



ICES 2024



(African) Lagoons Scientific and societal challenges

LE RÉSEAU TROPHIQUE DU LAC NOKOUÉ

(Cotonou - 2021)

LA PHYSIQUE



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LA MODÉLISATION



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PhDs : Victor Okpeitcha, Jules Honfo, Laetitia Ntanyong,

IRHOB : Arnaud Assogba, Zacharie SOHOU,

Trainees : Marie Chapellier, Noémie Ferdinand

LEGOS : Sylvain Biancamaria, Thomas Duhaut, Alexei Kouravov,

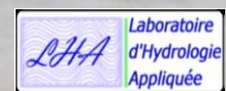
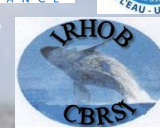
Patrick Marsaleix, Sylvain Ouillon, Pieter Van Beek

Other labs : Thomas Stieglitz, Fabien Rétif,

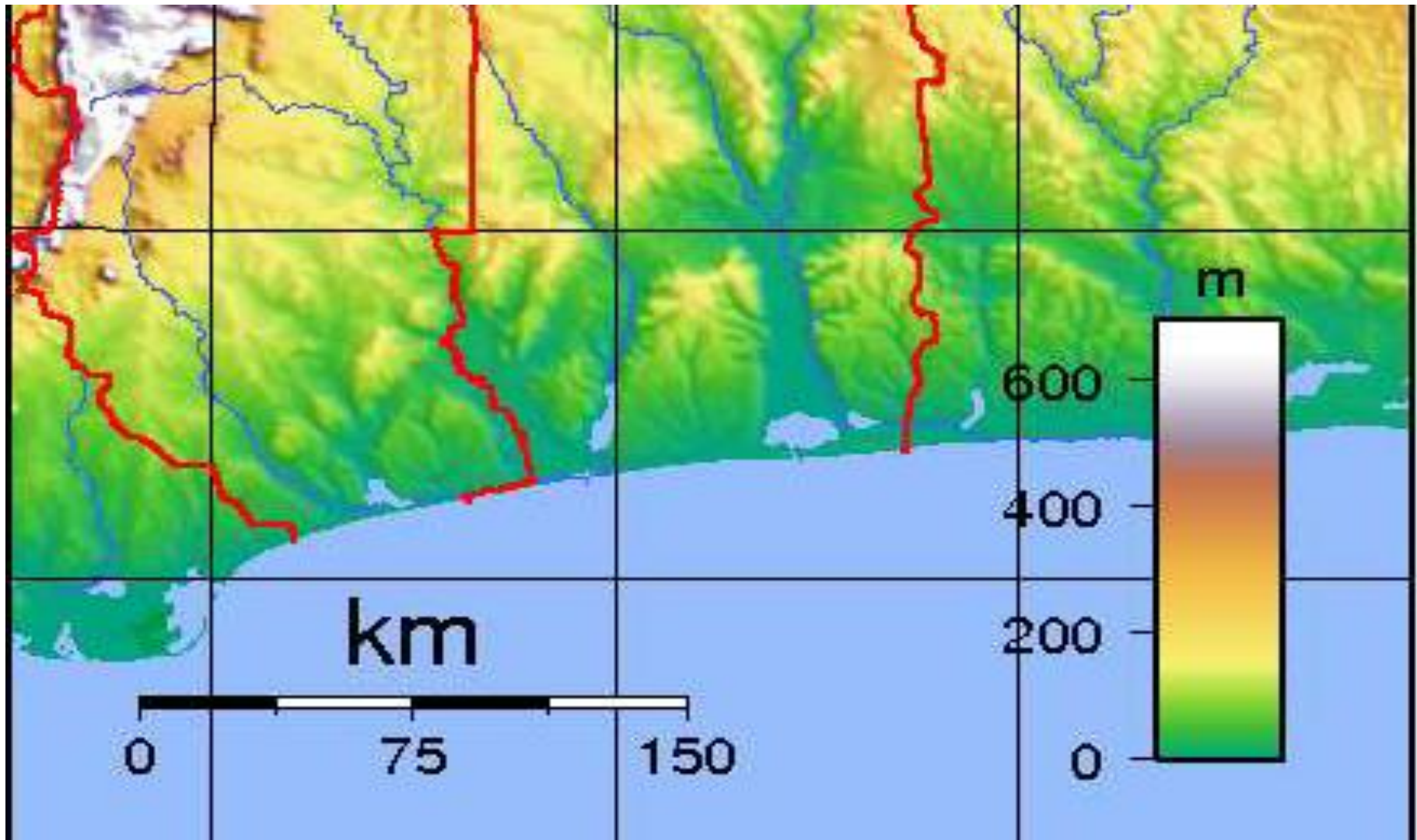
CNES : Nicolas Gasnier, Flavien Gouillon, Vincent Lonjou



INSU
Observer & comprendre



A system of interconnected lagoons



Benefits of the Nokoué lagoon

- ❑ Over 1 million people around lagoon

Leaving on its resources
(freshwater, fish, sand, tourism, ...)

