OGS in the Arctic

Contacts

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OGS and its polar missions

The **National Institute of Oceanography and Applied Geophysics - OGS** is an Italian public research Institute active in the field of pure and applied research on Earth and Marine Sciences (Oceanography, Geophysics, Seismology) with a focus on development and management of Research Infrastructures. OGS missions are to safeguard environment and natural resources and to prevent geological, environmental and climatic risks. A core activity is to implement the sustainable blue growth promoting Science Diplomacy.

In agreement and coordination with other research institutions OGS intervenes in scientific activities in the fields of Earth and Ocean Sciences, Polar Sciences and where its skills can help to produce knowledge and to solve scientific, economic and social problems (Art. 2 of the Statute). As such, OGS conducts research in the Arctic and Antarctica with its own R/V OGS Explora since 1989 and starting in 2019 with the icebreaking R/V Laura Bassi. What follows is a portfolio of the main activities (projects and expeditions) that OGS accomplished in the Arctic as leader or collaborator with other national and international partners.

OGS and infrastructures for Polar Sciences

Icebreaker Vessel Laura Bassi

In 2018 the Italian Ministry for Research (MIUR - Ministero dell'Istruzione dell'Università e della Ricerca) assigned to OGS a specific fund to acquire a vessel to be operated as research infrastructure to support the marine-based research activities for the Italian Antarctic Research Program (PNRA) and the Arctic Research Program (PRA). In May 2019, OGS bought the research vessel **R/V Laura Bassi** (formerly RSS Ernest Shackleton) an icebreaker with optimal scientific and logistic capability than can operate in polar area being compliant to Polar Core, Category B.

Founding agency and Coordinator: OGS, CNR (Consiglio Nazionale delle Ricerche), ENEA (Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile) and CSNA (Commissione Scientifica Nazionale per l'Antartide) are managers of the R/V Laura Bassi scientific activieties and provide its economical support.

ARICE

FP7/I3 **ARICE Initiative** "**Arctic Research Icebreaker Consortium**". ARICE´s overall aim is to provide Europe with better capacities for marine-based research in the ice-covered Arctic Ocean. ARICE will develop strategies to ensure the optimal use of the existing icebreaker research vessels at a European and international level and provide transnational access to four European and two international research icebreakearirs.

Michele Rebesco (OGS) is the chair of the Scientific Liaison Panel.

Renata Giulia Lucchi (OGS) is a member of the Advisor Board.

Funding Agency: EU.

Coordinator: Alfred Wegener Institute (AWI, DE).

Partners: ARCTIA (FI), BAS (UK), CNRS (FR), CNR (IT), CSIC (ES), DTU (DK), Finnish Meterorological Institute (FI), IOPAN (PL), Universtié Laval (CA), University of Alaska Fairbanks (US), Norwegian Polar Institute (NO), Swedish Polar Research Secretariat (SE), APECS, World Ocean Council.

EUROFLEETS2 with OGS EXPLORA

EUROFLEETS2: European project for marine research infrastructures (including OGS Explora) for the creation of an alliance of centers of marine research in Europe to work together and share resources to improve the quality of European marine research. This project (http://www.eurofleets.eu), includes a pioneering Polar Working Package to determine the resources and the demand in polar research and to facilitate the integration of the polar research fleet.

Funding Agency: EU.

Coordinator: IFREMER (FR).

OGS Contact: Michele Rebesco.

Partners: Institute for Marine Research (NO), Technical University of Denmark (DTU-AQUA, DK), Swedish Polar Research Secretariat (SE), OGS and other 27 partners.

Research vessel OGS Explora

PANORAMA I and II

Within the German project **PANORAMA**, OGS operated as technological provider using R/V OGS Explora for the conduction of the acquisition activities in Arctic. OGS won consecutively two international tenders in 2013 and 2015 to support geophysical marine researches carried out by the BGR (Bundesanstalt für Geowissenschaften und Rohstoffe) German research institute.

Data acquisition in the Arctic with OGS Explora in the summer of 2013

The main aim of the Panorama project was the acquisition of new data on subsurface structures to reconstruct the depositional history from the beginning of the opening of the Arctic Ocean (50 million years ago). The first PANORAMA cruise took place on board OGS Explora from 16 August to 17 September 2013, whereas the second one from 15 August to 20 September 2015.

Funding Agency and Coordinator: Federal Institute for Geosciences and Natural Resources (BGR, DE).

OGS Contact: Angelo Camerlenghi.

The European Polar Research Icebreker Consortium AURORA BOREALIS

The ERICON Aurora Borealis EU/FP7 project (http://archives.esf.org/hosting-experts/expert-boards-and-committees/polar-sciences/recent-epb-initiatives/ericon-aurora-borealis.html) for preparatory phase of the icebreaker Aurora Borealis (following EU roadmap) produced a document for the scientific strategy in the Arctic and Antarctica from 2015 to 2030 and a series of documents that suggest the pan-European business model of the infrastructure, from the legal, political and scientific point of view. The construction of the ship was then on standby awaiting a political decision to fund shared by several countries.

Funding Agency: EU

Coordinator: European Science Foundation, through the European Polar Board.

OGS Contact: Laura De Santis.

Partners:15 partners from 10 countries.

ECORD

ECORD is the European Consortium for Ocean Research Drilling (www.ecord.org) as part of the International Ocean Discovery Program (IODP) "Exploring the Earth under the sea" (2013-2023) and previously the Integrated Ocean Drilling Program (2003-2013).

