



15 avril 2024



CHIMIE DE L'ENVIRONNEMENT ET
MODÉLISATION HYDRODYNAMIQUE



Analytical



Environmental



Laboratory



The context...

Two specificities characterize New Caledonia:

A 1,600 km long barrier reef delimiting the largest enclosed lagoon in the world (23,400 km²): it is listed as a UNESCO World Heritage Site (July 2008);

A significant mining industrial activity placing New Caledonia among the leading global players.

Question: How to combine "economic development" and "environmental preservation"?

In accordance with New Caledonia regulations, AEL suggested deploying an innovative automated solution:

"sequential passive sampling technology."

Response:

Strengthen monitoring of the quality of marine environment waters!

.... monitoring for the best value of money...



What is passive sampling?

The method of analysis using "Diffusive Gradients in Thin Films"

Allows for quantification of dissolved pollutants without needing to take a water sample. In the context of environmental monitoring, this strategy offers the advantages of:

- Significantly reducing detection limits and therefore providing better precision;
- Improving the representativeness of the analysis by providing an average concentration;
- Avoiding the transport of water samples and thus ensuring their integrity;
- Substantially reducing the cost of monitoring.

Growing recognition :

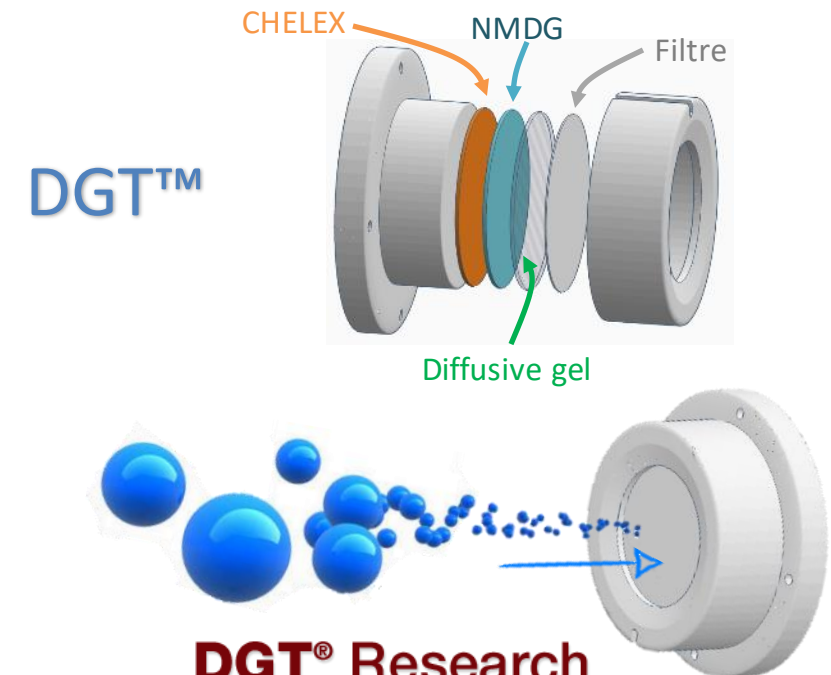
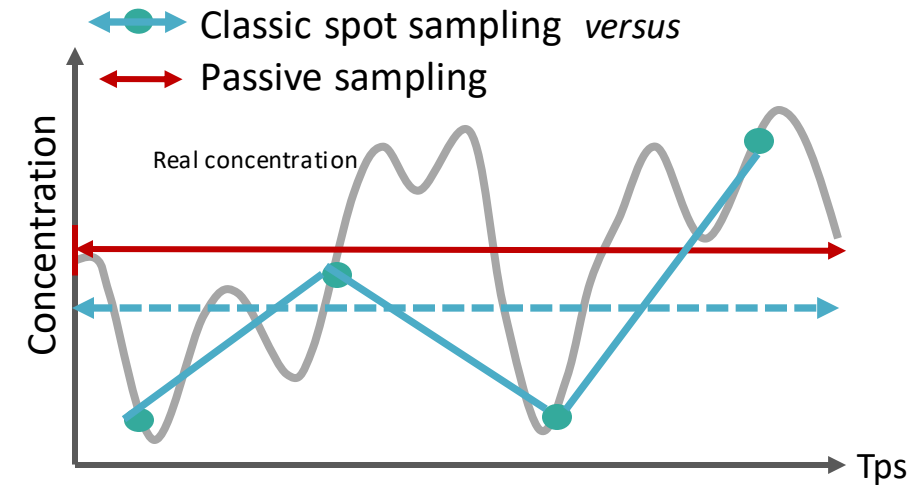
- >1000 scientific articles publishes
- FD T90-012 September 2021