- ❑ High biodiversity: Ramsar site

(Jan 2000)

- ❑ ~ 12 000 fishermen,

- ❑ ~ 65 % inland fisheries

- ❑ The largest lacustrine villages in W.A.



Threats

Climate Change

... for the future



Current Problems

Floodings

Pollution (macro-plastics,
chemical)

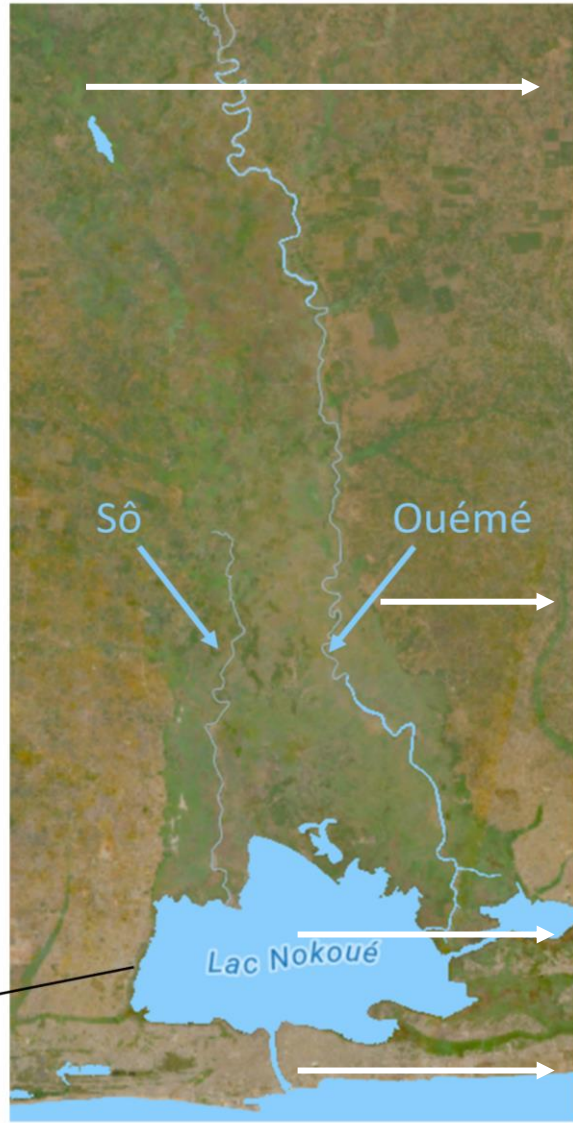
Eutrophication (jacinths)

Sedimentation/deoxygenation
(acadjas)

Resources management



Study of lagoons : a complex system

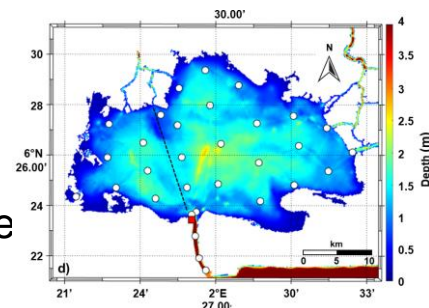
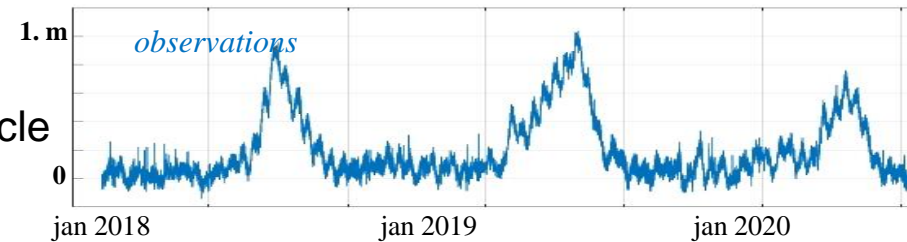
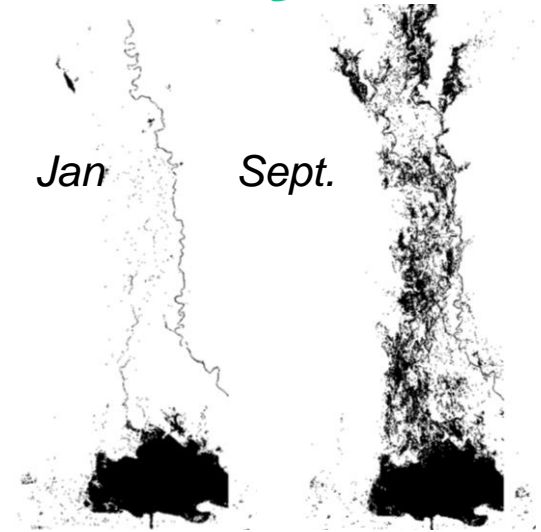