ECORD is a management structure for scientific ocean drilling and provides mission-specific platforms (MSP) for IODP expeditions. During the first Arctic MSP expediton in 2004 (302, Arctic Coring – ACEX) three vessels (Sovetskiy Soyuz, Oden and Vidar Viking) were employed for a successful ice-management programme and 5 sites were drilled on the Lomonosov Ridge. The forthcoming Arctic MSP (377, Arctic Ocean Paleoceanography - ArcOP) is scheduled for 2020.

Funding agency: ECORD Council through its 15 member states.

Coordinator: ECORD Council, whose chair rotates among the 15 partners on a year basis.

OGS Contact: Angelo Camerlenghi.

Partners: 14 European countries and Canada.

OGS in Arctic Science Networks

PAST Gateways

PAST Gateways (**Palaeo-Arctic Spatial and Temporal Gateways**), a six-year research network endorsed by the IASC aiming to understand Arctic environmental change during the period preceding instrumental records, across decadal to millennial timescales (www.geol.lu.se/pastgateways/). The main target was the nature and meaning of the transitions between major late Cenozoic climatic events (such as the interglacial and glacial maximum) and the more recent Holocene fluctuations.

The second international conference of this project was organized in Trieste by OGS from 19 to 23 May 2014.

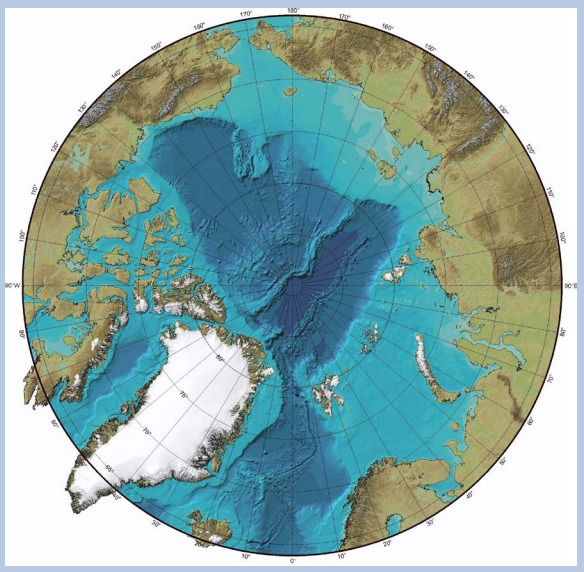
Coordinator: Colm O'Cofaigh (University of Durham, UK).

OGS Contact: Renata G. Lucchi.

Steering Committe: OGS, Université du Québec à Montréal (CA), GEUS (DK), AWI (DE), University of Lund (SE), Thule Institute (FI), Geological Survey of Norway (NO), Stockholm University (SE), University of Svalbard (NO), St. Petersburg State University (RU), Buffalo State University (US), CSIC-Barcelona (ES).

Pasterze Glacier (3798 m Grossglockner, Austria) where the field-trip on glacial geology and geomorphology was held.

IBCAO



IBCAO map Version 3 (Jakobsson et al., 2012)

IBCAO (**International Bathymetric Chart of the Arctic Ocean**) initiated in 1997 to develop a digital bathymetric database north of 64° for use by mapmakers, researchers, institutions and others whose work requires a detailed and accurate knowledge of the depth and shape of Arctic seabed (www.ngdc.noaa.gov/mgg/bathymetry/arctic/arctic.html).

Since 2018 the IBCAO project is supported by the Seabed 2030 (a collaborative project between the Nippon Foundation and GEBCO), which established the North Pacific and Arctic Ocean regional center with two bases: Stockholm University (SE) and University of New Hampshire (US). OGS was in the IBCAO Editorial Board since 2011, and is now in the newly established Arctic-North Pacific ocean Regional Mapping Committee. It also provides multibeam data (Jakobsson et al., 2012) and participates to the Arctic Mapping meetings (e.g. June 2016 and October 2018 in Stockholm University, SE)

Funding agency: Seabed 2030**.**

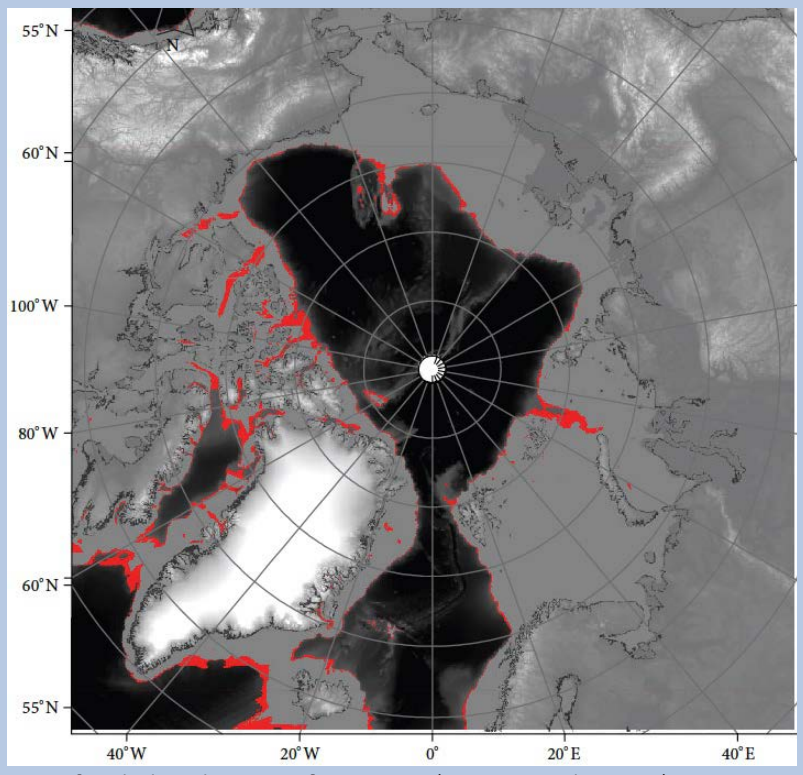
Coordinators: Stockholm University (SE) and University of New Hampshire (US).

