A glider fluorescence sensor (the MiniFluo-UV) for monitoring dissolved aromatic hydrocarbons in the marine environment

Goutx M[1], Cyr F[2], Bhairy N[1] & Tedetti M[1]

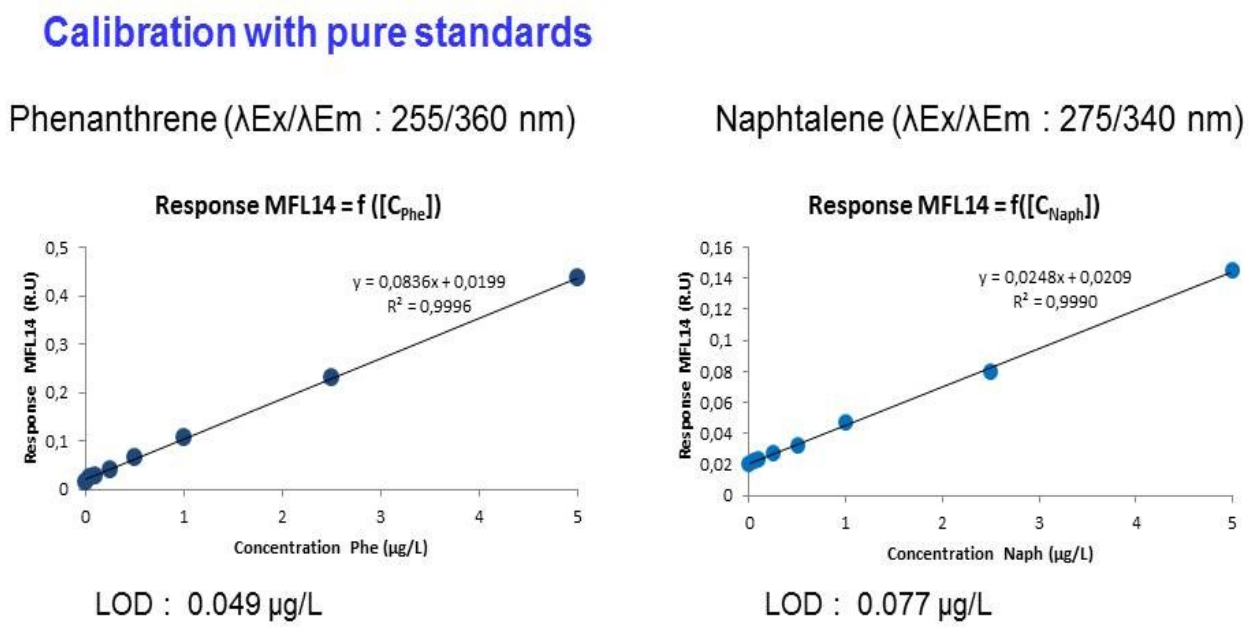
[1] Aix Marseille Université, CNRS/INSU, Université de Toulon, IRD, Mediterranean Institute of Oceanography (MIO) UM 110, 13288, Marseille, France

[2] Northwest Atlantic Fisheries Centre, Fisheries and Oceans Canada, St. John's, Canada

The MiniFluo-UV is a miniaturized fluorometer now fully operational on SeaExplorer gliders (Fig. 1). This sensor targets polycyclic aromatic hydrocarbons (PAHs), a specific class of dissolved hydrocarbons commonly found in crude oil.

Figure 1 Glider compatible MiniFluo (a) the complete MiniFluo : anodized aluminium for the upper part and copper cylinder for the bottom part; (b) diagram of the MiniFluo; (c) Optical cap with the quartz prisms at the center. The two channels for the through flow are also visible. (d) Optical cap (view from above); (e) MiniFluo installed on the SeaExplorer glider scientific payload; (f) MiniFluo with its optical cap.

