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Monitoring the hydrological dynamic of the ponds to control the environmental sensitive disease: the case of the Rift Valley Fever (RVF) in Barkedji

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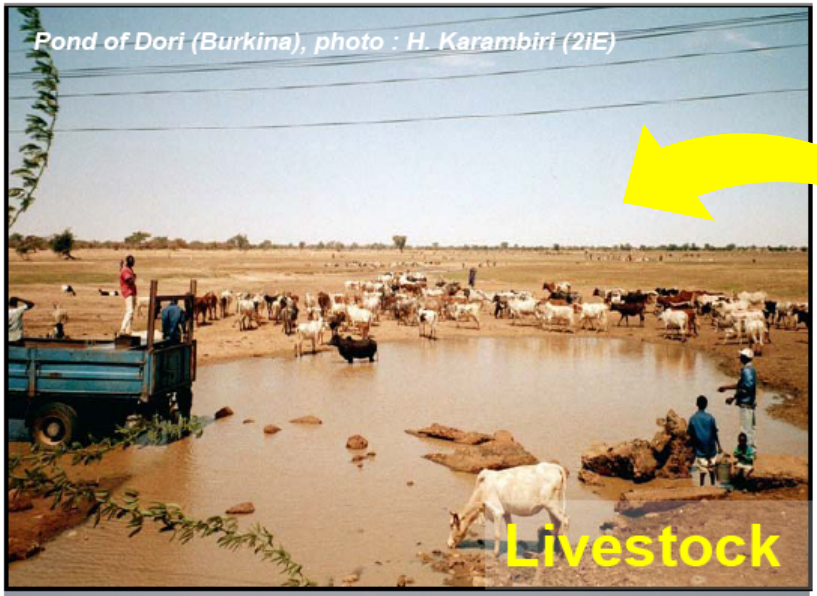
Plan

- **Introduction**
- **Problematic**
- **Study area**
- **Materials and methods**
- **Preliminary results**
- **Conclusion and perspectives**

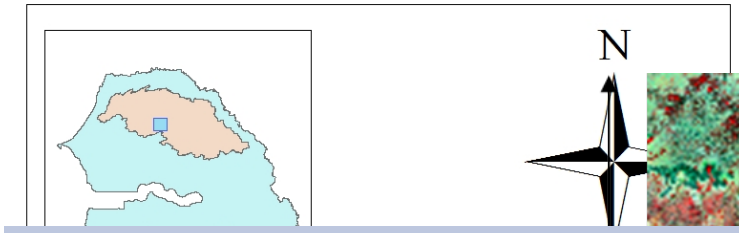
➢ In the Sahel, water is a vital resource for socio-economic development, human life and environment

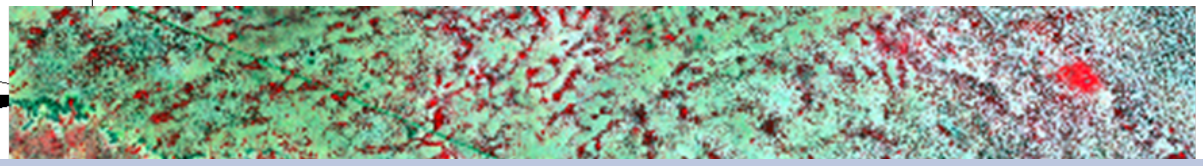


RVF epidemiological cycle in Ferlo area

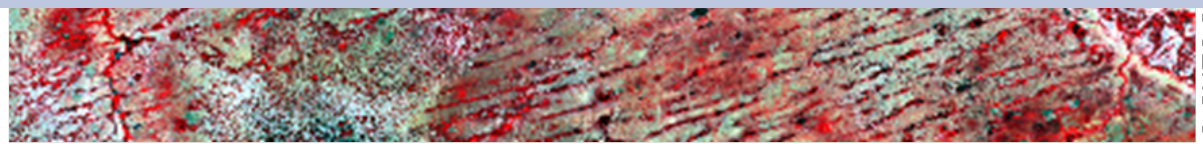
In this study, we propose to study the hydrological ponds' dynamics. This will allow us to monitor the changes in parameters (surface, volume, etc.)