OGS Contact: Michele Rebesco.

Regional Mapping Committee: OGS, Italian Hydrographic Institute (IT), University of Alaska Fairbanks (US), University of Cambridge (UK), AWI (DE), Norwegian Hydrographic Service (NO), UNIS (NO), NOAA Fisheries (US), Danish Geodata Agency (DK), Russian Academy of Science (RU).

PERGAMON

PERGAMON, COST EU is a European network for study and long-term monitoring of permafrost, gas hydrates and methane release in the Arctic and impact on climate change (www.cost.eu/actions/ES0902). In this context, OGS has organized the Training School "Permafrost and gas hydrate related methane release in the Arctic and impact on climate change" at the Research Station Sodankylä in Finland (26/9-5/10/2013) and published a study on the stability of gas hydrates in the Arctic (Giustiniani et al., 2013).



Areas of gas hydrate dissociation for a 2 °C rise (Giustiniani et al., in press).

Funding agency: EU

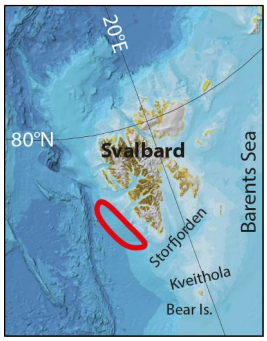
Coordinator: NIOZ (NL)

OGS Contacts: Umberta Tinivella, Angelo Camerlenghi, Federica Donda.

Partners: 20 COST parties and 9 participating institutions from non-COST countries.

OGS projects in the Arctic realm

EFRAM-ARC IODP

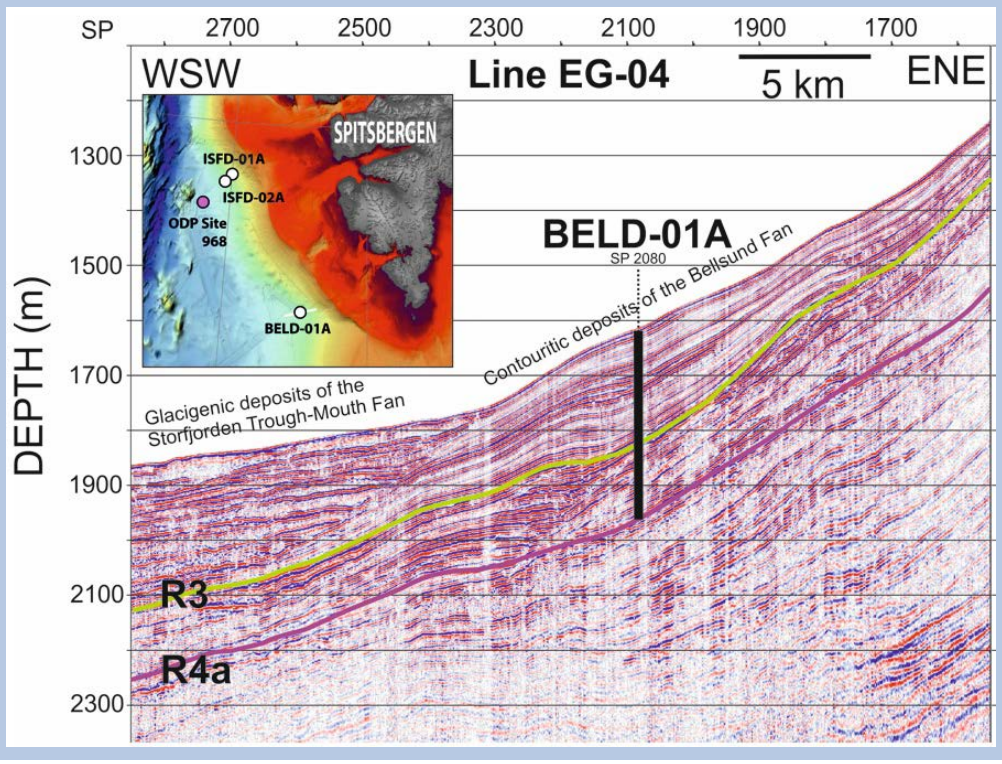


EFRAM-ARC IODP Ancillary Proposal Letter (submitted to IODP in April 2019).

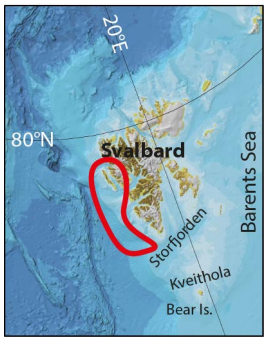
EFAM-ARC is a proposal to use the Joides Resolution drill ship to recover a high-resolution (sub-centennial) Early Pleistocene stratigraphic sequence containing the palaeoceanographic and palaeoclimatic archive after the onset of shelf-edge glaciation on the NW Barents Sea (c. 1.3 Ma), the Mid-Brunhes. Period (0.5–0.4 Ma) and switch from 41-ka to 100-ka glacial cycles periodicity (c. 1 Ma).

