

Préconcentration in situ automatisée des contaminants



11 Mars 2022

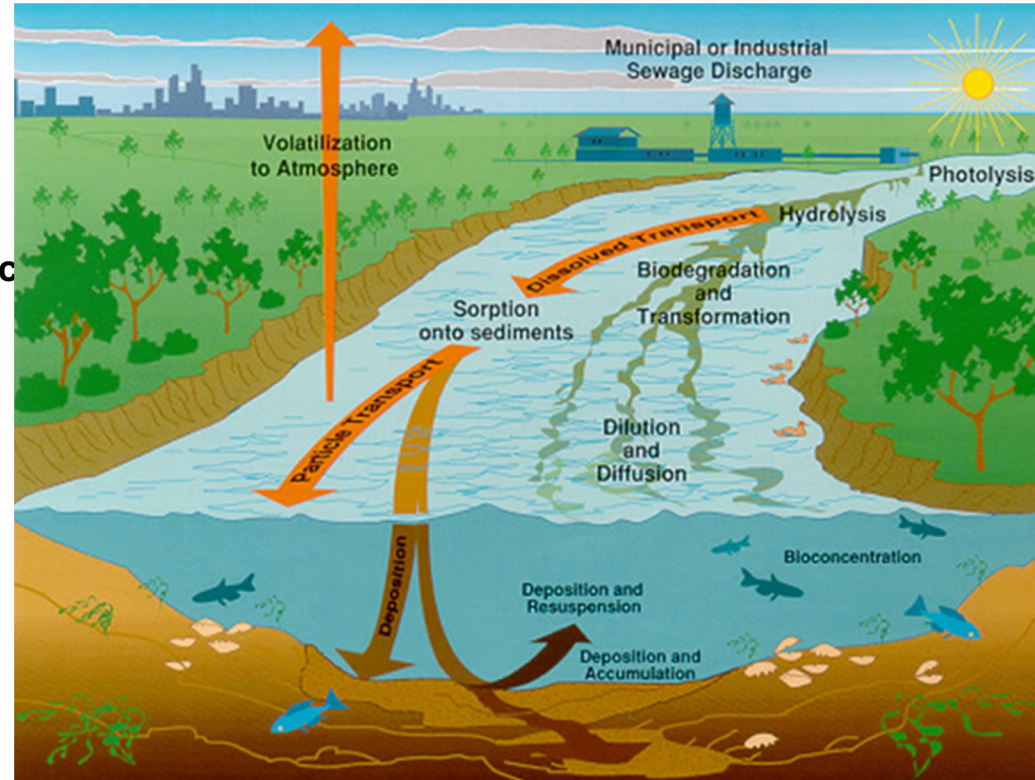
David Point UMR GET (coordinator)

Team : D. Biron (LMGE), H. Celle Jeanton (Chrono-env), P. Chardon (LPC), G. Montavon (SUBATECH), M. Coquery (INRAE), J.M. Fernandez (AEL)

How to estimate and quantify anthropogenic pressure related to contaminants in aquatic ecosystems?

