O_2 dans la Vasière Ouest Gironde
(Golfe de Gascogne)

Atelier ODATIS – O_2
Paris, 2-3 juillet 2019

Vasière Ouest Gironde et Estuaire de la Gironde

La Vasière Ouest Gironde : Principales caractéristiques

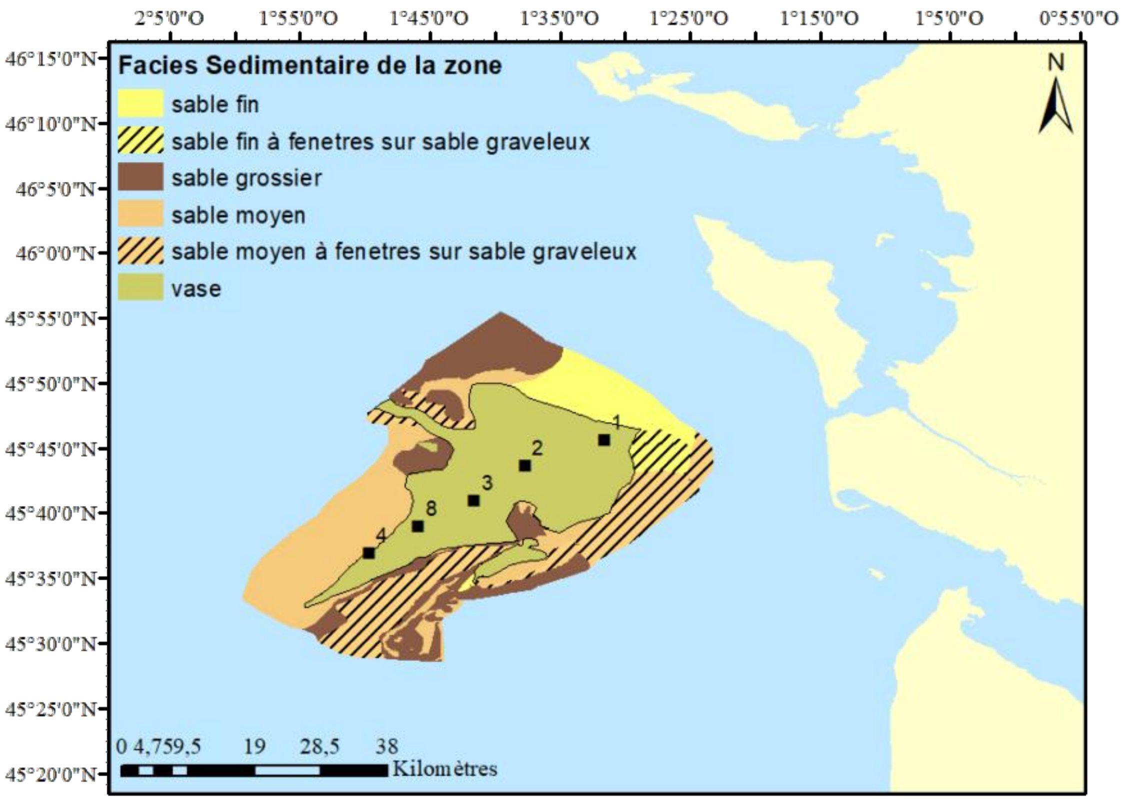
Vasière Ouest Gironde et Estuaire de la Gironde

- Vasière Ouest Gironde: 25 km de l'embouchure de l'Estuaire de la Gironde
  - → principale source de vase pour la marge Aquitaine (VOG: 20-40% flux particulaire)
  - → 0.2 à 3 $mm.an^{-1}$
- Estuaire Gironde : surface de 635 km^2
  - 75 km entre l'embouchure et la jonction de la Dordogne et la Garonne
  - bassin versant de 74 000 km^2
  - Système macro-tidal (semi-diurne; marnage jusqu'à 5 m à l'embouchure)
  - Débit liquide : 2,5 10^{10} m^3 an^{-1} avec jusqu'à 7 500 m^3s^{-1} (crue exceptionnelle)
  - Flux matériel particulaire fluvio-estuarien : 1,2 - 2,5 10^6 T an^{-1}
  - Temps résidence particules dans l'estuaire : 12-24 mois

(Jouanneau & Latouche, 1981 ; Castaing & Jouanneau 1987; Lesueur, 1989; Lesueur et al., 2002 ; Saari et al., 2010; Jalón-Rojas et al. 2015; Schmidt, unpublished data))

EPOC

La Vasière Ouest Gironde : Principales caractéristiques



(Jouanneau & Latouche 1981 ; Jouanneau et al 1989; Lesueur et al. 2002; Dano 2019)

- Surface 420-600 km^2 avec orientation Orientation NE-SW
- Bathymétrie entre 30 et 75 m
- Epaisseur de la couche de vase: 1 – <4 m
- Vase argilo-silteuse avec sable fin-grossier en périphérie
- Accumulation au cours des 2 derniers millénaires résultant de l'interaction entre
  - la bathymétrie
  - re-suspension du matériel sédimentaire par l'hydrodynamisme (tempête, vague, houle)
    - *H_{max} >4,8 m pdt 30j/an (9s>T<13s) → Tempête: H_{max} > 15 m (12s>T<15s)*
  - la bioturbation

Projet VOG : Etude de la Structure et du Fonctionnement de l’Interface eau-sédiment dans la Vasière Ouest-Gironde

(2018-2022)

Flotte océanographique française

- 7 missions déjà réalisées
- 4 campagne programmées

B Deflandre, *A Grémare, S Schmidt, A Romero-Ramirez, G Bernard, F Garabétian, S Rigaud, C Fontanier, H Gillet, JP Walsh , P Lebleu, N Lavesque, A Sottolichio, B Castelle, J Grall, C Labrune, MA Cordier, D Poirier, M Leconte, J Martin, C Portier, A Dalto, M Ténorio.*

Vasière Ouest Gironde et Estuaire de la Gironde

JERICO-NEXT (2015-2019) : Etude des **liens** entre **pressions/perturbations** et **diversité**

JRAP-2 : Etude des changements de la diversité benthique en lien avec ces perturbations
JRAP-3 : Développement outils d'observation

