In-situ detection of nutrients in Kongsfjorden, Svalbard Islands using a cost effective nutrient sensor

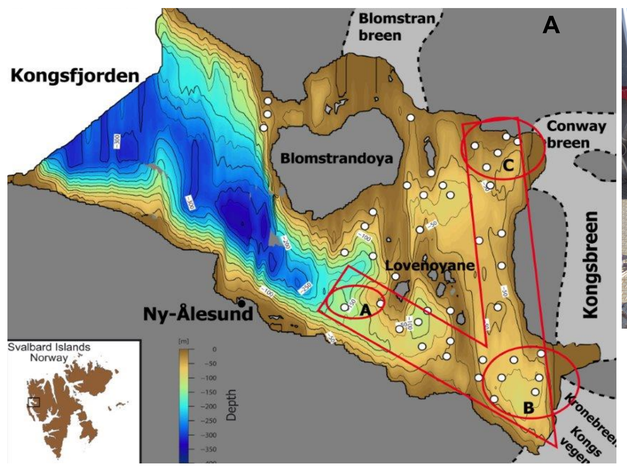
Margaret McCaul[1] Sean Jordan[1], Alberto Ribotti[2], Andrea Satta[2], Paolo Magni[2], Dermot Diamond[1]

[1] Dublin City University, Dublin 9, Ireland.
[2] CNR-IAMC, Oristano, Italy.

Introduction

Nutrients such as phosphate, nitrate and nitrite are central in many environmental processes within the marine environment, including several microbial, plant and animal metabolic processes. A cost effective sensor for the detection of phosphate in natural waters was developed as part of the COMMON SENSE FP7 project The project focused on descriptors of the MSFD, using sensors for the monitoring of nutrients, pH, contaminants, microplastic and underwater noise. The nutrient sensor developed at DCU for the detection of phosphate, nitrate and nitrite in marine and freshwater environments is based on a combination of microfluidic analytical systems, chemical colorimetric reagents and optical detection using a low-cost LED detection and wireless communications. In the framework of the Common Sense testing activities four daily cruises have been realized in the second half of June 2016 in the Kongsfjorden..

Sampling Plan



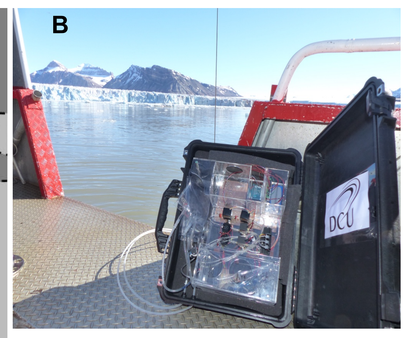


Figure 1. A) Map of sampling stations within the Kongsflorjden Fjord, **B** and **C)** Deployable CS nutrient sensor acquiring sample Kronebreen Kongvegen glacier.

Samples were taken at varying stations and depths determined by CNR Italy in Kongsfjorden Fjord (Figure 1 A). Over 180 water samples were collected using a Niskin sampler in different stations from the boat along the Kongsflorden at different depths from the surface to the bottom, typically surface, mid depth and bottom. Samples collected were analysed at the Italian research base laboratory for phosphate nitrite and nitrate. Nutrient concentrations were determined using the deployable nutrient sensor (figure 1 C-B). The CS deployable nutrient sensor was validated in the laboratory at the research base and deployed on the boat during the last day of the testing period. Figures 3 and 4 show nutrient concentrations measured in samples taken at four stations all samples were analysed using the CS nutrient bench top system. An aliquot of each sample was frozen and returned to DCU for further analysis.

Results

The results presented in Figure 3 show the depth profile for pH, Salinity, Nitrate, Nitrite and Phosphate at each sampling station realized on the 22nd June 2016 in the Kongsfjorden. Figure 4 shows colour distribution plots for Phosphate, Nitrate, Nitrite, pH, Temp and DO at varying depths along a transect from ITA 001 to ITA 008. N All maps were generated using Oceana Data View software.