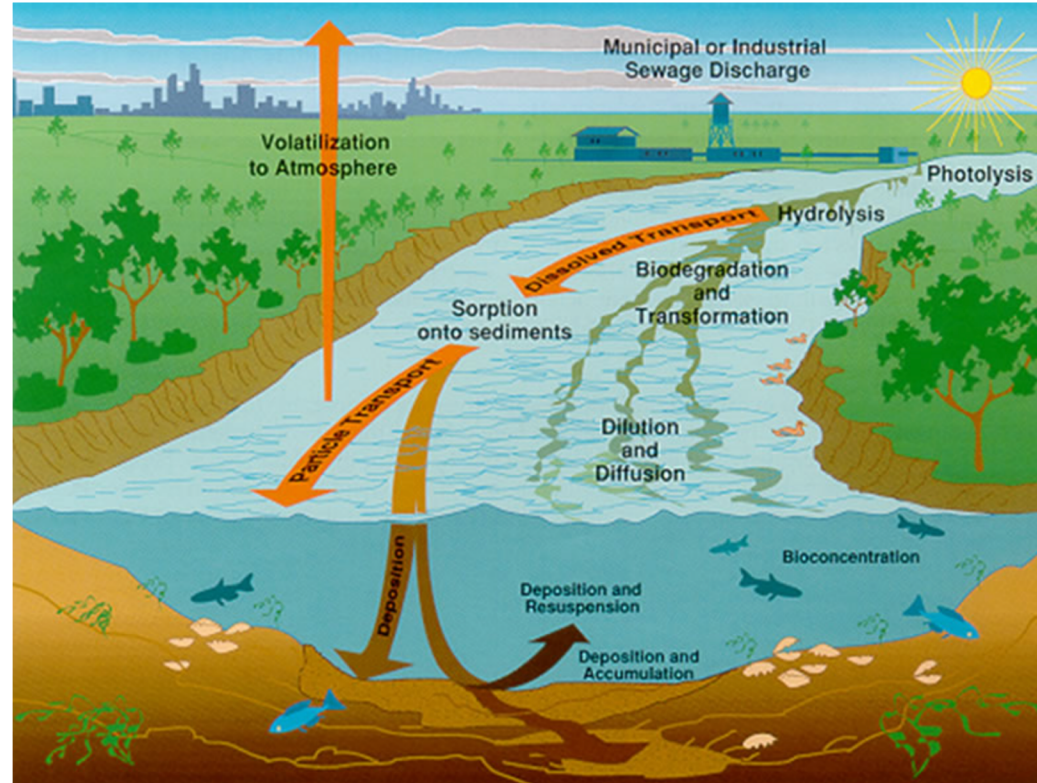
Challenges:

- Multiple elements & compounds
(trace elements, radionuclides, organometallic compounds, legacy organic contaminants, pesticides emerging contaminants, etc, ...)
- Low concentrations (pg/L-ng/L)
- Limited sensor tech.
- Contrasted (sub)regional context.
- High costs
- Expert labs



TERRAFORMA Objectives

- Dvlp low cost, robust, simple and efficient automated platform to monitor contaminants
- Start with existing tech. and improve
- Integrative platform for large and diverse community working on contaminants
- Large spectrum, and flexible contaminant monitoring
- Deploy and monitor contrasted hydrosystems
- Adapted to user needs
- Remote control
- Attractive and Fun!



Manual sampling bottleneck & Expert Labs



Sample
Storage
Shipping



Lab. Sample
Prep.

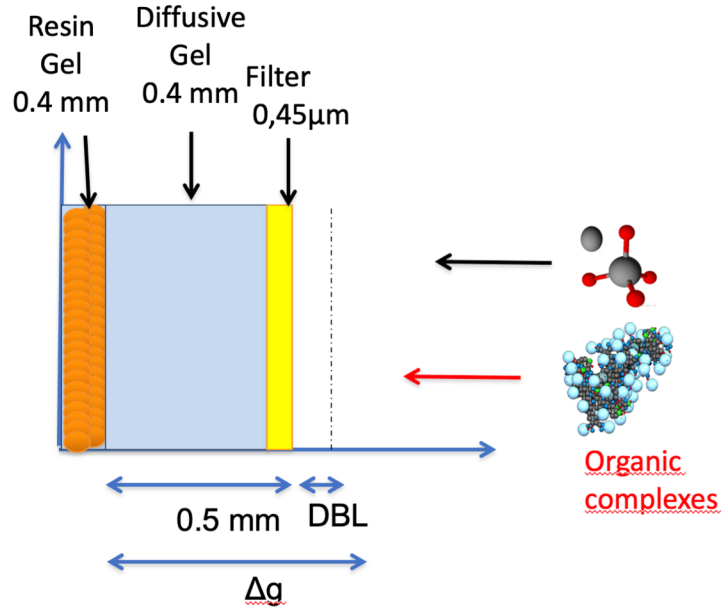


Lab.
Analysis



TERRAFORMA

DGT fundamentals: Passive Sensors



Fick Law

$$C = \frac{M \Delta g}{DtA}$$

- ✓ Simple
- ✓ Low cost (15€/pc)
- ✓ Molecular probes
- ✓ Time Intg. Conc.
- ✗ Slow sensors days-weeks (3cm²)
- ✗ Biofouling (long deployments)
- ✗ DBL