A good forecasting of changes in ponds parameters can be a great contribution for RVF vectors dynamics populations



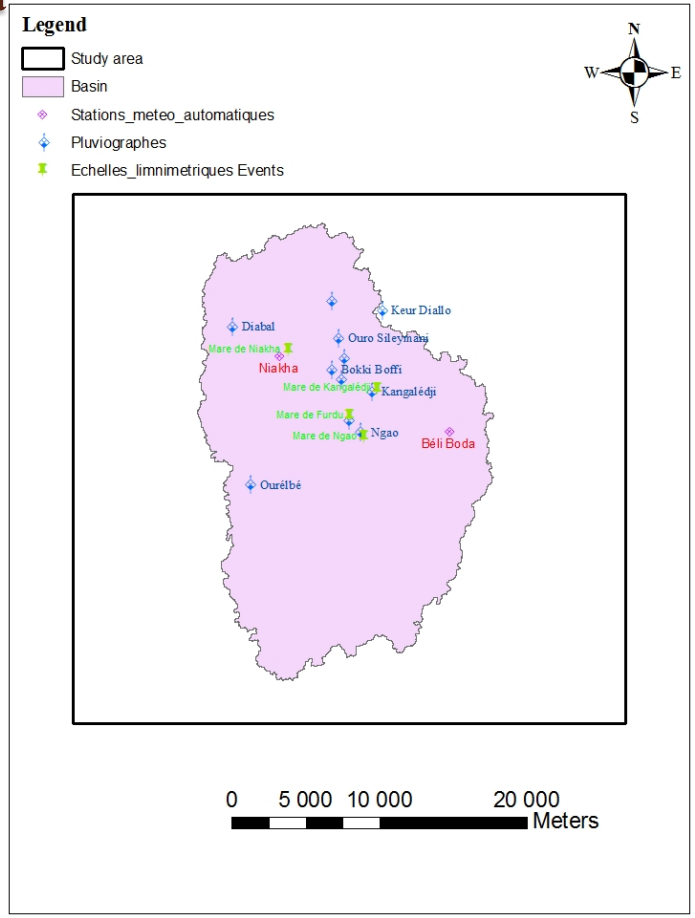


- ✓ Sahelian climate (rainfall average = 400-500 mm;T°C = ~ 40°C in may);
- ✓ 2 seasons: rainy (~3-4 months) and dry (~8-9 months);
- ✓ hydrographic system = endoreism (fosil Ferlo valley).



Hydro-climatical Data

Rainy gauge



Map of the equipments tools of the observatory

Automatic weather station

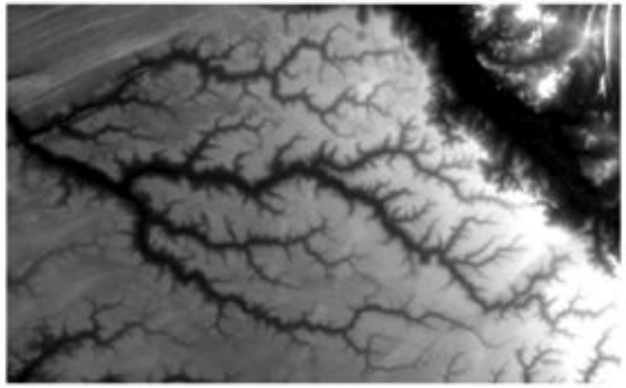
Staff gauge

Data collected

- Daily rainfall
- Daily pond's water level
- Temperature
- Evaporation
- Hymidity
- ETP

Topographical and Remote sensing Data

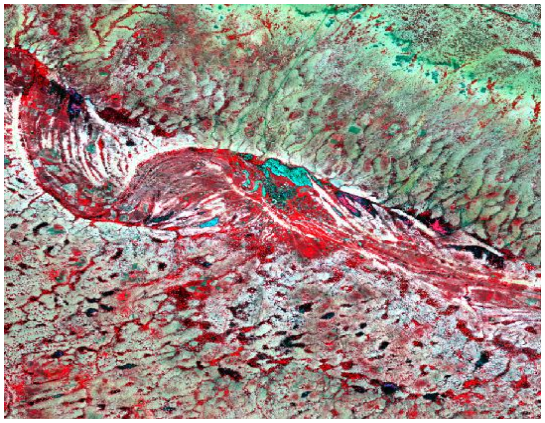
Topographic Data: topographic data taken with a differential GPS in April 2008
: DEM (srtm 30 m of resolution)