Figure 2 Nutrient platform CTD and Niskin Bottles

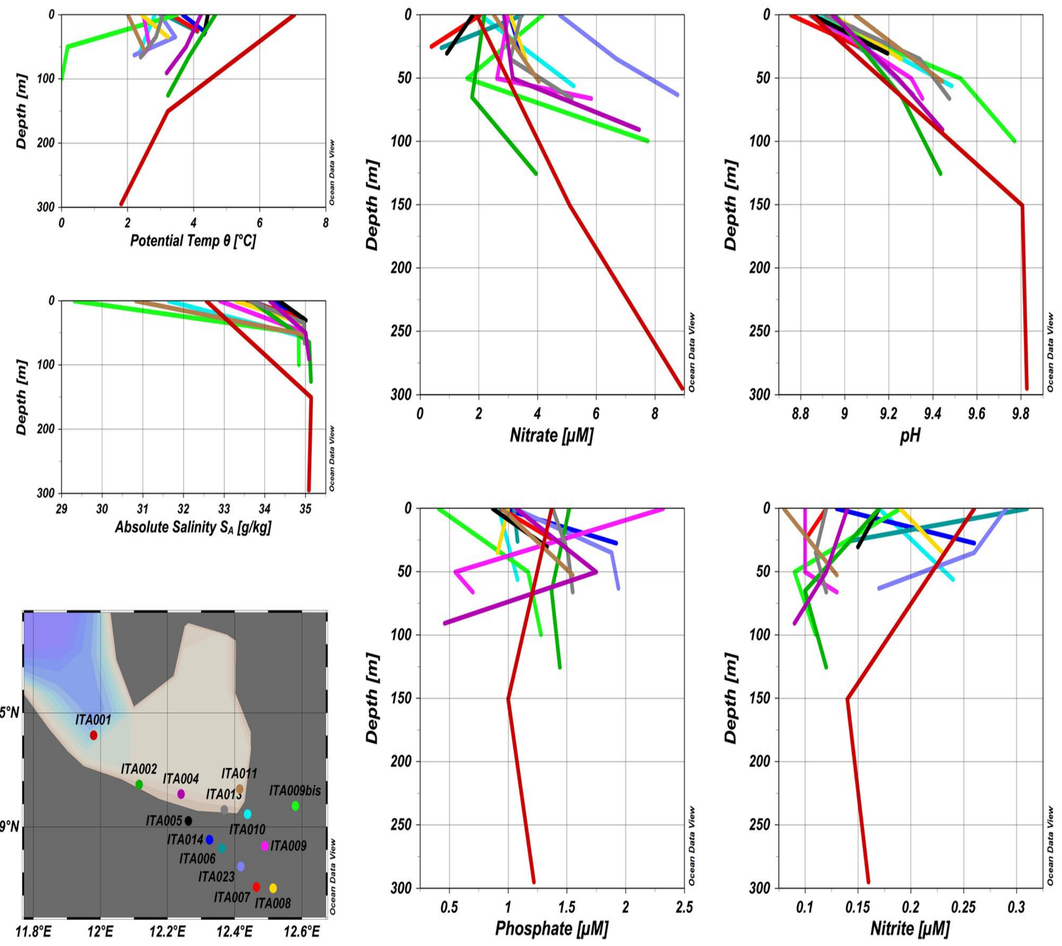


Figure 3 Depth profiles for Nutrients (Phosphate, Nitrate and Nitrite), Temperature, pH and Salinity at varying depths at each sample station. .

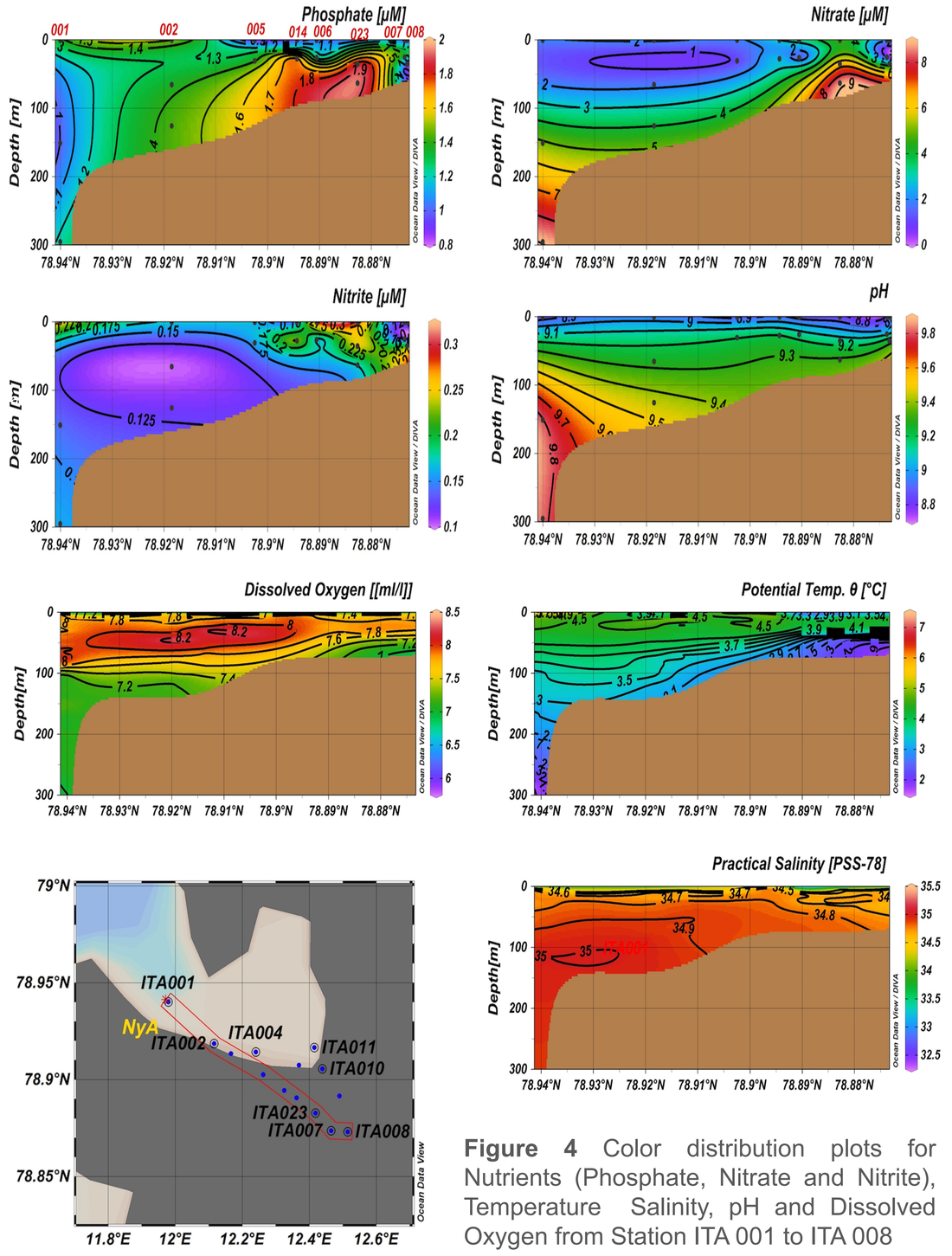


Figure 4 Color distribution plots for Nutrients (Phosphate, Nitrate and Nitrite), Temperature Salinity, pH and Dissolved Oxygen from Station ITA 001 to ITA 008