Commercial availability

DGT® Research

For measurements in waters, soils & sediments

[Select Your DGT](#) [What DGT Does](#) [Products](#) [Payment Advice](#) [FAQs](#) [Contact](#)



[Home](#) > [Online Shop For Products](#) > [Loaded DGT passive samplers for deployment in solution](#) > [LSNB-AP Loaded DGT device for mercury and As\(III\) in solution](#)



LSNB-AP Loaded DGT device for mercury and As(III) in solution

£15.00

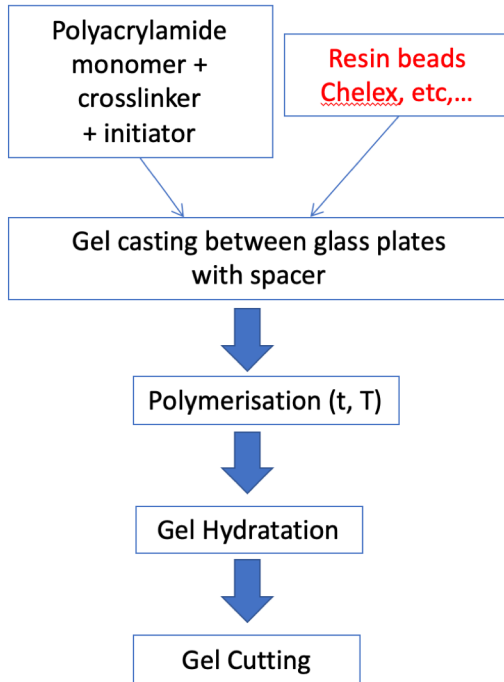
Can measure Hg present as Hg^{2+} and methyl mercury (*Gao et al., 2011, 2014*). It selectively measures As(III) (*Bennett et al., 2011*). Standard DGT holder for solutions with 0.8 mm agarose diffusive gel, polyethersulphone filter membrane layer and a 3-mercaptopropyl functionalised silica gel binding layer.