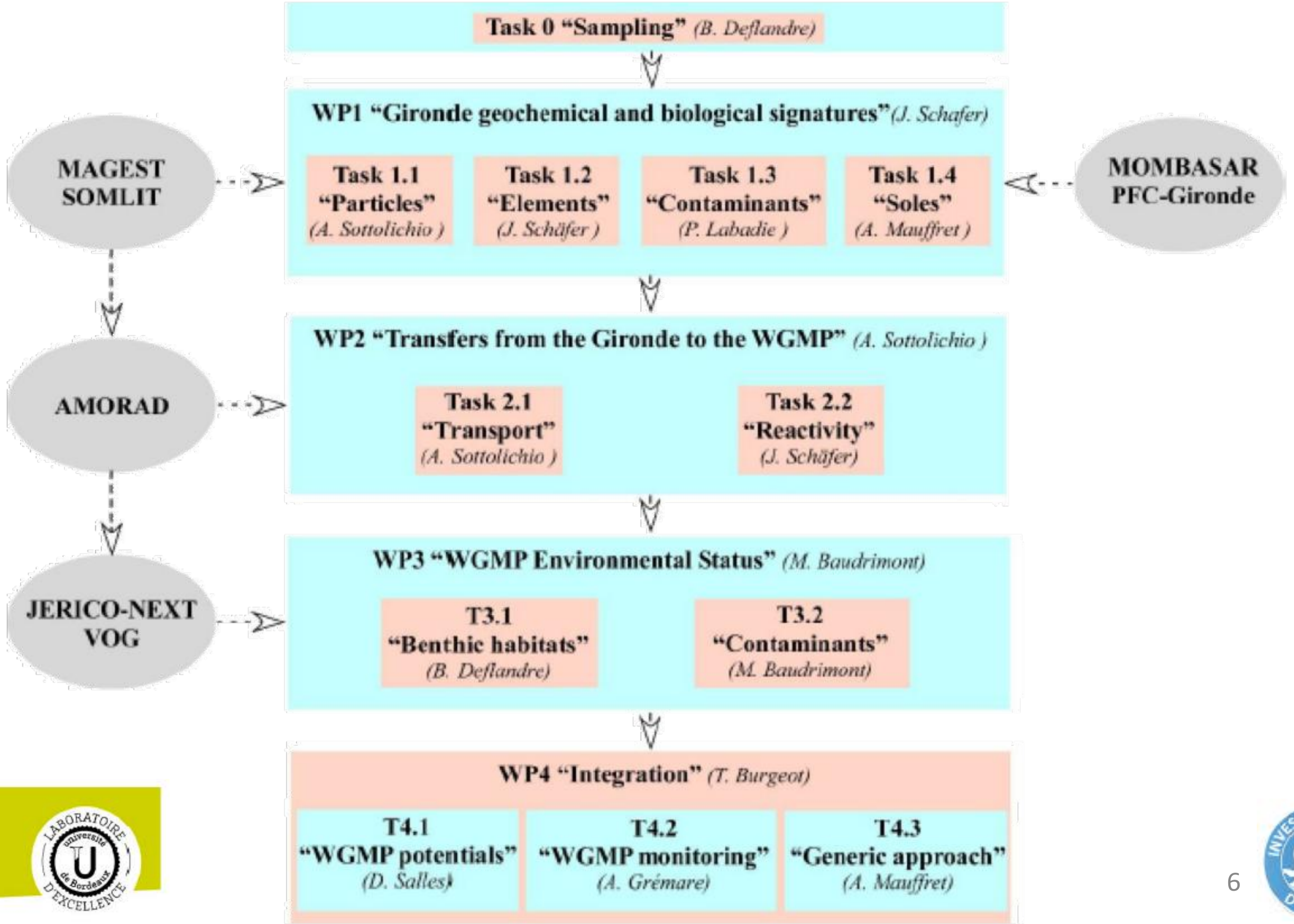
MISE EN PLACE D'UN OBSERVATOIRE COTIER DE LA BIODIVERSITE ET DES FONCTIONS DE L'ECOSYSTEME BENTHIQUE

The West Gironde Mud Patch: an integrated model for the application of the Marine Strategy Framework Directive to marine offshore systems (MAGMA)

A Grémare (EPOC UB) et T Burgeot (IFREMER Nantes)

La vasière Ouest Gironde : un Modèle intégré pour l'Application de la Directive Cadre StratéGie Milieu Marin aux habitats du lArge (*MAGMA*)

(2019-2023)

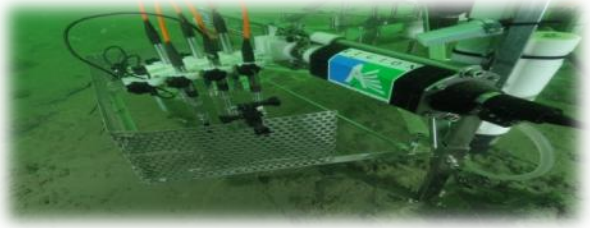


Projet VOG : Etude de la Structure et du Fonctionnement de l'IES dans la Vasière Ouest-Gironde

Méthodologies

Colonne d'eau	Sédiments

Sonde CTD
(T, S, P, turbidité, PAR fluorescence, O_2)