Coordinator and OGS Contact: Renata G. Lucchi (OGS and CAGE-UiT, Norway).

Partners: GEUS (DK), University of Tromsø (NO), AWI (DE), Norwegian Polar Institute (NO), University of Bordeaux (FR), University of Cardiff (UK), Université du Québec à Montréal (CA), US Geological Survey (US), INGV (IT).



SOA

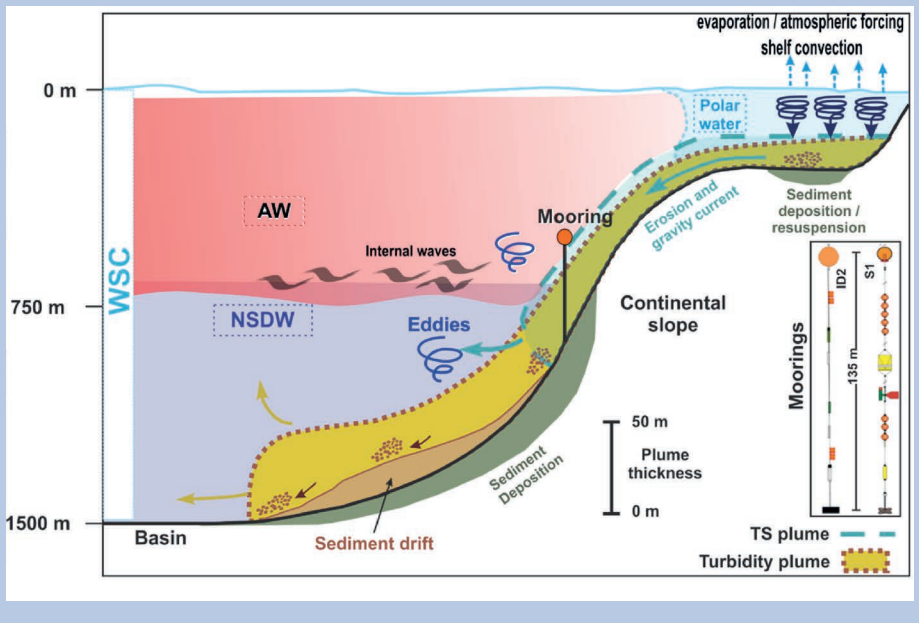


Project **SOA** - **Spitsbergen Oceanic and Atmospheric interaction**. This project, linked to the DEFROST project, is funded by the Svalbard Integrated Arctic Earth Observing System (SIOS) pilot programme to contribute to the first State of the Environmental Science in Svalbard (SESS) report due in 2018. In particular, the SOA project is aimed to combine oceanographic and meteorological data to understand the importance of strong wind events able to trigger turbidity and density driven currents, especially in a progressively ice-free Arctic. A workshop with the scope of writing the SOA contribution to the SIOS Report was organized by OGS with all partners on 6-7 March 2018 in Trieste. The SESS report 2018 was released in January 2019.

Funding agency: SIOS

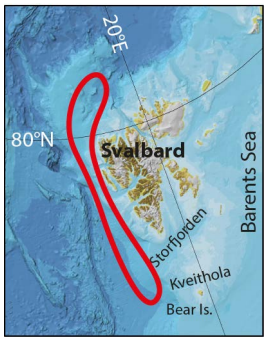
Coordinator and OGS Contact: M. Bensi (OGS).

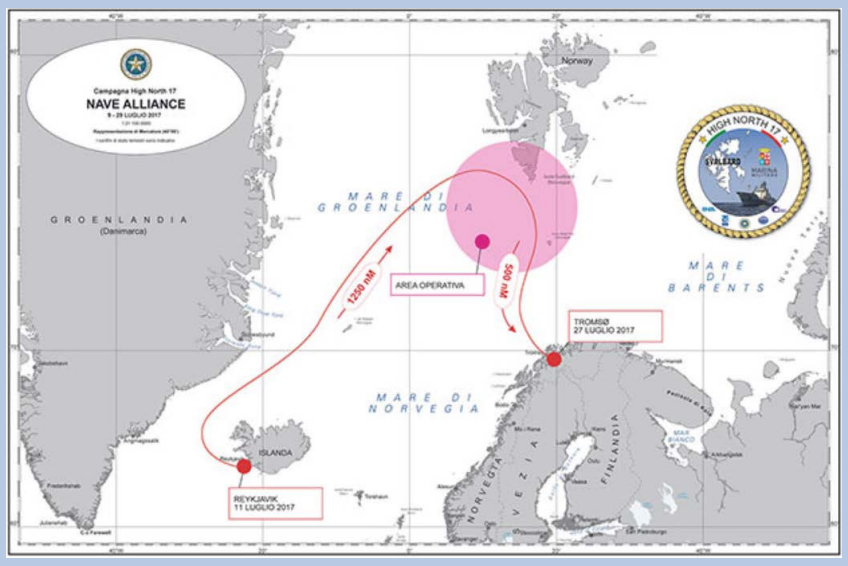
Partners: UNIS (NO), University of Gothenburg (SE), IOPPAN (PL), AWI (DE) and CNR (IT).



Shelf-slope dynamics along the West Spitsbergen slope.

