

## Autonomous portable module for continuous analysis of oceanographic variables along coastal transects

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**Abstract** –Eutrophication risk determination requires a continuous acquisition of nutrient data to establish environmental trends. In the context of the MarRISK project, a portable module has been designed to autonomously measure inorganic nutrients together with other parameters such as temperature and salinity along coastal transects.

**Keywords** - Inorganic nutrients, autonomous analyses, WIZ probe, eutrophication, coastal risks.

### OCEANOGRAPHIC MODULE DESCRIPTION

Eutrophication is associated with adverse effects in coastal ecosystems. This environmental problem implies an accelerated proliferation of opportunistic microbial and macroalgae communities, altering the trophic structure of the marine ecosystems and deteriorating water quality. Consequently, nutrient enrichment risk negatively affects the marine ecosystem services [1, 2]. Particularly, in the Galicia-North Portugal Euroregion we have identified coastal risks such as eutrophication, ocean acidification and algal blooms regime alterations and all of them directly affect supporting and provisioning services.

In order to establish the trend of environmental indicators related to the eutrophication risk in a specific area, it is essential a continuous acquisition of nutrient data [3]. Most of nutrient probes are commonly used for fixed and floating platforms [4], but it requires having an available infrastructure and constant maintenance. In the EU MarRISK project [5], a portable module has been designed for continuous analysis of several parameters along transects on board opportunity vessels.

Our module, integrated by a WIZ nutrient probe, a SBE45 thermosalinograph and a GPS system, Fig 1(a), is activated manually by a single user only to start and to stop it. All these instruments are mounted on a pumping circuit collecting sea-surface waters. Temperature and salinity analyses are in continuous mode. Nutrients probe is programmed for sequential measurement of nitrate+nitrite and phosphate every 40 min. Seawater sample is pumped with a peristaltic pump into a flexible bag before entering in the WIZ nutrient-analyser. The sample is previously filtered by passing it through a 0.1 micron-filtration unit. When the multi parameter analysis is finished, the filter and pumping circuit washing is activated by turning the pump in reverse mode.

The WIZ probe is based on the automated micro-Loop Flow Reactor technology (patented by Systea S.p.a., Italy) and it is composed of an analytical unit and a reagent canister, Fig 1(b). Nitrate and nitrite are measured by UV-photoreduction, phosphate method is based on

phosphomolybdate formation and ammonium is determined by OPA fluorimetric method. The main advantages of WIZ are the low reagents consumption, in the order of  $\mu\text{L}$ , and the analysis of nitrate+nitrite, nitrite, phosphate and ammonium using one single unit.

Nutrient results of WIZ probe and FUTURA autoanalyzer, based on segmented flow analysis, were also compared. Our multi-parameter module has been tested in several campaigns on board R/V Mytilus and Tyba III (BDRI, O Grove), showing that it is a powerful tool for biogeochemistry studies in coastal areas.



Fig 1. (a) WIZ probe-thermosalinograph-GPS module on board; (b) WIZ probe calibration in the laboratory.

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