Complex hydrological system feeds the lagoons with freshwater & sediments (rivers/sub-reservoirs/channels)

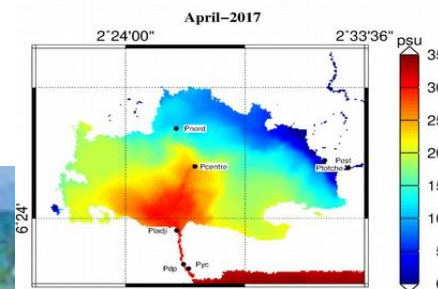
Extreme seasonal cycle (Monsoon)

Very shallow lagoon (1.3 m)
Sensitivity to small scale

Connexion with ocean
Exchange depends on dissipation
Processes difficult to accurately represent



Water Salinity At Ground Level



Study of lagoons : a complex system

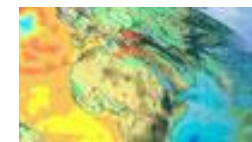
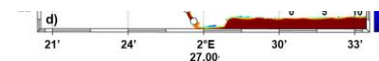
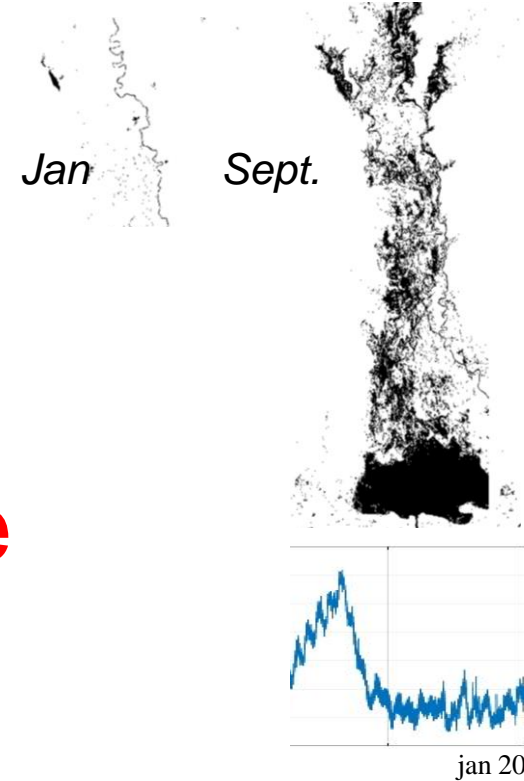
Complex hydrological system
feeds the lagoons with

Not to mention

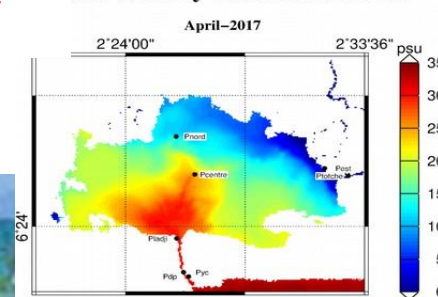
Sediment cycle
&
Ecosystems ...

All lagoons are specific

Connexion with ocean
Exchange depends on dissipation
Processes difficult to accurately
represent