High North





HIGH NORTH is a research program led by the Italian Hydrographic Institute (Italian Navy) with the partnership of OGS, CNR, ENEA, and CMRE. Two acquisition cruises were undertaken so far within the program (July 2017 and July 2018) onboard the Italian R/V Alliance and a third cruise (HN19) is planned for July 2019. Principal objectives were investigating the marine geophysical, oceanographic (physical and biochemical), and geological conditions in different Arctic sites close to the Spitsbergen Archipelago: Inbis Channel, Kveithola Trough, Hornsund Banken, Sorkapp Banken, SW Storfjorden and Yermak Plateau. The multi-disciplinary cruises acquired new CTD casts, glider oceanographic missions, box cores, sediment grabs and gravity cores, and irradiance measurements. In addition, High North cruises guaranteed the maintenance of two oceanographic deep sea moorings originally deployed during the European FP7 projects HERMIONE (2009-2012), Eurofleets2-PREPARED (2014) and PNRA-DEFROST (2016).

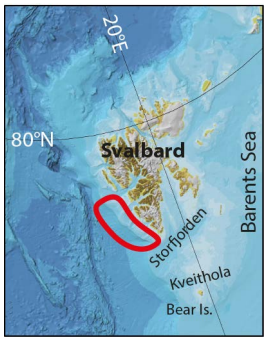
Funding Agency: Italian Navy.

Coordinator: Prof. Roberta Ivaldi, and CCF Maurizio Demarte (Italian Hydrographic Institute).

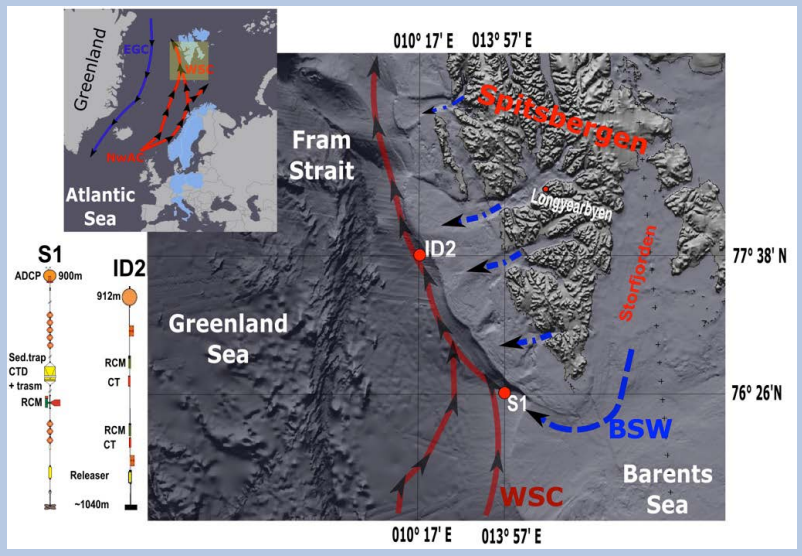
OGS contacts: Renata G. Lucchi, Michele Rebesco, and Manuel Bensi.

Partners: OGS, CNR-ISMAR (IT), CNR-ISSIA (IT), ENEA (IT), CMRE-NATO.

PNRA DEFROST



DEFROST (**DEep Flow Regime Off SpiTsbergen**) project aimed at investigating the temporal and spatial variability of the deep flow in the area of the contourite drifts offshore Spitsbergen, with emphasis on the near-bottom currents and their associated physical and biogeochemical properties. A multidisciplinary team composed by oceanographers and geologists has studied current characteristics, thermohaline properties, sedimentary processes, and seismic data in order to assess the link among the present seabed shape, deep-water flow and dense water plumes cascading. During the oceanographic cruises (June 2016 -DEFROST, July 2017-HN17, July 2018-HN18) the deep moorings, deployed in 2014 during the EUROFLEETS2-PREPARED initiative, were maintained and CTD casts (with water samples for physical and biogeochemical analyses) performed.



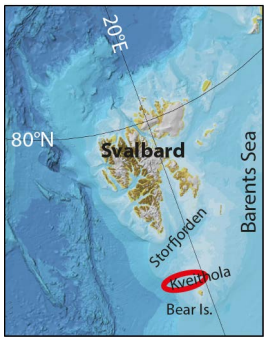
DEFROST study area

Funding agency: National Program for Research in Antarctica (PNRA) .

Coordinator: Manuel Bensi (OGS).

Partners: CNR ISMAR (IT), University of Gothenburg (SE), UNIS (NO), University of Bergen (NO), University of Tromsø (NO),Polish Institute of Oceanology (PL), AWI (DE).

PNRA AXED



AXED (**AnoXic Environments in Arctic sediment Drifts** project focused on the data set collected during the EUROFLEETS-BURSTER cruise with the aims to study 1) the hydrographic conditions and active gas seepage in the pockmark-field of Kveithola drift and 2) climate and environmental changes controlling the evolution of living organisms in extreme environments.

Funding agency: National Program for Research in Antarctica (PNRA).

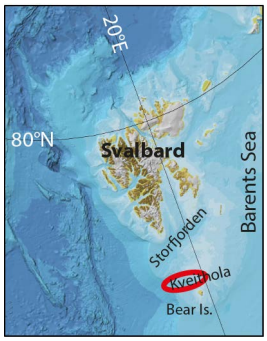
Coordinator: Caterina Morigi (Univerity of Pisa, GEUS-DK).

OGS Contact: Renata G. Lucchi.

Partners: University of Pisa (IT), OGS, Polytechnic University of Marche (IT), GEUS (DK), University of Oslo (NO), Centre de Recherche sur la Paléobiodiversité et les Paléenvironnements (FR), Universitat de Barcelona (ES), CSIC Barcelona (ES).