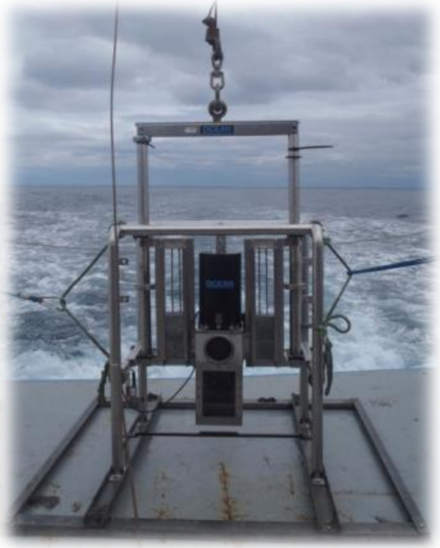


Profileur microélectrodes

Cloches benthiques / Incubations carottes

Carottier multitubes

Benne Hamon



Profileur Images sédimentaires

Banc hydraulique
(érodimètre)
IFREMER Arcachon

Caractéristiques du milieu

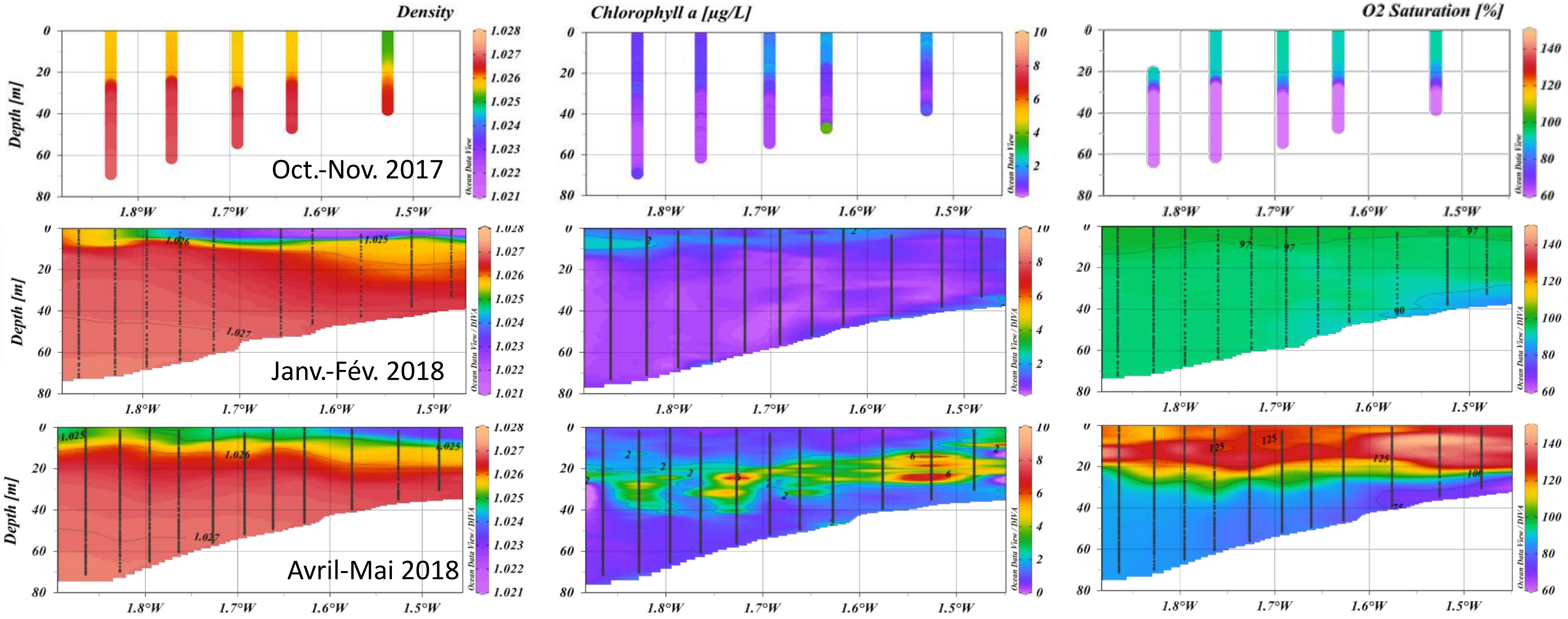
Diversité benthique
(procaryotes, Archées, meiofaune, macrofaune)