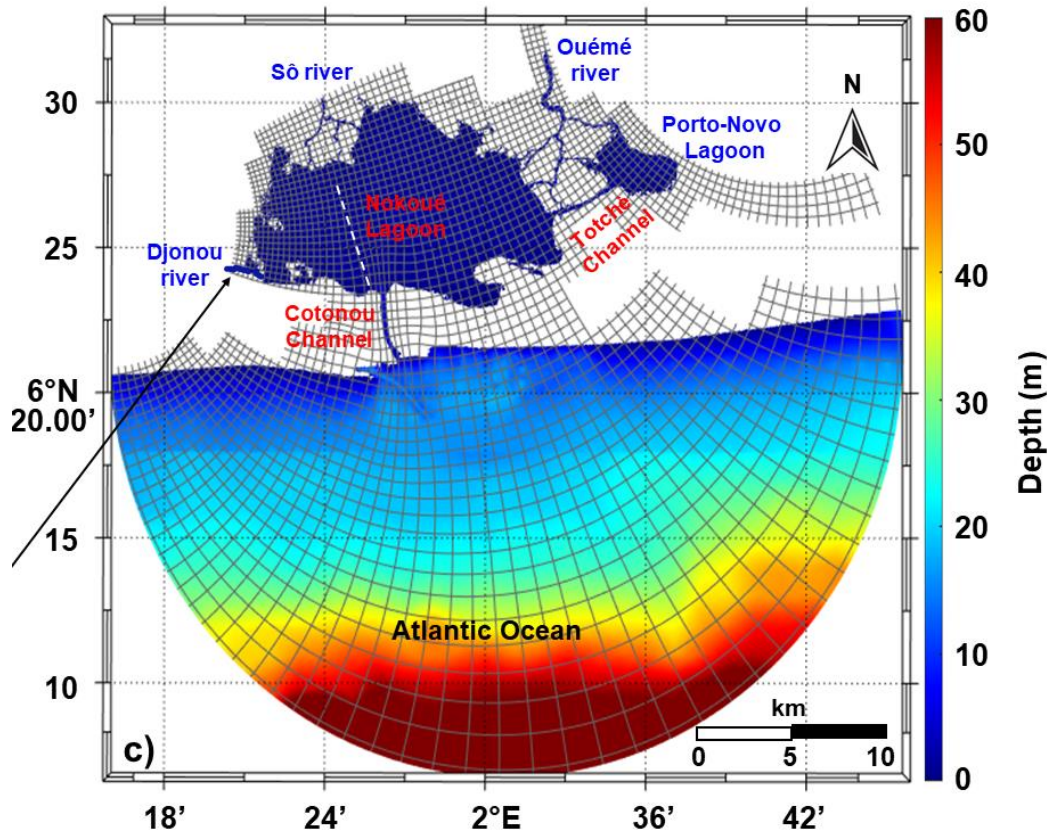


Water Salinity At Ground Level



Study of lagoons : tools/modelling

SYMPHONIE model (LEGOS)



Resolution 30 m-200m

10 vertical levels

Mercator + FES at ocean boundaries

River+wetland fluxes

ECMWF atmospheric (heat, precip/evap, WIND)

1 year ~ 2 days CALMIP, 200 procs

⇒ Validation

⇒ Impact studies

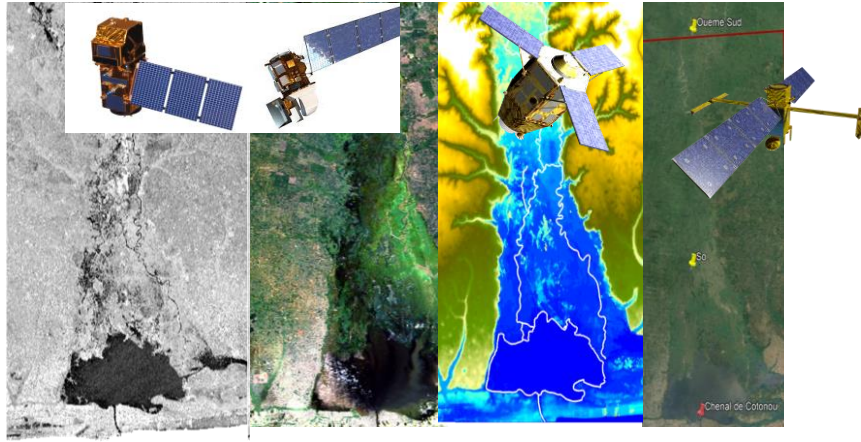
Salinity cycle=ecosystem

Residence time=pollution

Land use planning / anthropic pressure



Study of lagoons : tools/observations



Satellite observations

- Radar (SAR) – Sentinel 1
- Optic – Sentinel 2/Landsat
- Altimetry – Jason / SWOT



In situ Observations

- Monthly field campaigns (seasonal cycle+inter-annual variability)
- Permanent moorings (water level, Salinity, Temperature, O₂, pH, Turbidity, ChlA...)
- Specific observations (river flux gauging, heavy metals, ...)

General monitoring
Validation of numerical model



Main messages

We are not facing threats, we have to deal with current (big) issues

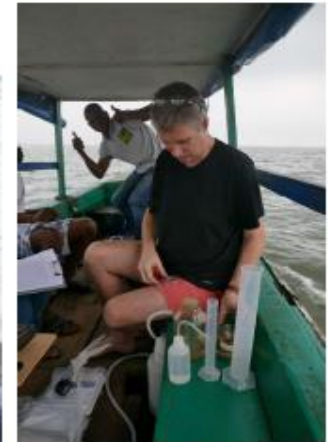
Challenges

Diversity of laggons (complex systems)
=> Scientific/modelling challenge

Solutions are local
=> Societal challenge
How to involve local scientists, users & managers (in Africa)

=> Need for infrastructure (modelling)
=> Training (gap is huge on modelling)
=> Funding of local people in charge (infrastructure/people)





THANK YOU !