- 1 +

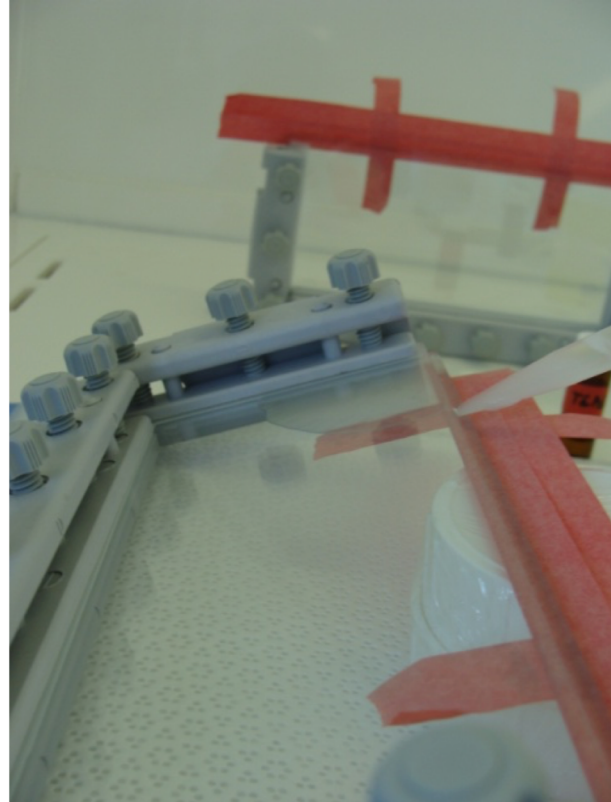
Add To Basket

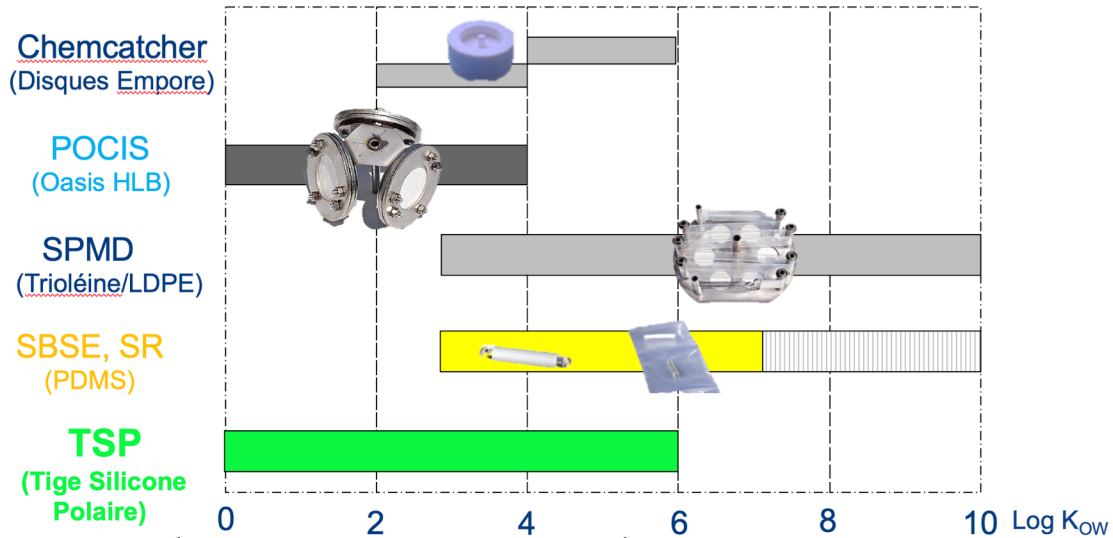
Category: [Loaded DGT passive samplers for deployment in solution](#)

DGT: DO IT YOURSELF



Resin & Diffusive gels
(4-5€/u)





Cas des **petits bassins versants agricoles dynamiques** :
 -> besoin d'un outil réactif, d'utilisation flexible, à large spectre

TSP : tige silicone polaire (2 cm x 3 mm, déploiement 1 semaine)