Benthic environment in the Kveithola Trough active seepage (Photo Lucchi)

EUROFLEETS2-BURSTER



EUROFLEETS2-BURSTER (**Bottom cURrents in a STagnant EnviRonment**): European project aiming to investigate the hydrographic and geological conditions in the active gas seepage field associated to the pockmark-structures piercing the inner Kveithola Trough sediment drift (NW Barents Sea). Additionally it aims to study the climate and environmental changes controlling the evolution of living organisms in extreme environments. The BURSTER cruise was held on the German R/V Polarstern.

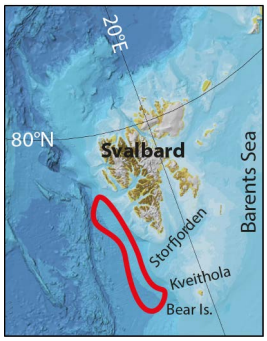
Funding agency: EU Eurofleets2.

Coordinator and OGS Contact: Renata G. Lucchi (OGS).

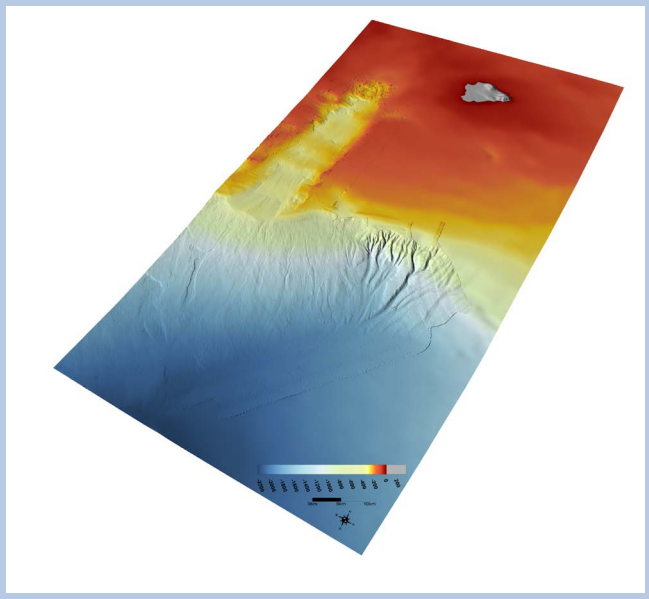
Partners: OGS, University of Pisa (IT), Polytechnic University of Marche (IT), University of Rome La Sapienza (IT), University of Oslo (NO), University of Tromsø (NO), GEUS (DK), BGR (DE), Universitat de Barcelona (ES), CSIC Barcelona (ES).

Research vessel Polarstern

PNRA EDIPO



The project **EDIPO** (**Eirik Drift Paleo Oceanographic investigation**) aimed at the study of the thermohaline circulation and paleoceanographic reconstruction of environmental changes and sedimentary mechanisms of the last glacial and interglacial cycles. Acquisition of seismic and morphobathymetric data, as well as XBT and oceanographic data has been performed in conjunction with the DEGLABAR project (Univ. of Barcellona, Spain) with research vessel OGS Explora on the NW Barents Sea margin from 21 September to 03 October 2015.



Bathymetry data of the INBIS Channel

Funding agency: National Program for Research in Antarctica (PNRA).

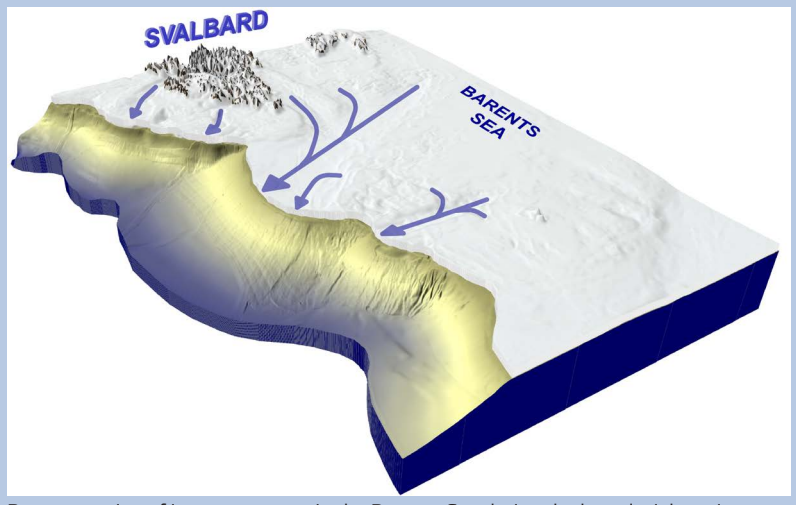
Coordinator and OGS Contact: Andrea Caburlotto (OGS).

Partners: University of Barcelona (ES), GEUS (DK), AWI (DE), University of Salamanca (ES), University of Aveiro (PT), ISPRA (IT), University of Parma (IT), University of Trieste (IT).

ARCA excellence Project

ARCA excellence Project (Arctic: Current Climate change and extreme events of the past) for Arctic research in collaboration between CNR, INGV and OGS.

The project aimed to gain insight into the complex mechanisms that govern the dynamics of the ice sheets and the flow of fresh water and sediments in the ocean, and to reconstruct the history of extreme events of sub-glacial melting over the past 20,000 years along the continental shelf edge south of Svalbard.



Reconstruction of ice cover extent in the Barents Sea during the last glacial maximum (about 18,000 years ago).