Processus biogéochimiques

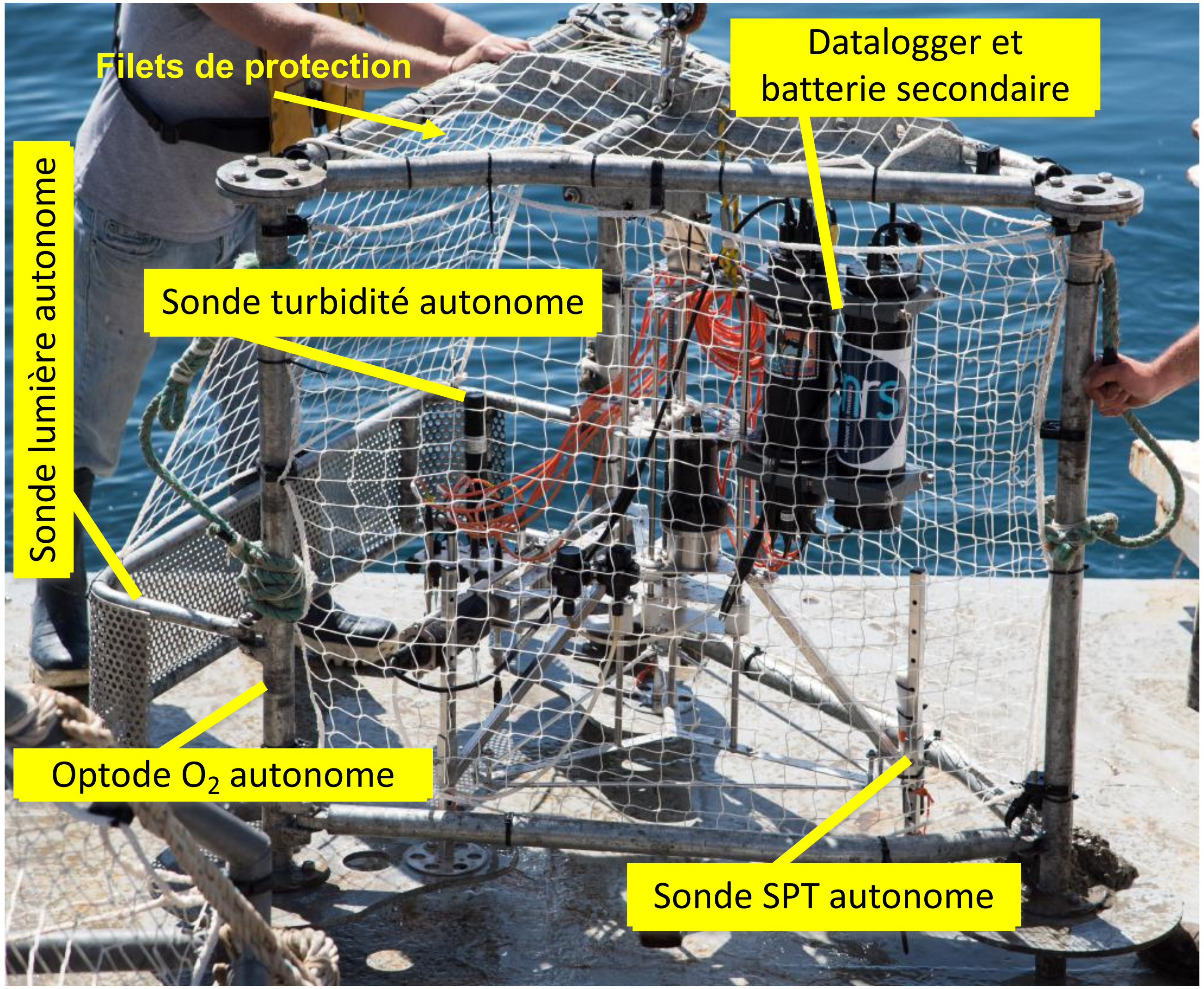
EPOC

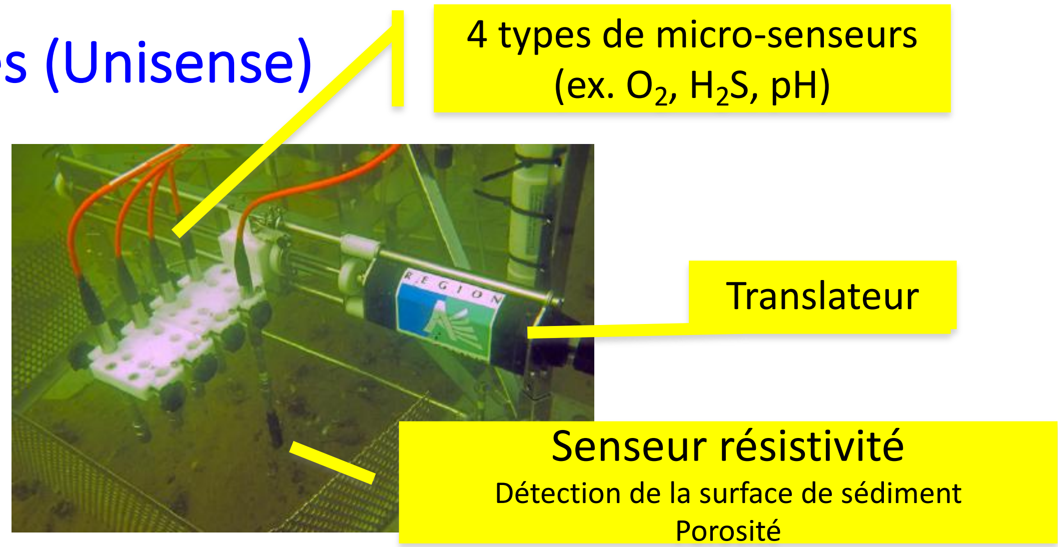
1-Transects : contextes hydrologiques contrastés

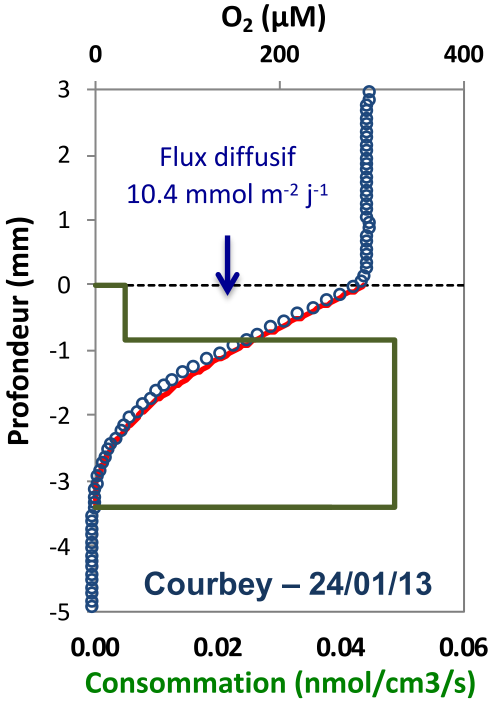
Seabird SBE-19 plus (T, S, Pression, PAR, fluorescence) + SDOT300 NKE (avec optode *Aanderaa* **4330F** ; O_2) + STBE NKE (turbidité) + STPS NKE + SPAR NKE (PAR)

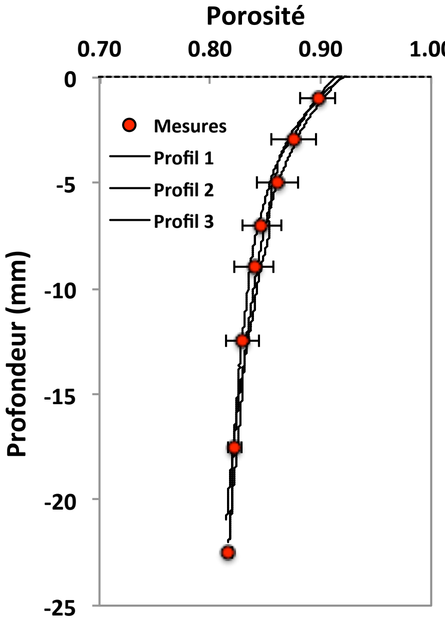


2. Le profileur benthique autonome de microélectrodes (Unisense)









optode Aanderaa **4330F** + SDOT300 NKE (avec optode Aanderaa **4330F** ou **3835**)