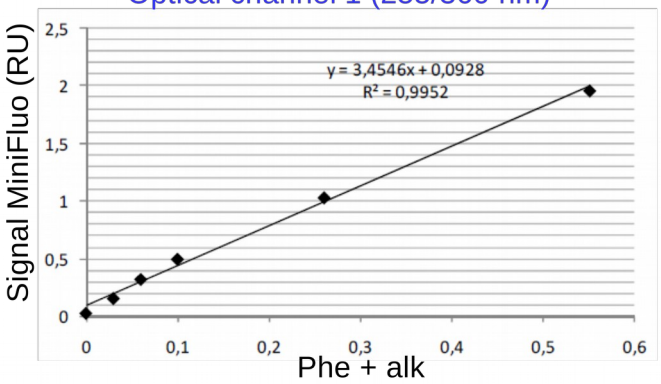
Laboratory measurements and calibration protocols using the two channels MiniFluo configuration are presented (Phe/Naph)(Fig. 2).



Calibration with petroleum water soluble fraction

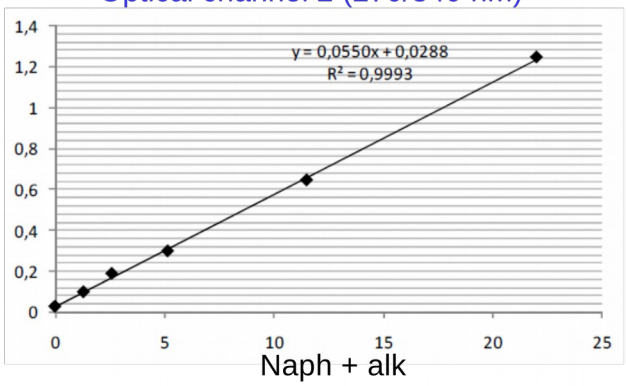
1) Production of the petroleum (Maya crude oil) water accomodated fraction (WAF)
2) Preparation of WAF dilution subsamples (1.5 - 25%)
3) Naph and Phe analysis in WAF subsamples with MiniFluo and GC-MS

Optical channel 1 (255/360 nm)



LOD : 0.058 µg/L

Optical channel 2 (270/340 nm)



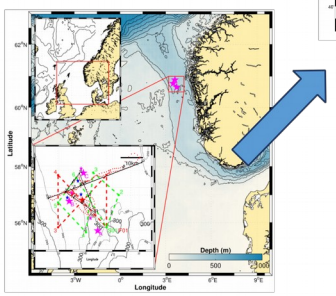
LOD : 0.475 µg/L

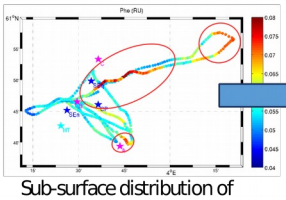
Concentration GC-MS (µg l^{-1})

In situ applications with the glider were carried out using only one version of the MiniFluo (Phe/Naph) during a campaign realized in the proximity of an oil & gas field in the North Sea (Fig. 3).

Glider + MiniFluo1 deployment in the proximity of an oil & gas field in the North Sea

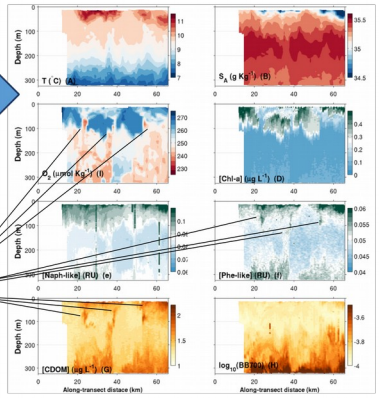
SeaExplorer Glider track deployment (end of 2016)
- MiniFluo MFL#14
- North Sea, Norway
- Statoil Troll field





Sub-surface distribution of PHE-like fluorescence

Chimney-like patterns



Depth profiled distribution of measured parameters by MiniFluo and Glider platform along transect distance

It is suggested that the package SeaExplorer glider/MiniFluo sensor is a powerful assessment tool to track dissolved hydrocarbons in natural waters.

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