

REQUEST FOR CONSENT FOR MARINE SCIENTIFIC RESEARCH
IN WATERS UNDER THE JURISDICTION OF ICELAND

Date: February 16th, 2016

1 GENERAL.

1.1 Cruise name.

The cruise name is NARVAL'2016.

1.2 Sponsoring institution.

Name: Service Hydrographique et Océanographique de la Marine (SHOM)

Address: Service Hydrographique et Océanographique de la Marine (SHOM) – 13, rue du Chatellier – CS 92803 – 29228 BREST cedex 2 – France

Director: Ingénieur général de l'armement Bruno FRACHON

1.3 French scientist in charge of the project.

Name: Jean-Claude LE GAC

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1.4 French scientist in charge of conducting the work at sea.

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1.5 Request authority.

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2 PROJECT DESCRIPTION.

2.1 Scientific objectives.

The NARVAL'2016 campaign is a multi-disciplinary sea-trial that will take place in an area where the knowledge of the marine environment is weak, either in oceanography, sedimentology and geophysics. The main objective of the campaign is to augment this knowledge by measuring *in situ* oceanographical and geophysical data.

In the field of the seabed knowledge, the analysis of the state of the art shows a lack of measurements of good quality in sedimentology and geophysics. Former bathymetric campaigns have led to compilations of data (IBCAO, Arctic project of the NGA), but the density of the available data is very weak. For the gravimetry, most of the data come from satellite measurements. As a matter of fact only the main structures of the seabed are well detected (ripple, shelf, underwater mountain). Unfortunately, the positioning of those structures is not precise enough for a use in the bathymetric field. In a general way, those data are qualified as quite poor. This is why gravimetric and bathymetric measurements should be done. They will also be used to correct the data from the satellite GOCE in order to determine the most precise geoid (approximately the mean sea level), determination of this geoid is vital in order to quantify the regional currents in the area.

Other measurements will be acquired; the magnetic field measurements will complete the spectrum of geophysical measurements in order to study the oceanic crust and its characteristics. The sedimentary nature of the seabed will be analyzed by acoustic measurements and imaging with a multibeam echo sounder and an acoustical sub-bottom profiler. Sediment corings may be done to get *in situ* ground-truthings.

Long term measurements close to the sea bottom will be made in a given position with a multi-sensors buoy "DORA" moored at an approximate depth of 2000m. This buoy will be equipped with a current-meter, a turbidity-meter, a thermometer and a pressure sensor. It aims at studying the following subject : temperatures close to the bottom as well as the turbidity, have some impacts on sedimentary and biological processes. The temperature significantly modifies the velocity of the water waves near the bottom and their propagation into the sediments. The variability of this temperature is not well known in Northern environment especially in winter and not well assessed within models. This buoy will be moored during the NARVAL'2016 sea trial and recovered during a second sea trial scheduled in 2017. The buoy will make observations from November 2016 to April 2017.

In addition, the water column will be studied by measuring on some points of interest the underwater ambient noise. That acoustical oceanography data, in relation with the study of the propagation of the sound in the water in the area and with the bathymetric features around the points of measurements will be confronted with the maritime traffic in the area and will allow to study the presence and the nature of the marine mammals in this region.

2.2 Past or future scientific cruises in the same area.

The French Hydrographic Office (SHOM) conducts similar research sea-trials in order to augment the general knowledge of the maritime environment in the Mediterranean Sea, the North Atlantic Ocean and in the Indian Ocean.

2.3 Bibliography.

None.

3 DESCRIPTION OF THE SHIP AND THE INSTRUMENTATION.

3.1 Ship information.

Ship name: BHO BEAUTEMPS BEAUPRÉ

Flag: FRANCE

Owner: MARINE NATIONALE

Operator: SHOM (GHOA)

Length: 81 m

Maximum draught: 7 m

DWT: 2025 t

GRT: 3292 t

Propulsion: Diesel Generators connected to electric engine

Speed: 12 knots

Maximum speed: 14 knots

Identification: FABB

Hull number: A 758

Communications: VHF/UHF – HF BLU – INMARSAT B – VSAT

Shipmaster: Cdr Moulart de Torcy / Cdr Goinere

Equipage: 29 (5 officers, 24 petty officers and crew members), all with French nationality.

Scientific team: 21 (hydrographers, scientists and engineers), all with French nationality.

3.2 Description of the instrumentation.

Type of data collected	Acquisition type	Systems
Bathymetry	Along shiptrack	Multibeam echo sounders: EM1002S and EM122 Singlebeam echo sounders: EA400, EA600

Geophysical measurements	Along shiptrack or on land	Sea gravimeter (Bodenseewerk KSS32M) Portable land gravimeter Scintrex Magnetometer
Sedimentology	Along shiptrack or station	Sub-bottom profiler: SBP120 Sediment sampling device Kullenberg corer (between 5 and 10 meters cores)
Current measurements	Along shiptrack	ADCP (Acoustic Doppler Current Profiler) 38 et 150 kHz
Hydrology	Along shiptrack	Expandable bathythermographs probes (XBT, XCTD) Sound Velocity Profiler Hull mounted Celerimeter Thermosalinometer Drifting ARGO buoys
Weather measurements	Along shiptrack	Onboard weather station
Acoustical oceanography measurements	Station	Experimental drifting acoustical buoy or other drifting/moored buoy (device presently at a conception stage)
Oceanographical measurements close to the sea bottom	Mooring	DORA buoy

3.3 Dangerous chemical.

No.