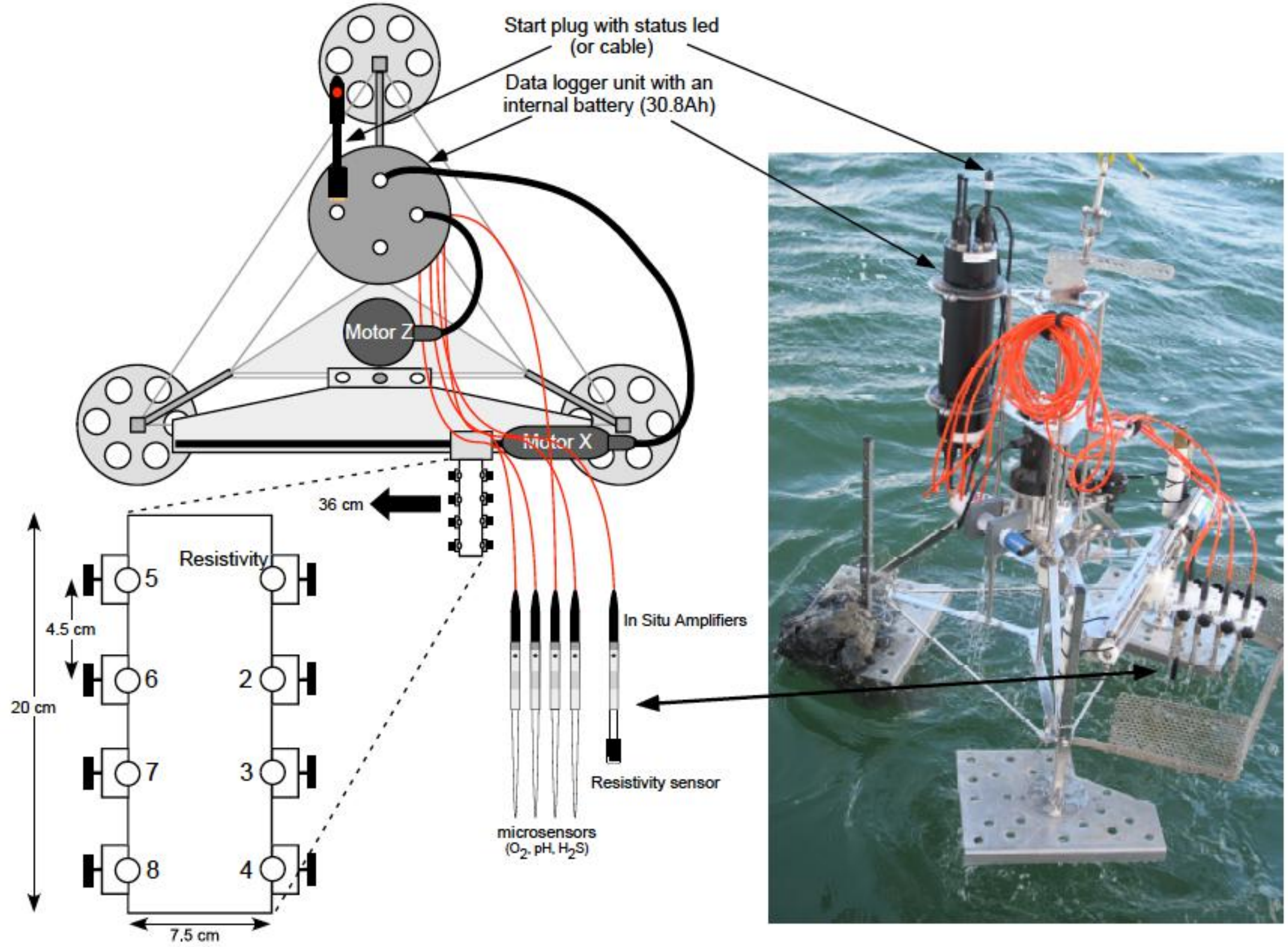


Figure III.1 Overview of the MP5 micro-profiler

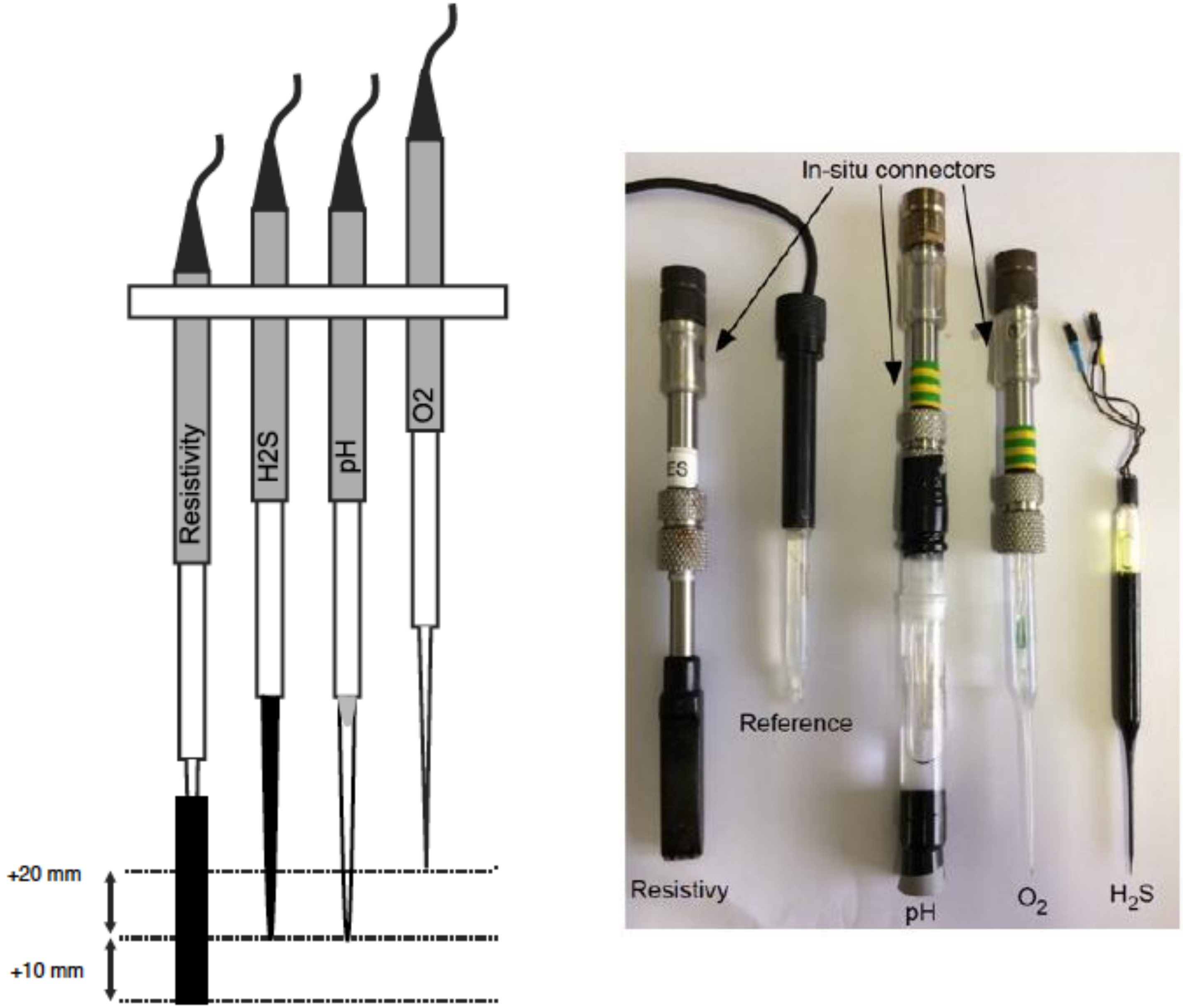


Figure III.3 Positions of respective sensors while profiling within the sediment column