NORMES
FRANÇAISES ET
EUROPÉENNES



Water quality - Determination of metal content - Method for the measurement of metal concentration with passive sampling by diffusive gradient in thin films

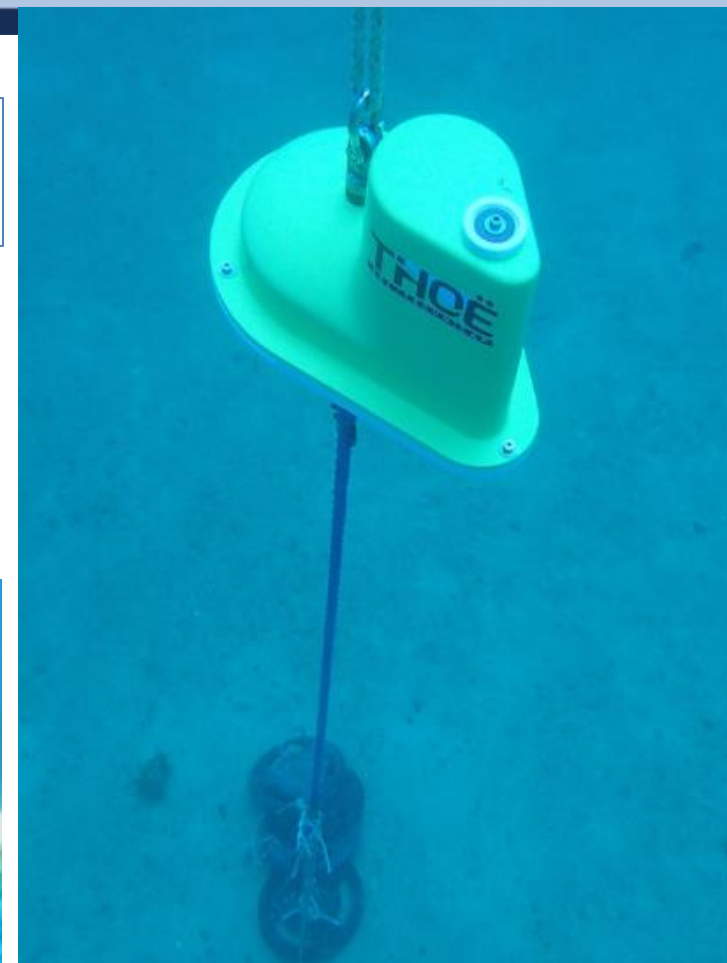
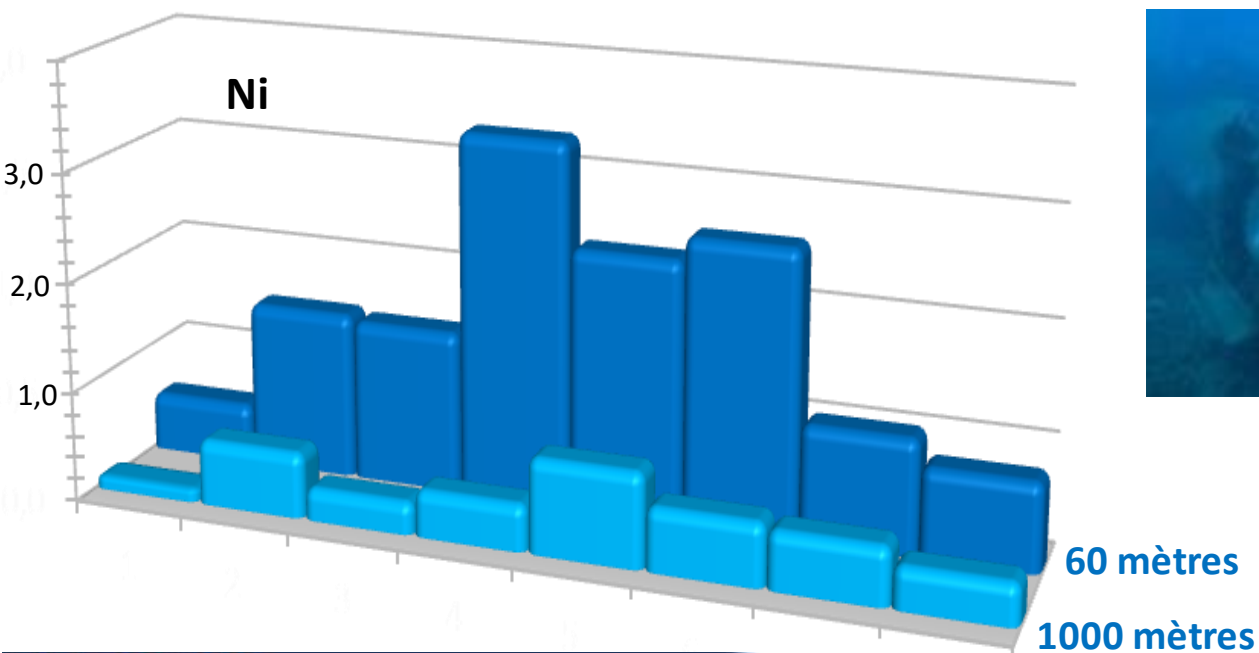
- NIWA – Published document: Instructions for use.