Thèse A. Martin, 2016, brevet n°16.51311



Marina Coquery
 Christelle Margoum
 Cécile Miège
 INRAE

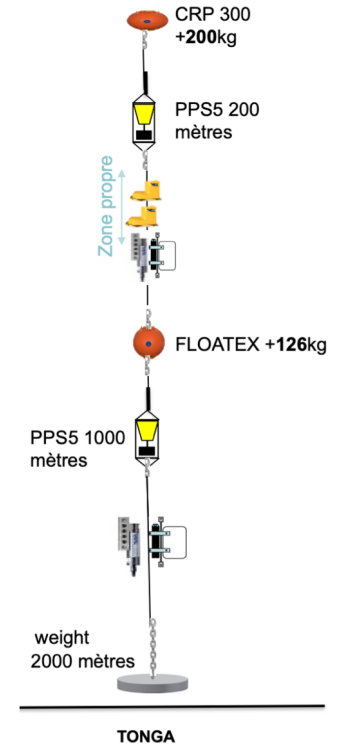
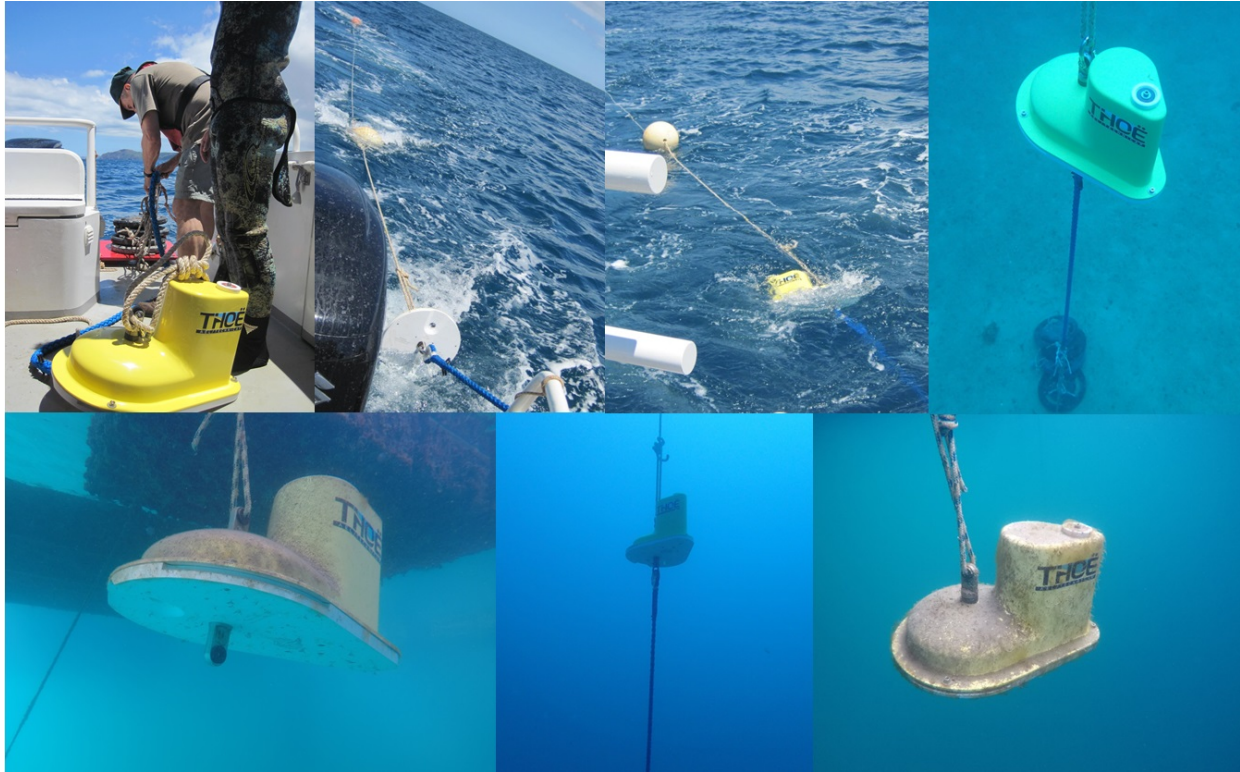
Automatic sampler using passive DGT[®] devices for water analysis

FEATURES

- Multiple deployment options available.
- 12 DGT[®] sequentially.
- sequences from few hours to several weeks.
- Built-in temperature sensor
- Titanium rotation axis to direct the DGT[®] towards the current.
- Max. depth of 1000 m.
- Structure, carrousel and seals in chemically inert components (PEEK, PETP, PTFE and Silicon).
- Autonomy in immersion mode of more than one year.



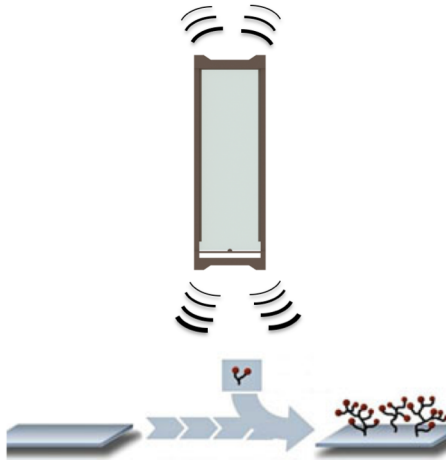
Deployment of THOE Autosampler in Deep Pacific waters (ANR TONGA) 1 year- 250m depth



Design TONGA Mooring (Lionel Souarnec, DT INSU)