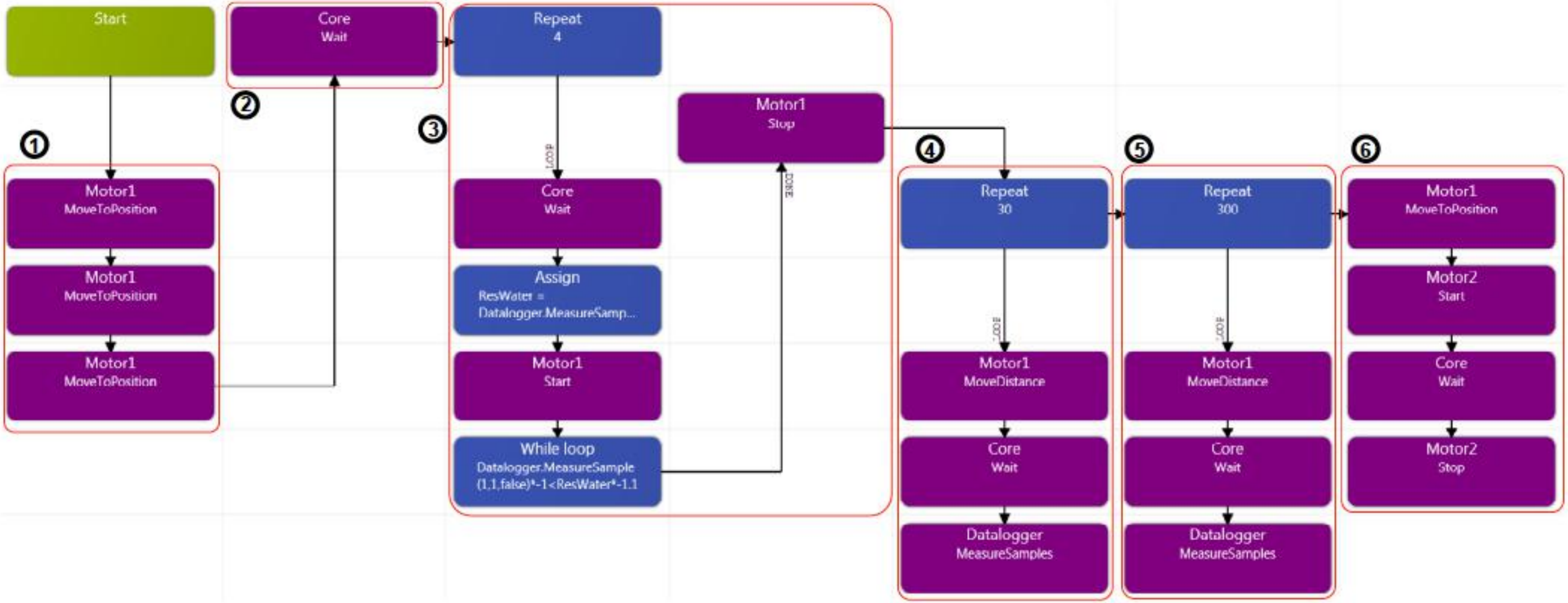


Figure III.4 Example of a profiling sequence for a total deployment time of 5.5 hours. Numbers are associated to the different steps described in the text.

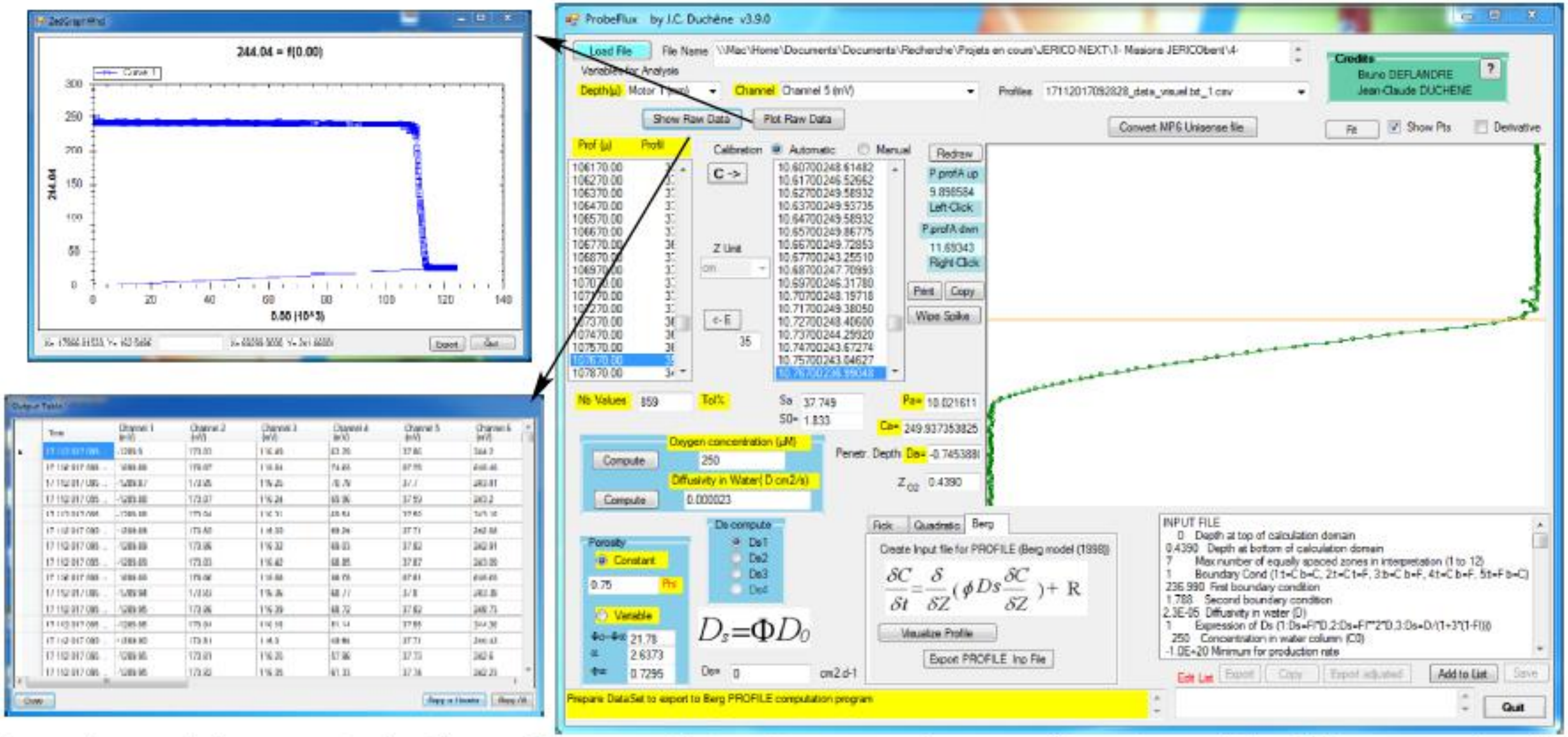


Figure 6 Snapshots of the new ProbeFlux software with its three new buttons/functions: (1) a "Show raw data" button to check the raw data for possible correction, (2) a "plot raw data" button to quickly plot untreated data, and (3) a "Convert MPx Unisense file" button for the conversion of data measured from the micro-profiler. See Deflandre et Duchêne (2010) for a more detailed description of software functioning.