3.4 Drilling.

Core samplings (3 to 5 in the area, 10m length at the maximum) may be planned during the sea trial. Core positions will be determined from multibeam imagery.

3.5 Explosive.

No.

4 EQUIPMENTS AND INSTALLATIONS.

4.1 Physical measurements.

Echosounders will be used in order to measure the bathymetry of the area with accuracy compatible with the requirements of the International Hydrographic Organization (IHO).

A sea gravimeter and a sea magnetometer will be used to measure the changes in geophysical signals (anomalies in particular) in the survey area.

Sub-bottom profiler and sediment sampling, with multibeam imagery, will allow scientists to increase their knowledge of the sea bottom nature in the area, and to update the world sea bottom nature chart.

ADCP will be switched on to measure current in the water column during the whole survey.

Hydrology measurements will be done to provide the necessary sound velocity profiles for multibeam echosounder signal processing (inversion of time into vertical distance taking into account the acoustic ray paths), and to study the spatio-temporal variations of oceanographic phenomena in the area.

The experimental acoustical buoy TELEMAQUE with an antenna of hydrophones will measure the underwater ambient noise in different positions known to have different environmental characteristics (bathymetry, sedimentology, ship traffic,...). Depending on the weather conditions, lighter devices based on drifting or moored concepts might be used (these devices are still at a conception stage at SHOM).

The DORA buoy will allow current measurements, turbidity, temperature and pressure close to the sea bottom (see § 2.1).

4.2 Geophysical measurements during port of calls.

Earth gravity is measured for global geophysical purpose. At a call, still to be scheduled, the gravity data collected at sea will be calibrated by comparison with a well known terrestrial reference linked to the IGSN71 gravity world network. The gravity will be measured on land with a portable gravimeter near the ship and at a gravity reference station (see details in annex).

Request for authorization to carry out these measurements will be also detailed in the letter to be addressed for requesting the authorization to stop in ports of call.

5 GEOGRAPHICAL AREAS.

5.1 Description of the areas of the survey (WGS84).

The project will be carried out within the following areas:

- For bathymetric and geophysical measurements:
Within the polygons bounded by the following points:

69°00'N 011°00'W
69°00'N 007°30'W
65°30'N 007°30'W
65°30'N 011°00'W

65°45'N 008°30'W
65°00'N 005°30'W
60°00'N 016°00'W
60°30'N 018°30'W

- For the acoustical oceanography measurements, Beautemps-Beaupré will be at a distance up to 100 nautical miles maximum from the following positions:

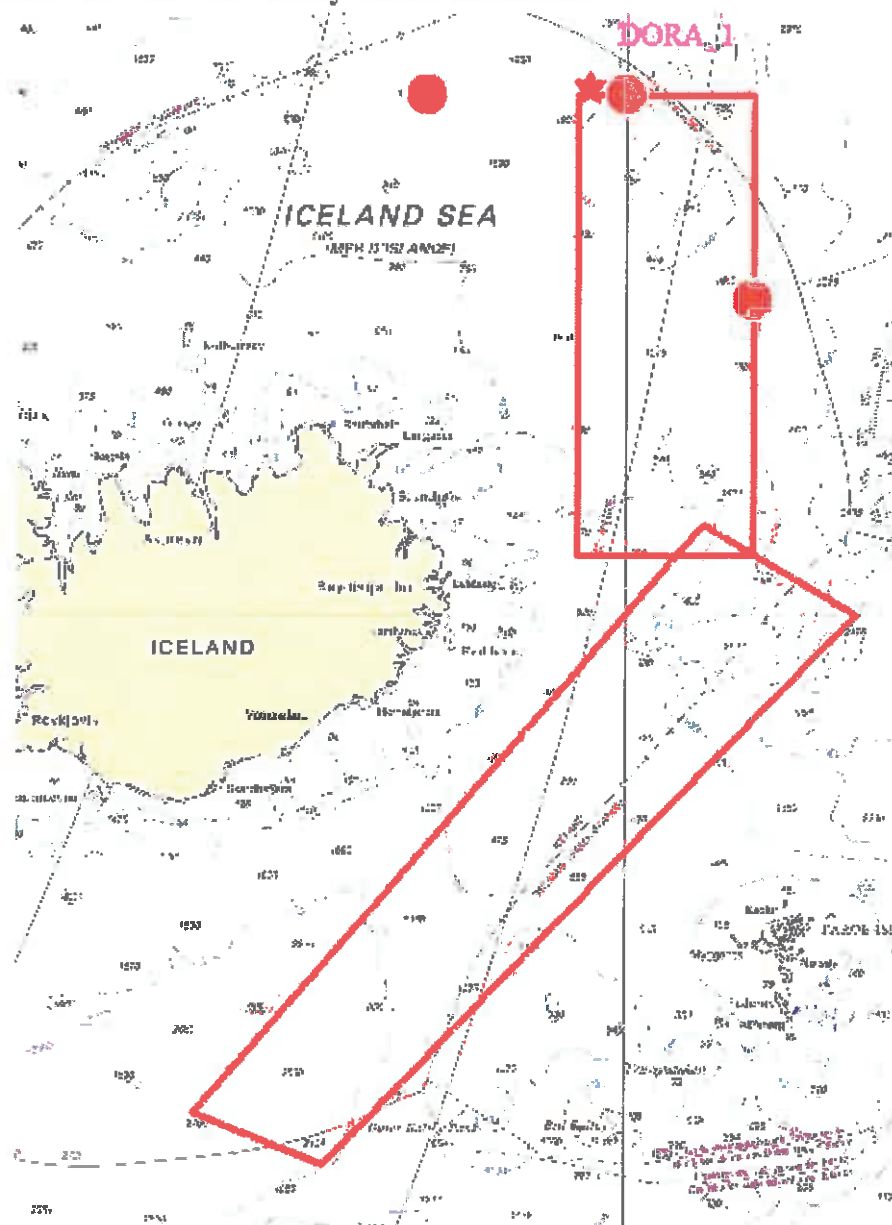
69°00'N 014°00'W
69°00'N 010°00'W
67°30'N 007°30'W