DEM: SRTM (30m of resolution)

differential GPS

Remote sensing Data: Image SPOT, 5



Spot 5, extrait de scène 10 m Couleur - Acquisition du 26 août 2003

❖The first step consist to inventory all the ponds in Barkedji's zone

- This inventory are done with the Arc GIS and ERDAS software
- **Three ponds are chosen and characterized**

❖The delineation of the whole of watershed is performed

- **The delineation is effected with the ArcSWAT model**
- **The morphometric parameters of the sub-basins are calculated**

❖A hydrological model is proposed

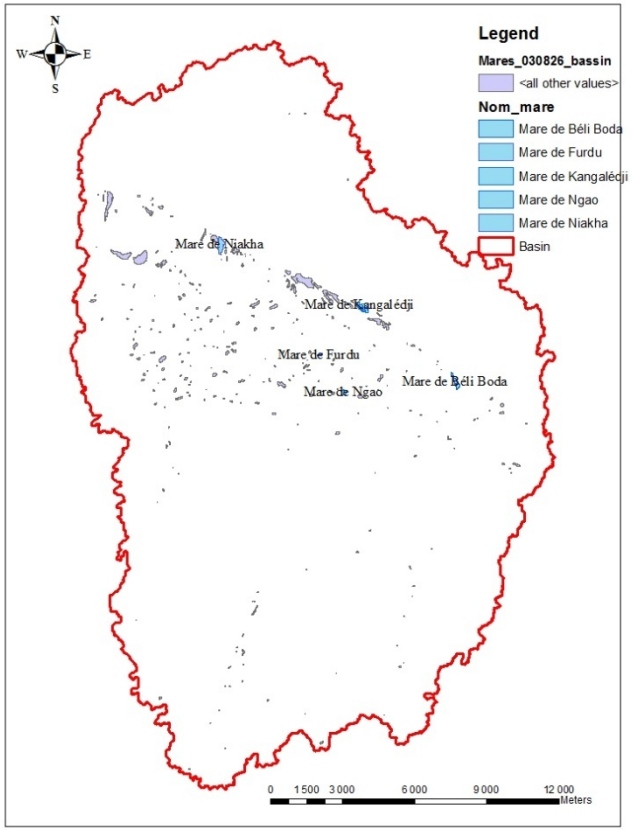
The model is consists of two parts:

- The first is the **function of production** which is based of the SCS (Soil Conservative Service), In this method the rain off is gave by:

$$P_n = Q = \frac{(P - 0.2S)^2}{P + 0.8S}$$

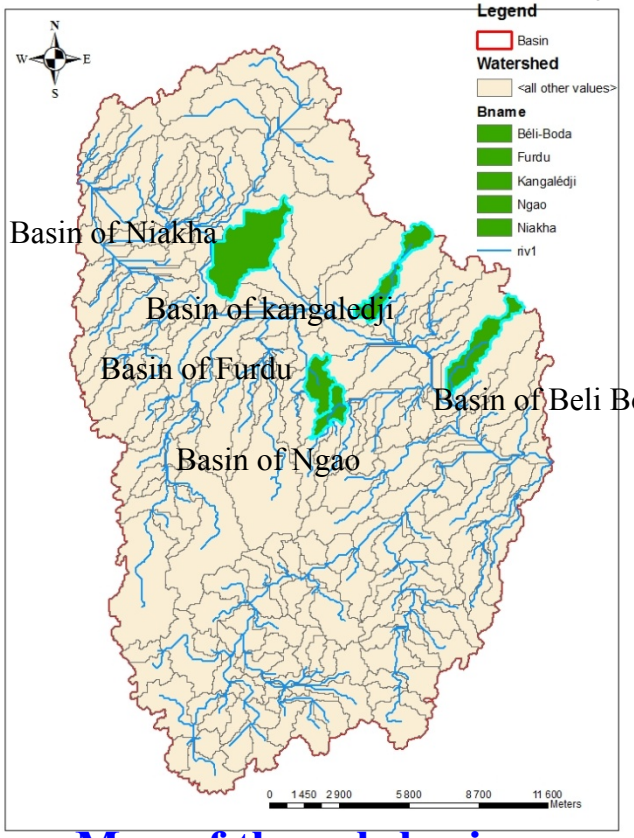
- The second part is the **transfer function** is based on the water balance hydrological equation: $\mathbf{Vj = Vj\text{-}1 + Vp - Ej\text{-}1 - V_b - V_I}$