DGT® Research
For measurements in waters, soils & sediments

CUSTOMER REQUIREMENTS: Monitoring the dispersion mechanisms of industrial effluents discharged into the Havannah Canal.

- 6 THOË units deployed twice a year (2*2 continuous months);
- 7 days of exposure per DGT® (average concentration per week);
- Deployment of the 6 THOË units on either side of the diffuser;
- 2 immersion sites (60 and 1,000 m from the outfall), 2 depths (30 and 40 m).



OBJECTIVES: Validation of dilution rates

Factor Tx = 2,000

Factor Tx = 10,000: return to natural concentration



Locations

- New Caledonia
- France
- Italy
- Finland
- Boliva
- Peru
- Philippines

Projet Territoire d'Innovation : « *THOË-S interactive sentinel* »

OBJECTIVES:

Surveillance/study:

of the coastal fringe (0-100 m)

of continental freshwater (rivers, lakes)

➡ **90% of potential market (2020)**



Main characteristics

- Programming/connection: WiFi and/or USB3
- Number of measurement steps: 12 (possibility of triplicates)
- Autonomy: 1 year
- Immersion depth: up to 100 m

Main innovations:

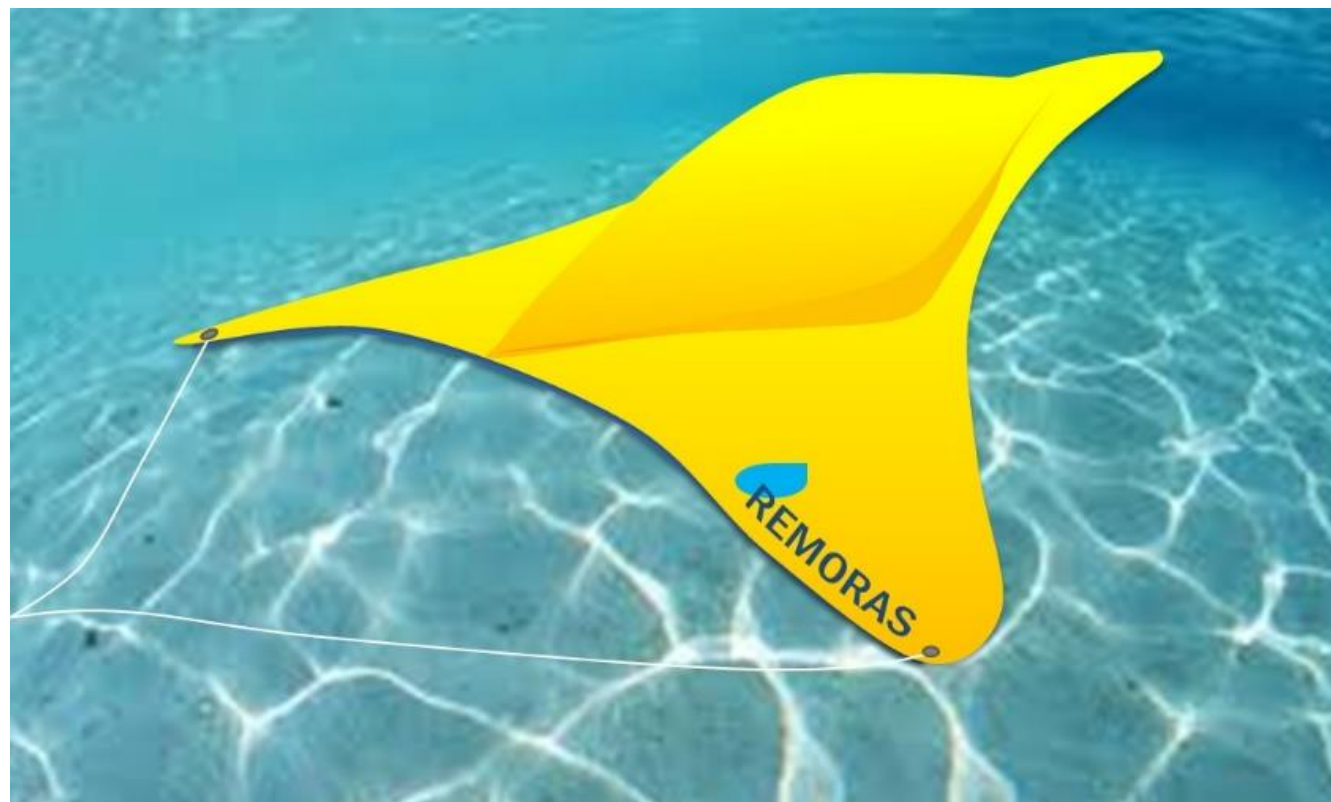
- 4G communication (PC and Smart-Phone)
- Remote interrogation by the operator
- (Re)programming/data transfer
- Acquisition of physico-chemical parameters (P, T°C, S‰...)
- GPS positioning
- Simplified assembly

Project for evolving towards a "mobile sentinel": RÉMORAS

OBJECTIVES: Monitoring the geochemical quality of surface seawater on a global ocean scale (e.g., Coral Sea Park, Great Barrier Reef, oil fields,...)

Main features:

- Fully autonomus movement through coupling with gliders or vessels (USV)
- Hydrodynamic design
- Number of measurement steps: 12-15
- Autonomy: 1 year
- Immersion depth: up to 50 m
- Acquisition of physico-chemical parameters (P, T°C, S‰...)
- Satellite communication (re)programming/data transfer
- Real-time GPS positioning