GET « Tracesence » Technology for fast insitu preconcentration of contaminants

Vibrating glass slide in solution

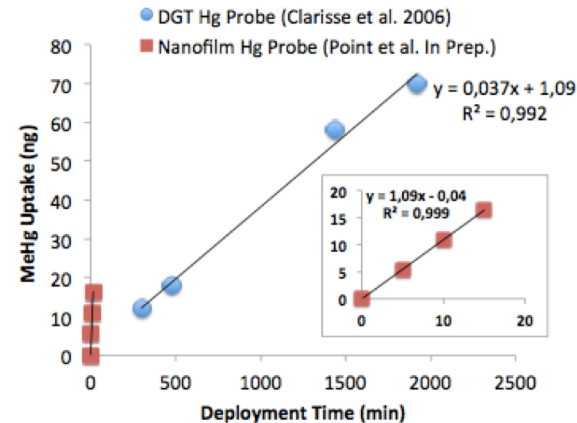


Thiol nanocoated Glass slide

IRD patent [WO2016128686](https://patents.google.com/patent/WO2016128686)

D. Point –A. Gauthier

Energy efficient dynamic
preconcentration device

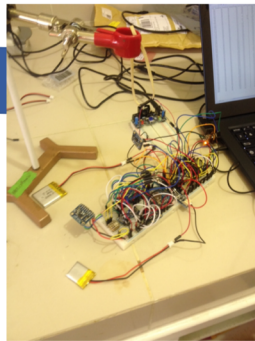


Challenges Lab. -> Insitu

Proof of Concept



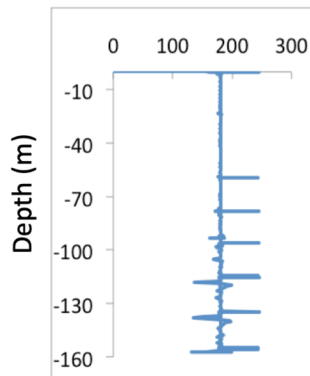
Electronics and mechanical integration



Laboratory
experiment



Vibration Frequency (Hz)