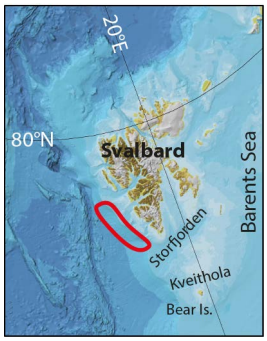
Funding agency: Italian Ministry for Research (MIUR).

Coordinator: CNR (IT).

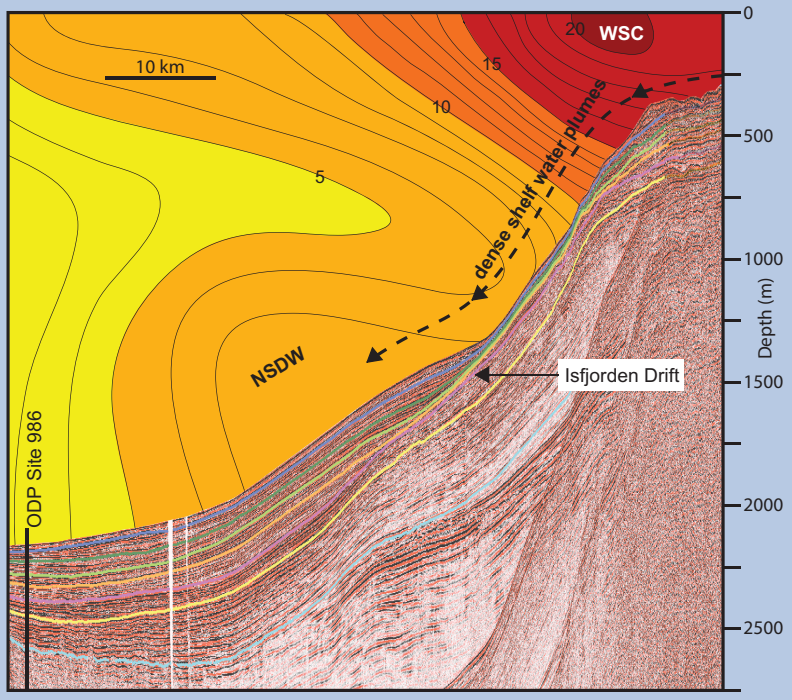
OGS contacts: Michele Rebesco and Renata G. Lucchi.

Partners: OGS, INGV (IT). Collaborations with the Norwegian Universities of Tromsø and Bergen among others.

EUROFLEETS2-PREPARED



EUROFLEETS2-PREPARED (PREsent and Past flow Regime on contourite Drifts west of Spitsbergen) objective was to investigate and define the oceanographic structure in in two depocenter areas (contourite drifts) located on the eastern side of the Fram Strait. The project applied a full range of time scales, from oceanographic instantaneous (CTD) and seasonal (moorings) measurements to the analysis of recent (box corer) and deep (Calypso corer) depositional record to investigate the recent and geological past. The PREPARED cruise was held on the Norwegian R/V G.O. Sars during June 5th–15th, 2014.



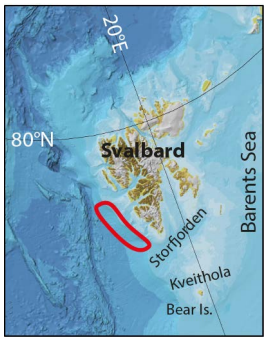
Relationship between the West Spitsbergen Current and contourites west of Svalbard (after Rebesco et al., 2013)

Funding agency: EU Eurofleets2.

Coordinator and OGS Contact: Renata G. Lucchi (OGS).

Partners: OGS, CNR-ISMAR Bologna and La Spezia (IT), University of Tromsø (NO), University of Bergen (NO); The University Centre in Svalbard (NO), University of Gothenburg (SE), Polish Institute of Oceanology (PL), University of Bremen (DE), AWI (DE).

EUROFLEETS2-POLAR PLASTIC



The **Eurofleets-2 PolarPlastics cruise** was conducted from June 5th - June 15th 2014, in collaboration with the PREPARED cruise, on board the Norwegian R.V. G.O. Sars. The purpose of the PolarPlastics cruise was to collect and make an assessment of the abundance and distribution of microplastics in polar waters, in relation to fronts and currents.

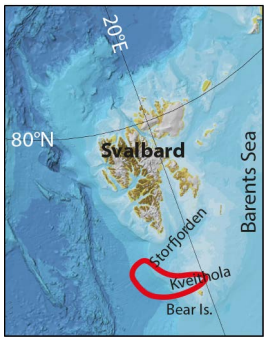
Fuding agency: Eu Eurofleets2.

Coordinator: Amy Lusher (IE).

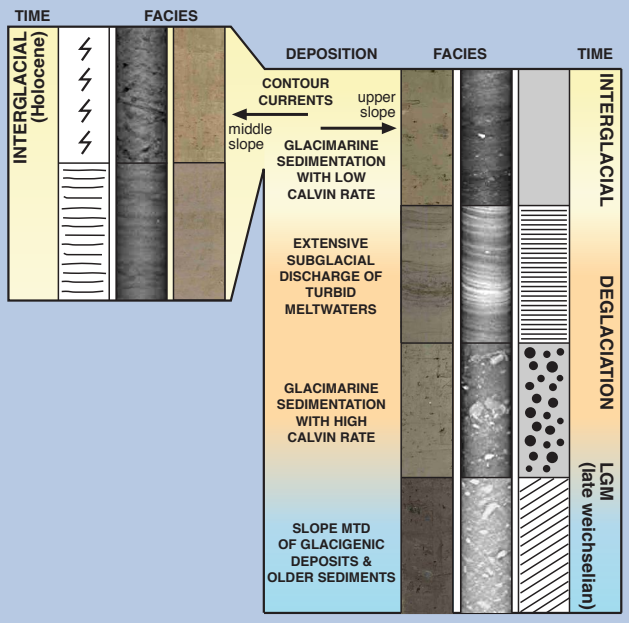
OGS Contact: Valentina Tirelli.

