Gliding with methane sensors

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When planning underwater monitoring, three questions are essential: which vector, which sensor, and what proof of concept? These define the efficiency of the work while minimizing HSE risks.

Since the early 2000s, underwater gliders have become a cornerstone of autonomous ocean observation. Initially developed for oceanography (2000), they expanded into defense applications (2005) and, more recently, oil & gas (2015).

Gliders are slow but highly enduring robotic platforms that profile the water column with great efficiency. Models are optimized for different environments: shallow waters (down to 200 m), deep waters (up to 1,250 m), and new developments aim at ultra-deep deployment (3,500 m). They have been successfully deployed in every ocean and sea worldwide.

Gliders can carry a wide range of sensors, including those for dissolved gases. Methane (CH_4) in particular has been monitored using infrared fluorescence sensors or semiconductor-based detectors, both providing reliable relative qualification of gas concentrations in the water column.

Recent technological progress is opening new possibilities, especially with the development of low-power CH_4 spectrometers, enabling more precise and continuous monitoring without compromising endurance.

The effectiveness of this approach is already proven. Since September 2021, the SeaExplorer glider has been continuously monitoring an active CO_2 and CH_4 seep linked to an underwater volcano. This long-term program demonstrates that gliders can quantify dissolved gas emissions and validate the concept of autonomous dissolved-gas monitoring.

Concerning O&G, Multiple use cases have already been documented: France, Greece, the United States, the North Sea, Colombia, and Angola, primarily for exploration. The same techniques are directly applicable to natural seeps, drilled & waiting (D&W) wells, plug & abandonment (P&A) operations, and even CO_2 storage monitoring.

In this presentation, we will look at some of these data to illustrate current capabilities and future potential.