313 wet zones (ponds) are inventoried in Barkedji's basin



Map of the ponds in Bakédji's basin

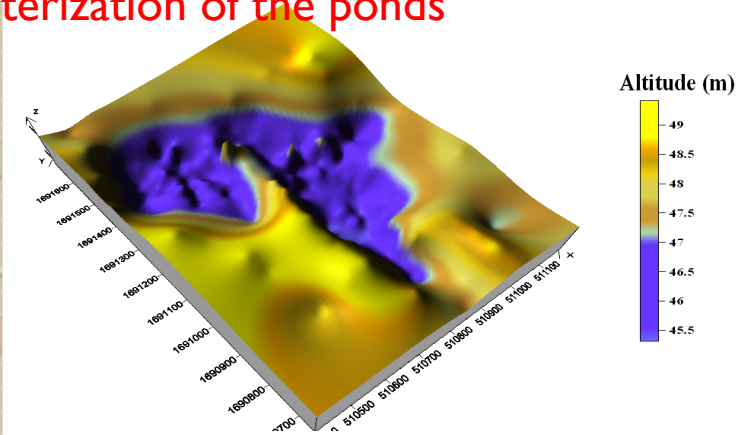
263 watersheds are delineated around Barkédji



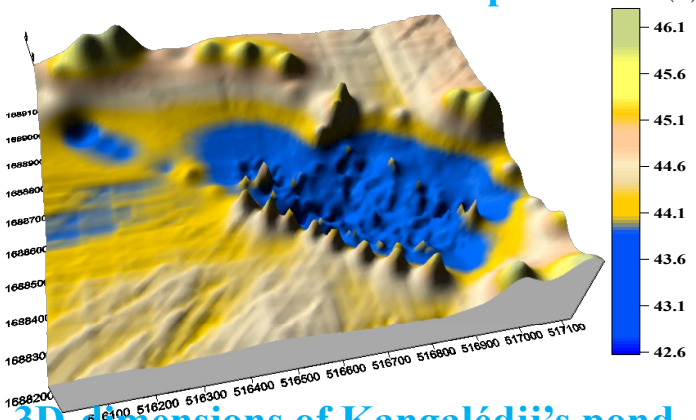
Map of the sub-basins

	A(km²)	P (km)	Z_{min} (m)	Z_{moy} (m)	Z_{max}(m)	Slope	La (km)	I_G
Niakha	5.72	16.98	13	21.84	48	1.72	5.36	1.98
Kangalédji	3.56	18.9	13	31.17	54	1.64	6.94	2.8
Furdu	2.04	10.08	16	19.06	24	1.49	1.13	1.28
Ngao	0.34	3.78	16	18.40	22	1.69	1.12	1.82
BéliBoda	3.35	16.2	14	32	53	1.71	5.7	2.48

