

## Project information

### Project title

Elaboration of a Ferrybox based system for the ocean acidification parameters measurements

### Year

2011/2012

### Project leader

Kai Sørensen, NIVA

### Participants

- Kai Sørensen, NIVA (Project leader)
- Evgeniy Yakushev, NIVA

Collaboration with Helmholtz Zentrum Geestacht (HZG), Germany. Collaboration agreement with the Franatech company for sensor development.

### Flagship

Ocean acidification, Theme: Processes related to the Arctic and the sea ice

### Summary of Results

Project will elaborate the use of a Ferrybox based system for measurements of ocean acidification parameters. Two variables that of high value to make automatic measurements are the pH with the sensitive spectrophotometric method and pCO<sub>2</sub> with new membrane technology and solid state detectors. The systems must work automatic in and together with a Ferrybox system. Leave alone the continues measurements of pCO<sub>2</sub> and pH the Ferrybox system will allow to perform discrete sampling for Alkalinity. The line between Tromsø and Svalbard are the target for the installation, with a test period on a ship in the Skagerrak where other similar systems will be in operation (HZG). This makes it possible to compare different systems (e.g. Jerico project) and one is close to the German company that is developing e.g. the pCO<sub>2</sub> system. The performed 2011 experimental studies were targeted in comparison of the pH measurements with different techniques: potentiometric (NBS/NIST scale) and spectrophotometric (total scale). The collected data will allow to elaborate statistical correlations between these 2 techniques necessary for using the archive pH(NBS) data for the interannual and multidecadal pH changes estimates. An automatic version of the pH(tot) will be designed and tested early 2012.

The pCO<sub>2</sub> systems will be developed at the Franatech company in Germany in close cooperation with NIVA. An agreement of cooperation as been set up between NIVA and Franatech. Within the marine acidification flagship we have discussed the present technology and we will prepare for an intercomparison of different systems including the G.O. system used by IMR and BCCR on the research vessel G.O. Sars in the Barents Sea. A target goal for the accuracy of pCO<sub>2</sub> is set to 1 ppm. The system will be operated with an Labview software that also operate the Ferrybox. A design review meeting will be held early December and will be installed for testing in end of December.

Project will elaborate the use of a Ferrybox based system for measurements of ocean acidification parameters. Two variables that of high value to make automatic measurements are the pH with the sensitive spectrophotometric method and pCO<sub>2</sub> with new membrane technology and solid state detectors. The systems must work automatic in and together with a Ferrybox system. Leave alone the continues measurements of pCO<sub>2</sub> and pH the Ferrybox system will allow to perform discrete sampling for Alkalinity. The line between Tromsø and Svalbard are the target for the installation, with a test period on a ship in the Skagerrak where other similar systems will be in operation (HZG). This makes it possible to compare different systems (e.g. Jerico project) and one is close to the German company that is developing e.g. the pCO<sub>2</sub> system. The performed 2011 experimental studies were targeted in comparison of the pH measurements with different techniques: potentiometric (NBS/NIST scale) and spectrophotometric (total scale). The collected data will allow to elaborate statistical correlations between these 2 techniques necessary for using the archive pH(NBS) data for the interannual and multidecadal pH changes estimates. An automatic version of the pH(tot) will be designed and tested early 2012.

The pCO<sub>2</sub> systems will be developed at the Franatech company in Germany in close cooperation with NIVA. An agreement of cooperation as been set up between NIVA and Franatech. Within the marine acidification flagship we have discussed the present technology and we will prepare for an intercomparison of different systems including the G.O. system used by IMR and BCCR on the research vessel G.O. Sars in the Barents Sea. A target goal for the accuracy of pCO<sub>2</sub> is set to 1 ppm. The system will be operated with an Labview software that also operate the Ferrybox. A design review

meeting will be held early December and will be installed for testing in end of December.

#### Published Results/Planned Publications

When the test period is finished the results are planned for publication Journal.

#### Communicated Results

The results of the new spectrophotometric pH method are used in the acidification subprogram in KLIFs "Tilførselsprosjekt".

#### Interdisciplinary Cooperation

The project is discussed with partners within the Ocean Acidification flagship and the systems will be compared to systems operated by the partners.

#### Budget in accordance to results

It will make it possible to transfere the methods to the Barents Sea Ferrybox systems when the testing is ready.

These kind of developments need a funding for good testing and validation and the funding has supported this.

#### If Yes

If one succeed to meet the goal of 1 ppm accuracy for pCO<sub>2</sub> this will be of high value for NIVA and the company that has designed the prototype.

If one succeed to meet the goal of 1 ppm accuracy for pCO<sub>2</sub> this will be of high value for NIVA and the company that has designed the prototype.

#### Conclusions

a) Indicate future research and/or perspectives which the project results have led to

If the two new methods that are under developments and testing within the project this could be the basis for a long tem study of marine acidification for e.g. Klif monitoring programs.

b) List and describe new methods or techniques that have been developed during the project or that the project has revealed a need for.

Improvement of an spectrophotometric pH method to be prepared for an automatic system onboard a Ferrybox systems. Development of a prototype pCO<sub>2</sub> system for studying marine acidification.