Bassin d'Arcachon

Rigaud S, Deflandre B, Maire O, Bernard G, Duchêne JC, Poirier D, Anschutz P (2018) Transient biogeochemistry in intertidal sediments: New insights from tidal pools in Zostera noltei meadows of Arcachon Bay (France). Marine Chemistry 200:1-13

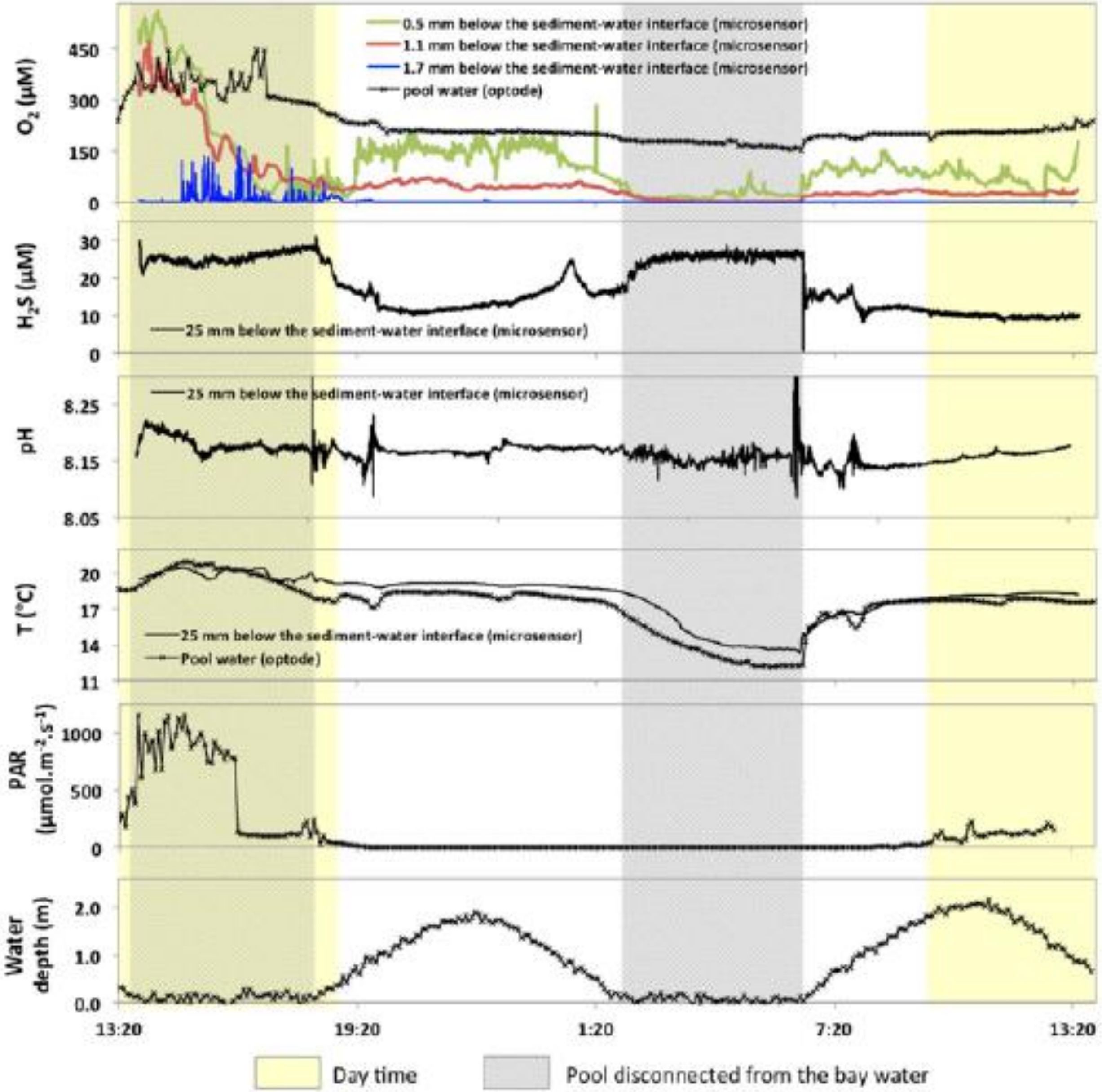


Figure III.7 Example of temporal changes in O_2, H_2S concentrations, pH and temperature at various depths below the sediment-water interface for a 24 h period in Arcachon Bay. Temperature and O_2 concentration in the pool water are reported as well as light (expressed here as Photosynthetically Active Radiation) and water depth.

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Rigaud S, Deflandre B, Maire O, Bernard G, Duchêne JC, Poirier D, Anschutz P (2018) Transient biogeochemistry in intertidal sediments: New insights from tidal pools in Zostera noltei meadows of Arcachon Bay (France). Marine Chemistry 200:1-13