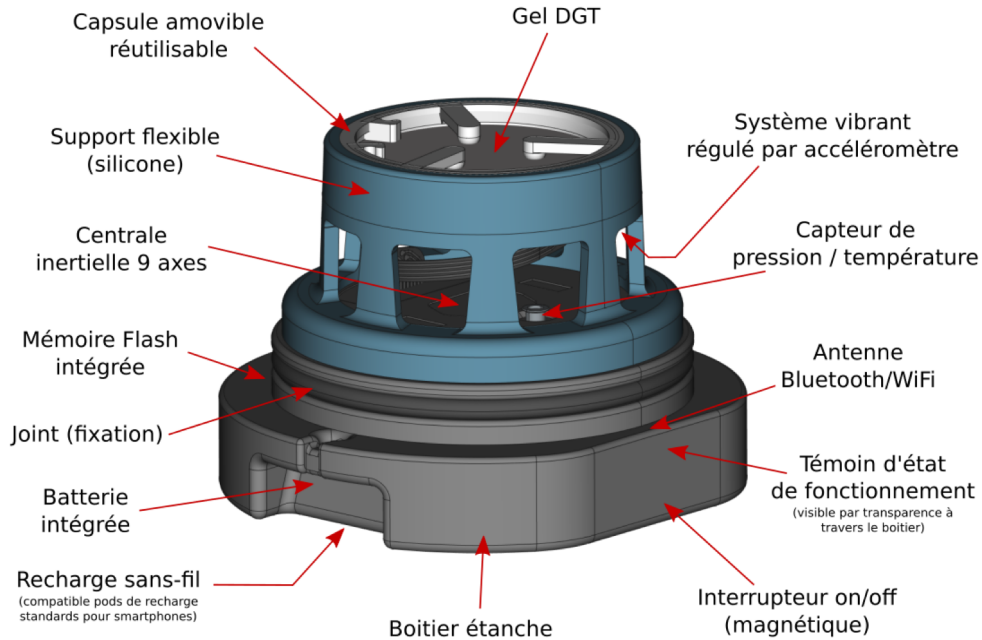
Field and in situ deployment



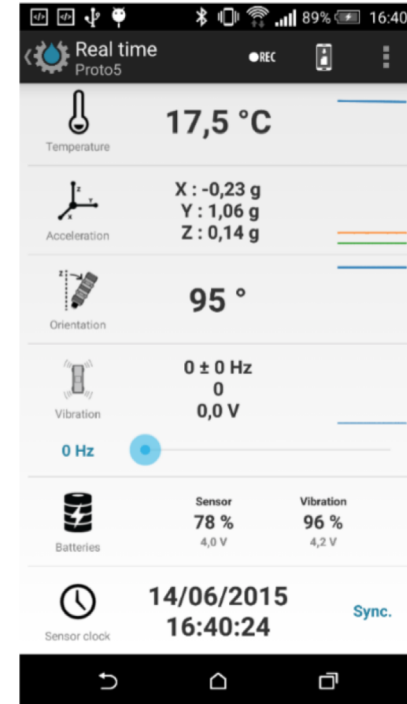
IRD patent WO2016128686

TRACESENSE Mini Insitu Autonomous New Prototype

Uses commercial DGT resin gels, test other supports



Smartphone App.



IRD patent WO2016128686

Point et al. In prep

TRACESENSE Mini



IRD patent [WO2016128686](#)

Point et al. In prep

Development and testing plan

3

Custom
Design DGT
resin gels

DGT® Research

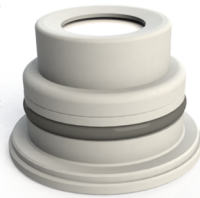
For measurements in waters, soils & sediments



Ex. 30 metals including Cd, Co, Cu, Fe, Mn, Ni, Pb and Zn;
Phosphorus and oxyanions including As, Mo, Sb, Se, U, V and W; Hg and As (III);
Polar organic compounds, including antibiotics; pesticides,
pharmaceuticals compiunds

**DGT
Passive
Sampler**

DGT
Holder



Day-weeks time integrated contaminant data

THOE
AEL/TECHNICAP



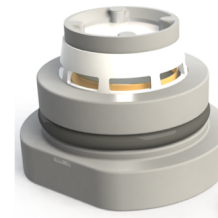
1

Develop and test
THOE-SMART version for
continental water body

2

IRD Institut de Recherche
pour le Développement
FRANCE

**Tracesense Mini
Dynamic sampler**



Compare, test and
optimize design of
TRACESENSE

Hourly time integrated contaminant data

Laboratoires impliqués : CARRTEL, CEBC, CEFE, Centre de Géosciences, CERFE, CESBIO, Chrono-environnement, CRAL, CReSTIC, DT-INSU, Dynafor, ECOBIO, ECOLAB, EVS, GET, GR, GSMA, HABITER UR, IGE, IM2NP, IPAG, IPGP, IRISA, IRT, ISM, ISTO, LAAS, LCA, LECA, LEMAR, LHYGES, LIG, LIRMM, LMGE, LPC, LRGP, LIS, RiverLy, SAS, Subatech.

Tutelles et partenaires non académiques : **CNRS** :INSU, INEE, INSIS, IN2P3, INP, INS2I, INSHS, INSB. **Autres organismes de recherche** : IRD, INRAE, IPGP. **Ecole d'ingénieur** : Mines ParisTech. **Universités** : Grenoble, Savoie-Mont-Blanc, Toulouse et Toulouse INP, Rennes, Clermont-Auvergne, Montpellier, Reims, Toulon, Franche Comté, Orléans, Strasbourg, Aix Marseille.**EPIC**: INERIS. **PME**: Extralab

Soutiens: CNES, OFB, BRGM, Agence de l'eau Loire Bretagne, Réseau RECOTOX, l'observatoire du sol vivant, Institut Carnot Eau & Environnement, Groupes Régionaux des experts du climat, Régions, Office régionales de la biodiversité, Fondation François Sommer

Remerciement aux autrices du livre TERRA FORMA qui nous ont laissé l'emprunt de leur titre.

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de la recherche



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