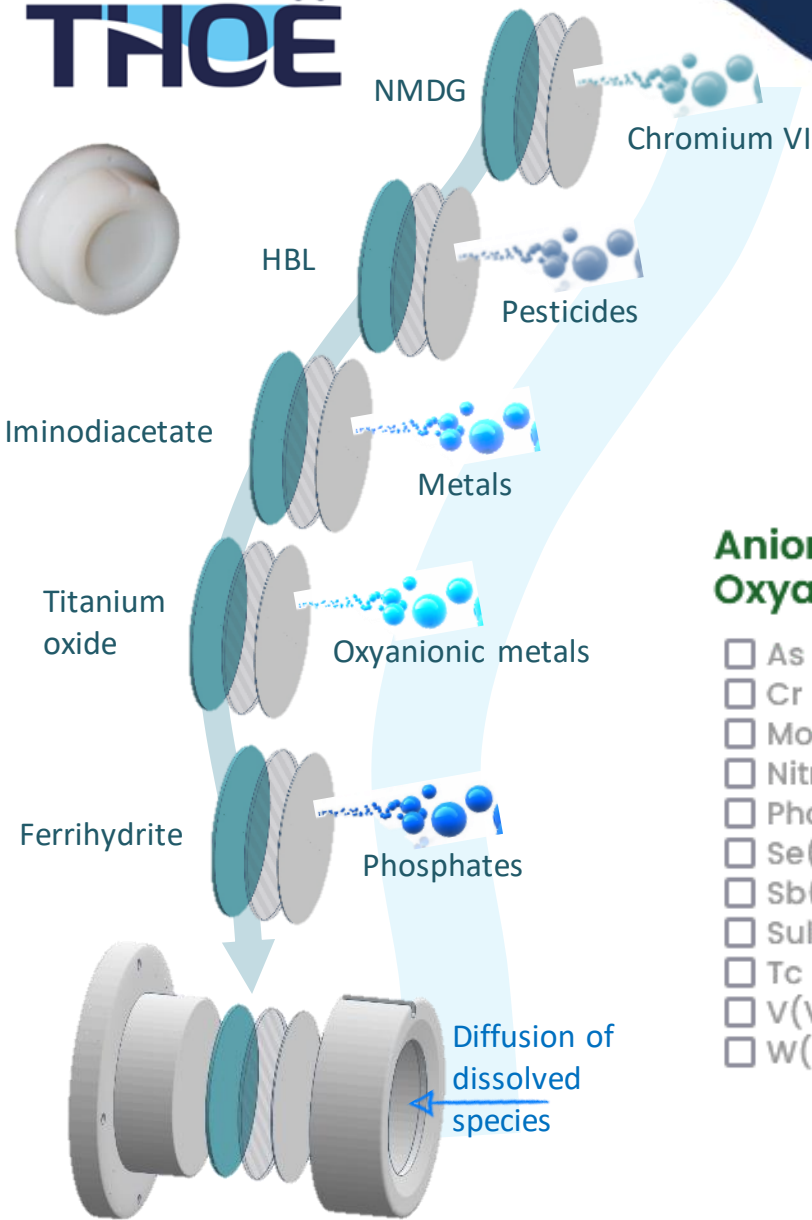
- Limitations exist in what can be deduced by optical remote sensing of complex multi-parameter coastal systems.
 - Innovative technologies 'THOË' that allow the determination of chemical parameter time series are necessary.
- Combining these technologies, satellite remote sensing capabilities with in-situ chemical analysis improves the monitoring and management of coastal waters.

Our thanks to:



Thank you for your time

“...DGT measures all dissolved species (organic and inorganic) that are available to biota



Anionic/neutral – Oxyanionic metals

- ☐ As
- ☐ Cr
- ☐ Mo(VI)
- ☐ Nitrate
- ☐ Phosphate
- ☐ Se(IV)
- ☐ Sb(V)
- ☐ Sulphide
- ☐ Tc
- ☐ V(V)
- ☐ W(VI)

Cationic metals

- ☐ Al
- ☐ Ca
- ☐ Cd
- ☐ Co
- ☐ Cu
- ☐ Fe
- ☐ Hg
- ☐ CH₃Hg
- ☐ Mg
- ☐ Mn
- ☐ Ni
- ☐ Pb
- ☐ U
- ☐ Zn
- ☐ °REEs
- ☐ Radionuclides

Organic substances

- ☐ Antibiotics
- ☐ Bisphenols
- ☐ Household & personal care products
- ☐ Illicit drugs
- ☐ Pesticides & herbicides
- ☐ Endocrine disrupting chemicals
- ☐ Nitrochloro benzenes
- ☐ Organophosphate flame retardants
- ☐ Perfluorinated compounds
- ☐ Psychiatric pharmaceuticals
- ☐ Pharmaceuticals

Multi layered

- *Cr(VI) / Cations*