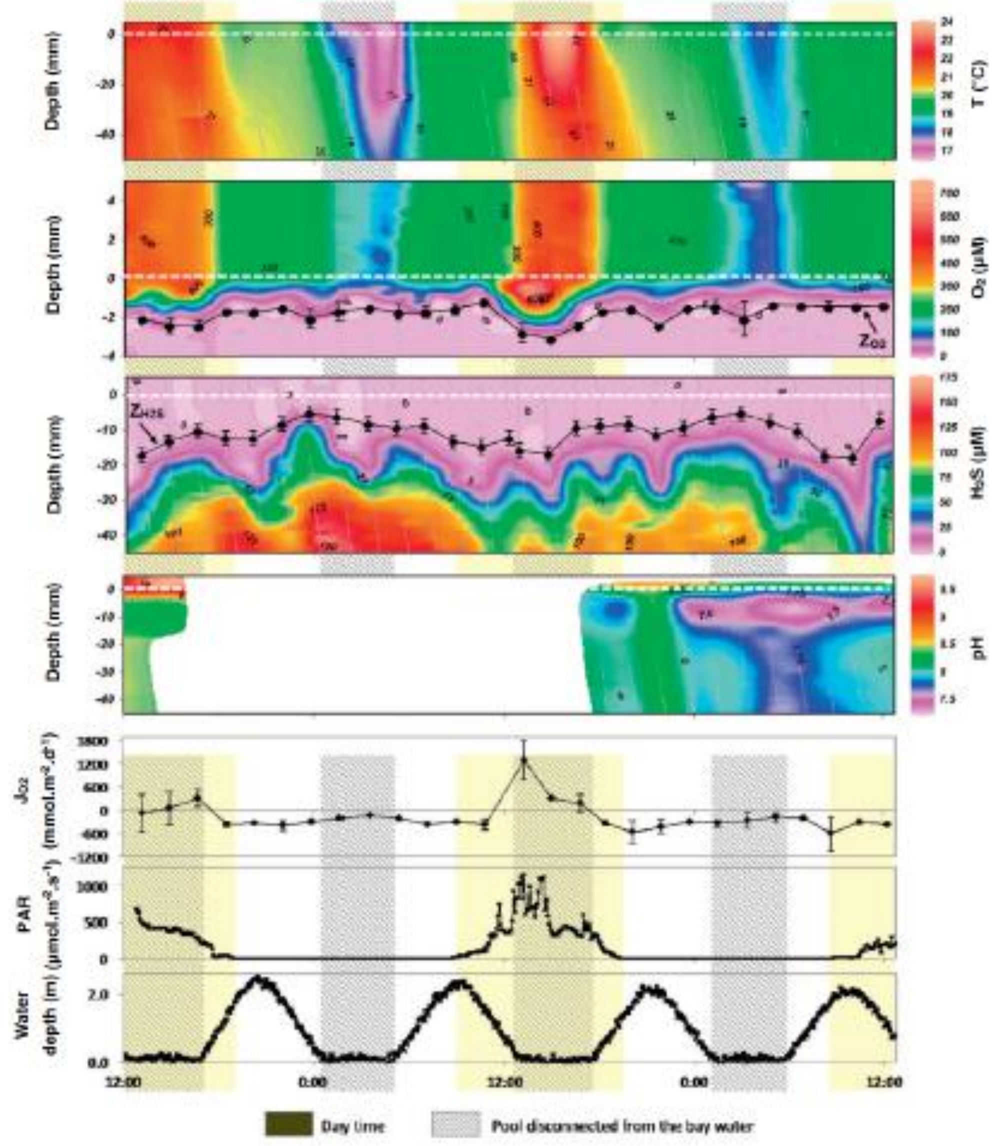
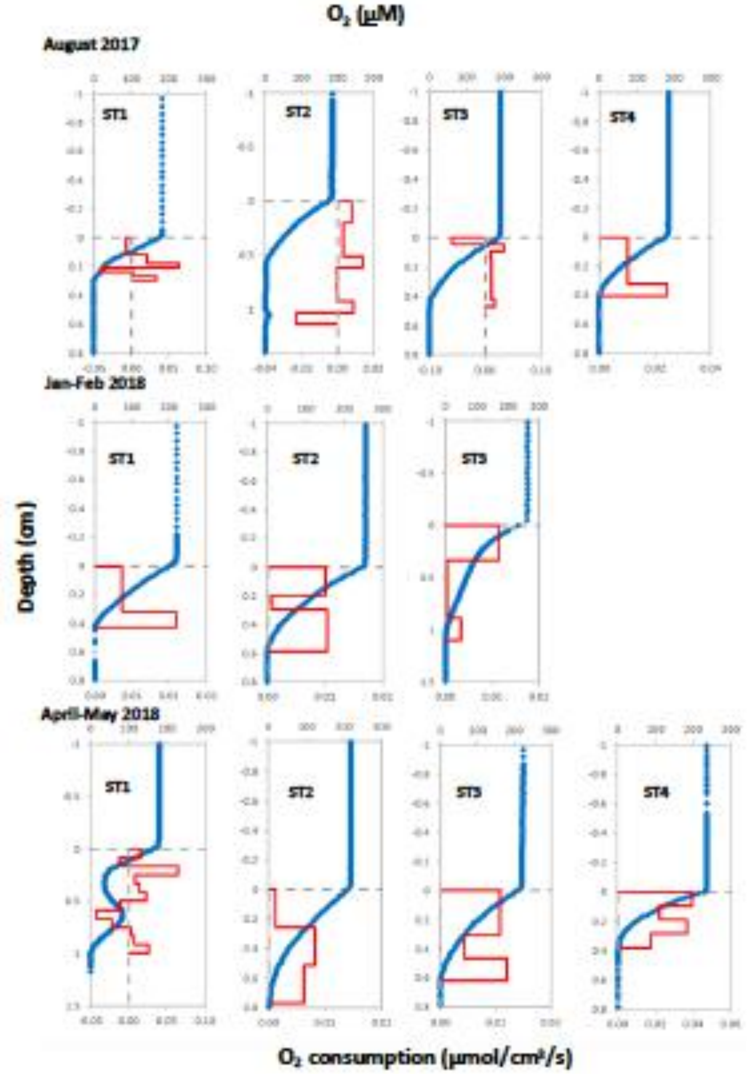


Figure III.8 Depth profiles of O_2 and H_2S concentrations, pH and temperature measured for a 48 h period with the MP5 micro-profiler in a pool sediment of Arcachon Bay. The 2D mapping was carried out using the DIVA gridding mode of the Ocean Data View software (Schlitzer, 2018). The O_2 penetration depth (Z_{O2}), apparition depth of H_2S (Z_{H2S}) and diffusive O_2 fluxes at the sediment-water interface (J_{O2}) obtained from the depth profiles (n=3) are also reported. Negative J_{O2} values are associated to fluxes from the water to the sediment. The horizontal white dashed lines correspond to the sediment-water interface. PAR and water depth are also reported with the periods when the pool was disconnected from bay water (dashed area) and the daylight period (light shaded areas). The absence of pH values is due to a broken electrode during the profiling sequence.

Vasière Ouest Gironde



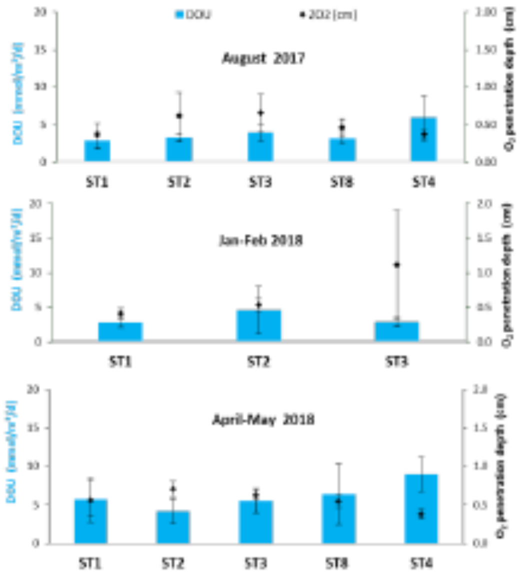


Figure III.12 Spatiotemporal changes in O_2 penetration depths and diffusive O_2 uptake rates (DOU) calculated from depth profiles of O_2 measured with the MP7 micro-profiler in the WGMP during the JRAP2 cruises (Oct-Nov 2016, August 2017, Jan-Feb 2018, April-May 2018; see **Figure III.11**). The number of studied stations is variable, depending on meteorological conditions. No data in Oct-Nov 2016 due to a communication issue between the profiler and computer.

Figure III.11 Selected depth profiles of O_2 measured with the MP7 micro-profiler in the West Gironde Mud Patch during JRAP2 cruises in August 2017, Jan-Feb 2018, and April-May 2018; no data in Oct-Nov 2016 due to a communication issue between the profiler and computer. Red line represents O_2 consumption rates calculated by modeling using the PROFILE software (Berg et al., 1998), and dashed line represents the sediment-water interface.