



**ALFRED-WEGENER-INSTITUT**  
HELMHOLTZ-ZENTRUM FÜR POLAR-  
UND MEERESFORSCHUNG



## CRUISE-REPORT

### FS Heincke – Cruise 477

Norwegian trench, Sognefjorden, Danish EEZ

**Chief Scientist: Dr. Sören Krägefsky**

13.02– 27.02.2017

#### Scientific Participants

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<sup>1</sup> 13.02. – 26.02.2017

<sup>2</sup> 15.02. – 21.02.2017

<sup>3</sup> 15.02 – 23.02.2017

## **Zusammenfassung**

Hauptziel der FS Heincke-Expedition HE477 war der Test eines drei-dimensional steuerbaren Schleppsystems nach Anpassungen der Flugsteuersoftware. Die Anpassungen erfolgten nach Maßgabe der Ergebnisse, die auf HE469 gewonnen werden konnten. Das Schleppsystem dient als Trägerplattform für eine synergistische Integration von verschiedenen Sensoren- und Messgeräten. Das geschleppte Messsystem soll eine räumlich und zeitlich hochauflösende Untersuchung physikalischer, chemischer und biologischer Parameter im oberen Ozean ermöglichen.

Es wurden ausführliche Tests der Flugeigenschaften bei vertikaler Undulation, horizontaler Auslenkung und verschiedenen Schleppgeschwindigkeiten durchgeführt. Nach Flugtests ohne Sensor- und Gerätebestückung, erfolgten Tests mit integrierter Messsensorik, darunter ADCP, Breitband-Echolotsystem Simrad EK80, CTD und optische Messsensorik (PAR, Ramses ACC VIS Radiometer, Transmissiometer, Fluorometer). Die Messungen mit der Messsensorik erfolgten für Testzwecke. Messungen mit dem schiffsgebundenen Breitband-Echolotsystem Simrad EK80 wurden ebenfalls für Testzwecke durchgeführt. Es wurden en route Messungen mit dem schiffsgebundenen Thermosalinographen vorgenommen. Diese Daten sind zusammen mit anderen Schiffsdaten archiviert worden und sind unter <https://dship.awi.de/> verfügbar.

Main objective of the FS Heincke expedition HE477 was to test a towed vehicle steerable in three-dimensions after a revision of the flight control software. Changes in the flight control software were made in accordance with the insights gained during the cruise HE469. The vehicle serves as a carrier allowing a synergistic integration of a set of sensors and instruments. The towed system will allow surveying of physical, chemical and biological parameters in the upper ocean with a very high spatial and temporal resolution.

Extensive testing of the flight performance of the towed vehicle was performed in vertical undulation mode, with horizontal inclination and at different towing speeds. After tests without integrated sensors, tests were performed with sensors and instruments mounted on the vehicle, among others with ADCP, Wide-Band Echosounder Simrad EK80 and optical sensors (PAR, Ramses ACC VIS radiometer, transmissiometer, fluorometer). Sensor measurements were conducted for testing purpose. Also for testing purpose, measurements with the ships mounted Simrad EK80 were performed. En route measurements were made with the ship mounted thermosalinograph. This data have been archived along with other ships data, and is available via <https://dship.awi.de/>

## **Introduction and objective**

Primary objective of the cruise was testing a towed vehicle steerable in three-dimensions, serving as a carrier allowing a synergistic integration of a set of sensors and instruments, which will allow high-resolution measurements of physical, chemical and biological parameters in the upper ocean.

## Study area

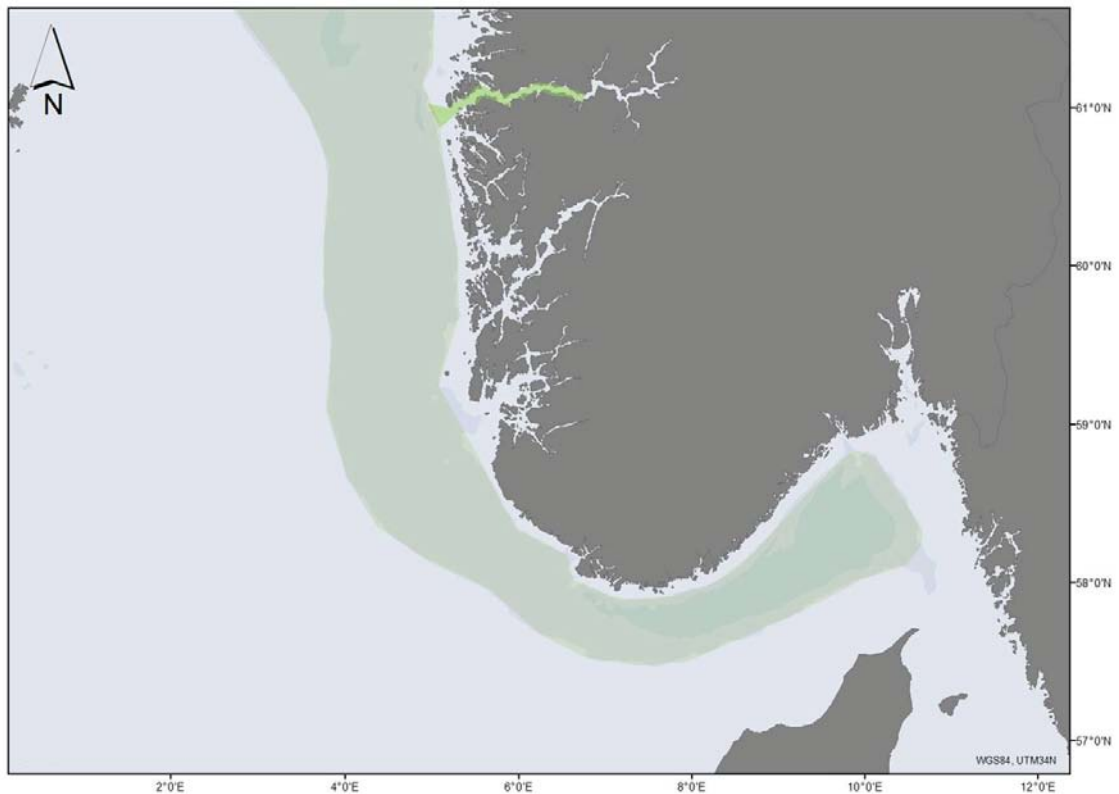


Chart of the geographical area of intended work marked in grey-green (Norwegian trench) and light-green (Sognefjord).

All tests of the flight performance of the towed vehicle were performed in Sognefjord (Norway). Port calls were in Bergen on 15.02.17 and in Esbjerg on 25.02.17, which serve embarkment of cruise participants and unload of the towed system, respectively.

## Methods

Flight performance tests were conducted with different flight parameters, among others at different towing speeds, cable lengths, horizontal inclination and vertical undulation. Communication of the sensors and instruments mounted on the vehicle and control units on board the ship via fiber optic and performance of the instruments were tested for several hours, while testing flight performance with payload.

## Preliminary results

Flight performance tests allow assessing the system limits and progress made due to adaptation of the flight control software based on the findings during the FS Heincke cruise HE469.