- For the oceanographical measurements close to the bottom with the DORA buoy, around the following theoretical location :

69°03.6'N – 010°45'W

- Opportunity bathymetric and geophysical measurements will also be done along the transit transects between the above areas and the ports of call.

5.2 Chart of the area where the survey will be carried out.



The red polygons are the areas of interest of the project for the bathymetric and geophysical measurements. Those areas spread over the bounding limits of the EEZ of Iceland. The red points are the points of interest for the acoustical oceanography measurements. The prioritization of the areas for geophysics and sedimentology (red polygons) is not done at the time being. Only one of the two polygons should be surveyed during the campaign. The choice will be transmitted to Iceland before the campaign.

The magenta star is the DORA buoy location.

6 CHRONOLOGY.

6.1 Actual starting and finishing dates of the project.

At the earliest the work will begin on August 10th and at the latest the work will finish on October 20th 2016.

The DORA observations will be made till summer 2017. The buoy will be recovered during a second scientific sea trial (MOCOSED'2017) that will occur in 2017 aboard another scientific vessel. A specific request for consent for this second campaign will be sent later to the authorities of Iceland.

6.2 Multiple entries.

Multiple entries are possible.

7 PORT OF CALL.

7.1 Dates and places of port of calls.

Ports of calls are not yet decided. However, ports of call might be scheduled in Akureyri and Reykjavik.

Final place and date of the call will be confirmed later on in the request for authorization to stop in ports of call.

7.2 Logistics needs during the call.

A dedicated letter will be addressed for logistics needs during calls.

7.3 Name, address and phone of the agent.

Not available.

8 PARTICIPATION.

8.1 Possibility for an observer of Iceland to take part in the program.

An observer is welcome aboard the ship during the survey.

Whatever the decision to embark or not an observer, operations carried out can be presented during a call (cf. 7.1).

8.2 Dates and harbours possible for embarking and disembarking an observer.

To be planned in accordance with the ship schedule still to be set up.

9 ACCESS TO DATA AND RESULTS OF THE CRUISE.

9.1 Preliminary report of the cruise.

On demand of authorities, a cruise report will be sent no later than 6 months after the end of the cruise.

9.2 Access to data and samples.

On demand of authorities, processed hydro-oceanographic data will be sent on numerical storage devices.

9.3 Access to information needed to interpret or qualify the quality of the data.

The cruise report describes the methods applied to collect data and gives necessary information to evaluate the quality of numerical data.

9.4 International diffusion of information

The bathymetric data will be used by SHOM in order to update nautical publications (including charts) according to International Hydrographic Organization, by communicating all data relevant to navigation safety to the regional cartographic authority as stated by the IHO (see resolution 1/2006 from M-3 publication and resolutions A-402.1 and B-635.4 from S-4 publication available on IHO web site at

http://www.iho-ohi.net/iho_pubs/IHO_Download.htm).

ANNEX 1: LAND GRAVITY MEASUREMENT

A portable land gravimeter SCINTREX is used for this operation.

The aim is to measure the offset between the gravity values on the reference station and near the ship.

This is a passive measurement device: no radio signal is emitted during the operation.



Scintrex gravimeter

Main steps of the calibration

1. Gravity measurements on the dock near the ship (about 10 minutes)
2. Move to the gravity reference station (on foot, car rental, ...)
3. Gravity measurements exactly on the location of the reference station as defined by the International Gravity Office (about 10 minutes)
4. Move back to the ship and a new gravity measurements on the dock near the ship (about 10 minutes).