
TMR4585 Underwater technology 2019

Project description

Introduction

The student groups will spend one day onboard the RV Gunnerus to collect data for the project work of TMR4585 using multibeam echosounder (MBE), ROV and AUV. The survey site will be the Tautra coldwater coral reef. The motivation for the field work is to teach the students the principles of data collection during underwater operations and seabed mapping. Using this understanding the students should be able to recognize typical error modes and ways of assessing error. The motivation of the project work is to learn the principles of underwater operations, vehicles and robotics for seabed mapping. The different tools that are available – their possibilities and limitations. The nature of the data they collect and the inherited error sources including accuracy and resolution limitations. Using this insight, knowledge of the concepts of processing should be obtained by practicing on the data collected during the field work. The project work will hence cover; underwater navigation, seabed mapping and control strategies for underwater vehicles.

For this project - we are considering a scenario where a pipeline should be placed across the Tautra threshold where vulnerable cold water corals are present. The pipeline route should be surveyed to find an optimal transect which provides the optimal conditions for the pipeline while avoiding the cold water corals.

The students of the course should organise in group of 3 to 5 students. Each group should produce a report from the work during the semester. The report will be the basis for the oral examination at the end of the semester.

Figure 1: RV Gunnerus and ROV launch



Practical information

All students should meet at the RV Gunnerus at 08:00. Do not keep the vessel waiting for you. Onboard the vessel we will collect the data necessary for the operation. You will be served meals onboard. During the different steps of the operation there might be waiting time, so bring your computer to allow yourself to utilize the waiting time efficient.

HSE

It is essential to the safety onboard that you follow the instruction from the vessel crew and instructions during the time onboard. Please also read the HSE instruction for NTNU:

<https://innsida.ntnu.no/wiki/-/wiki/English/Fieldwork+-+for+participants>

Data collection

During the day we will collect the follow data sets:

1. Multibeam echosounder (EM3002)
2. ROV [stereocamera and underwater hyperspectral imager (UHI) is optional]
3. AUV with seabed imager and side scan sonar

Processing

The data should be processed during your project work:

Table 1: Data types processing and products.

Data	Processing tool	Expected product
MBE	CARIS	Bathymetry models
ROV-navigation	Matlab	ROV tracks Accuracy estimates
[ROV imagery]	Agisoft	3D models
AUV-navigation	Neptus / Matlab	AUV track Accuracy estimates
AUV-imagery	Neptus	Georeferenced seabed imagery Photomosaics
AUV-Side scan sonar	Neptus / Sonarwiz	Side scan imagery Sonar mosaics
CTD	Matlab	Density profiles Speed of sound profiles

If possible, all data should be imported in a GIS project; like QGIS or ArcGIS.

Timeline

To be able to utilize the time onboard RV Gunnerus efficiently we rely on a timeline. There are however possibilities for changes to the schedule. Bring computer to be able to use your time efficiently if there will be waiting periods.

Table 2: Timeline

Time	Item
08:00	Departure for Tautra
09:30	CTD cast
10:00	Start MBE survey
11:30	End MBE survey and deploy ROV for Video
12:00	Lunch
12:30	AUV survey <ul style="list-style-type: none"> • Program mission • Deploy vehicle • Recover vehicle • Download data
16:30	Depart from site

Literature

The students are encouraged to find search for relevant literature. The following articles are good starting points for basic understanding of the planned work.

1. Johnsen 2016
2. Ludvigsen 2016
3. Nornes 2017

App notes / Howto

As described in Table 1, there are multiple software packages that are useful for the project work. To make it easier to get started, there are developed simple app notes to get started for some of the work packages.

- CARIS
- SonarWiz
- Agisoft