 km
Methodology

Data acquisition

- National level: Ground data (Acquisition by DIRH and local components on 3 pilote sites)
- Regional level: Satellite data (acquisition via AGRHYMET systems)

Data from SATELLITES (ERS / ENVISAT)
Data processing and analysis

1. Data pre-processing
   Hydrological data
   EO Data
   Ancillary data

2. Integration / Modelling
   Flooding Maps
   Seasonal Hydrological characteristics
   Qualitative and Quantitative Indicators

3. Analyse
   To compare current, average and extreme situations
   Seasonal forecast
   Extreme events
   Early warning

Methodology
**Information dissemination**

Aim : To disseminate informations at regional and local level to operational users for decision :

- By E-mail
- Decadal and monthly bulletins
- RANET System (radio on Internet)

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**RANET System**

1 - **SERVEUR MULTIMEDIA WWW**
2 - **STATION MONTANTE**
3 - **SATELLITE GESTATIONNAIRE**
4 - **TELECHARGEMENT AU « CID »**
5 - **TRADUCTION et DIFFUSION FM**
6 - **RADIO SOLAIRE**

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**Methodology**
Preliminary results: Addressing target №1: Flooding

**Approaches**
- Multi-temporal Images processing
- Detection of change from one acquisition to the others

**E.g. of Results**
- Flood
- Inundation Mapping

*Multitemporal Radar Images (ERS-1 & 2, Envisat)*

*Lac Bam spatial extension Mapping:*
Jaune (avril), bleu (août), magenta (octobre)
Preliminary results: Addressing target N°2: Monitoring Water Dynamics

**Monitoring**

- Water Front and Waterbodies Surface (Automatic Classification of Low and Medium resolution Images)

**E.g. of results**

- 40-km Advance Further North of the Upper Bassin in 1999
- 80% Increase in open water surface.
Preliminary results: Addressing target N°3: Wetlands inventory inventory and characterization

**Inventory**
- Recognition and identification of wetlands in the landscape
- Discrimination of the principal agroecological units into the wetlands

**Characterization**
- Aggregation of the information according to a gradient of flooding given by a relation between humidity index (from satellite data) and piezometric level
Project is in a preliminary step.

But conviction that earth observation systems (e.g. ERS and ENVISAT) is useful for the recognition, the discrimination and the characterization of wetlands hydrodynamic.

**2 Avenues of success**

- Capacity building of NHS to collect, process, analyze and disseminate hydrological data
- Availability of earth observation data regularly in time

Conclusions
Thank you

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