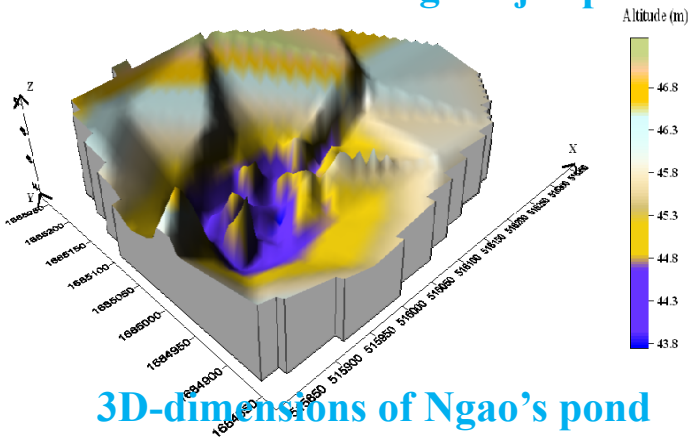
Characterization of the ponds



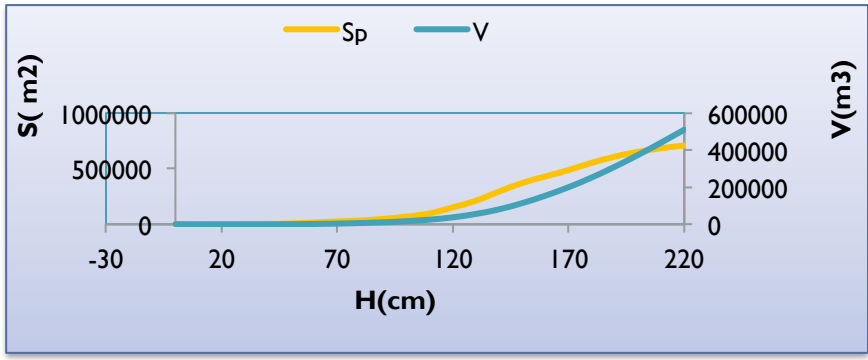
3D-dimensions of Niakha's pond



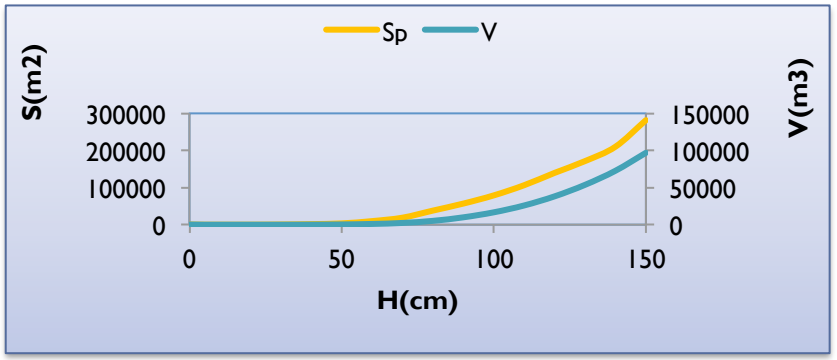
3D-dimensions of Kangalédji's pond



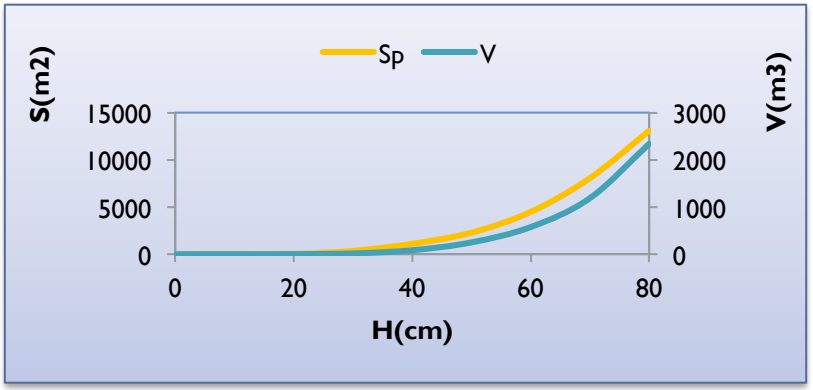
3D-dimensions of Ngao's pond



Rating curve of the pond of Nikaha

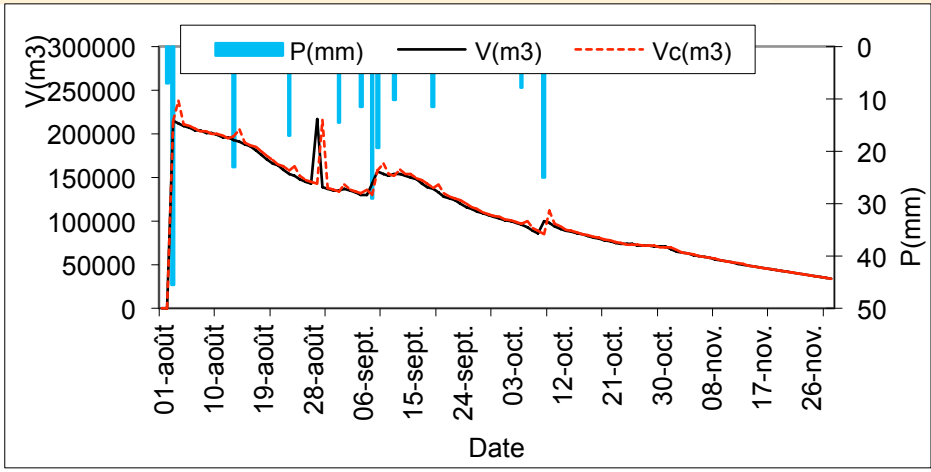


Rating curve of the pond of Kangalédji

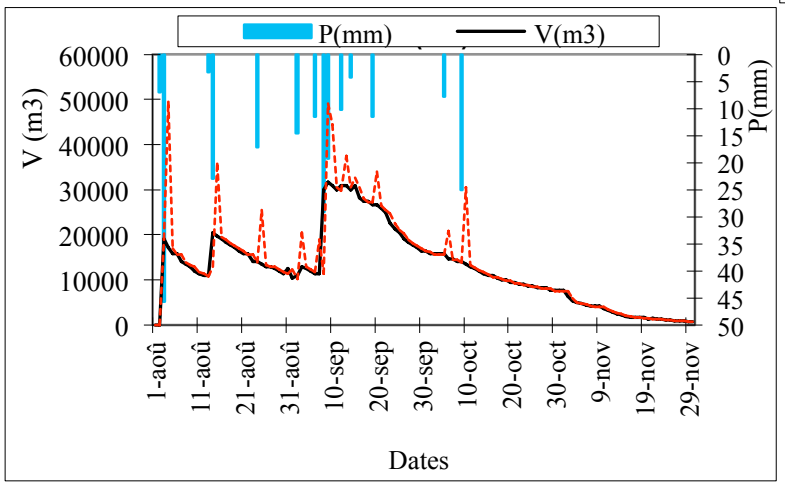


Rating curve of the pond of Ngao

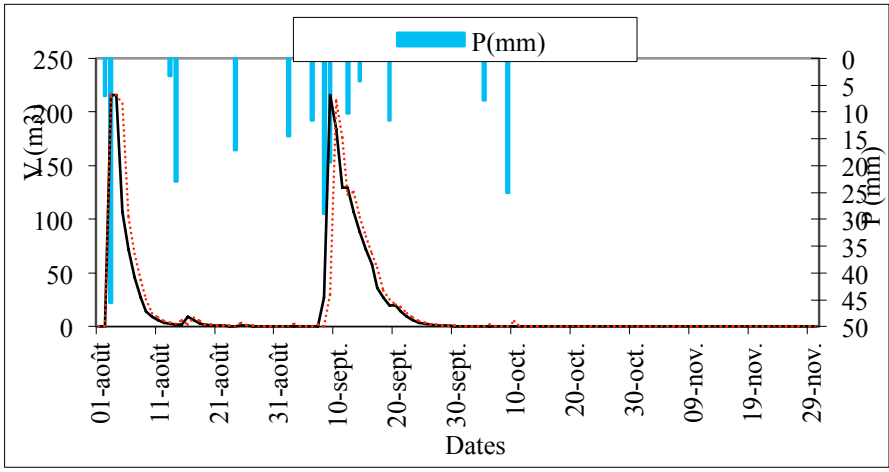
Volume calculé et mesuré au niveau des mares



Evolution of the calculate and measured volume at NIAKHA's pond



Evolution of the calculate and measured KANGALADJI's Pond



Evolution of the calculate and measured at NGAO's pond

Preliminary results:

- ❑ remote sensing can contribute to a good assessment of water resources;
- ❑ characterization of ponds is a very important as it allowed to have an idea on which parameters have a direct impact on the vectors dynamics;
- ❑ results obtained with the model are acceptable, with a small improvement, these results may provide relevant inputs for vectors dynamic models.

Perspectives

- ✓ to classify the ponds according to their geomorphological position;
- ✓ to update main component analysis with the most significant parameters of ponds and sub-basins;
- ✓ to apply other hydrological models in comparison to simulate hydrological dynamics of ponds compare the compare the method used;
- ✓ to apply the results of RVF epidemiological models.


THANK YOU