Partners: GMIT (IE), OGS.

PNRA CORIBAR-IT



CORIBAR-IT project aimed to study the sediment cores and acoustic record collected during the international CORIBAR project and the EUROFLEETS 2 PREPARED project. The main objective of this project is to reconstruct the last deglaciation phase in the NW Barents Sea and the consequences of turbid melt-water discharge on the palaeoenvironment (oceanography and living biota) and continental margin instability.



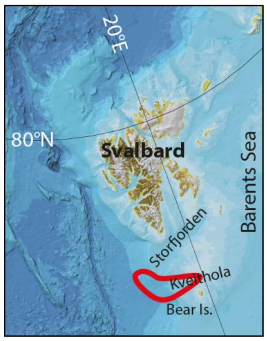
Reconstruction of depositional processes associated to natural climate changes on the NW Barents Sea

Funding agency: National Program for Research in Antarctica (PNRA)

Coordinator and OGS Contact: Renata G. Lucchi (OGS).

Partners: OGS, University of Siena (IT), University of Trieste (IT), University of Parma (IT), INGV-Roma (IT), GEUS (DK), University of Tromsø (NO), University of Bremen and MARUM (DE), CSIC Barcelona (ES).

CORIBAR



CORIBAR, international project (Italy, Germany, Spain, Norway, Denmark) for the study of paleoclimate in the Barents Sea through perforations with MeBo on R/V Maria S. Merian (16.07-15.08.2013). The project based on data acquired with the Italian vessel OGS Explora for project IPY-EGLACOM (sites.google.com/site/ipynicestreams/coribar). The innovative technology of drilling with an underwater drilling derrick placed on the seafloor and remotely controlled from the ship has been used in the Arctic for the first time.

Funding agency: independently funded by the partners.

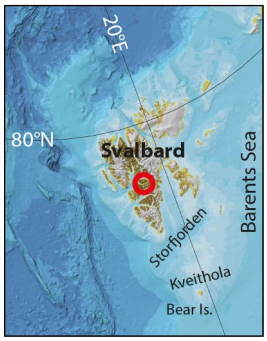
Coordinator of the initative: OGS.

Coordinator of the cruise: MARUM (DE).

OGS Contact: Michele Rebesco.

Partners: University of Tromsø (NO), University of Barcelona (ES), GEUS (DK), CSIC Barcelona (ES), MARUM (DE).

PNRA IMPERVIA

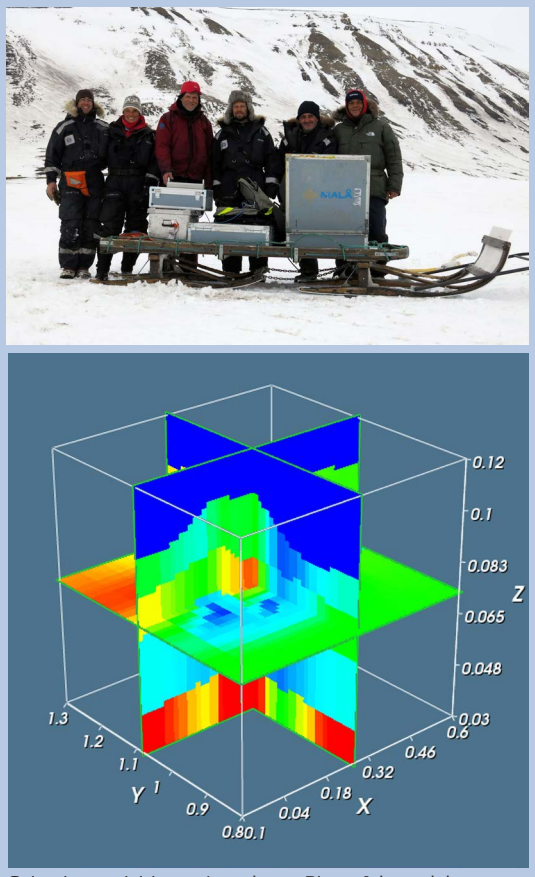


PNRA IMPERVIA project was aimed to study with integrated geophysical methods the characteristics and changes in Arctic permafrost in a natural laboratory in the area of Innerhytta Pingo, Adventdalen (Spitzbergen, Svalbard Islands). The acquisition activities with different types of seismic sources and geophones was conducted in April-May 2014, and data processing, inversion and interpretation have been published.

Funding agency: National Program for Research in Antarctica (PNRA).

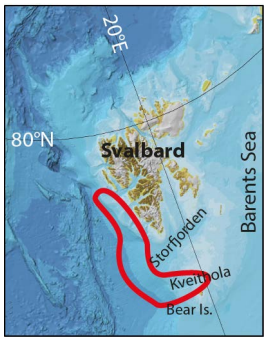
Coordinator and OGS Contact: Giuliana Rossi (OGS).

Partners: The University Centre in Svalbard (UNIS, NO); Norwegian Centre for Integrated Petroleum Research (CIPR) at University of Bergen (NO).

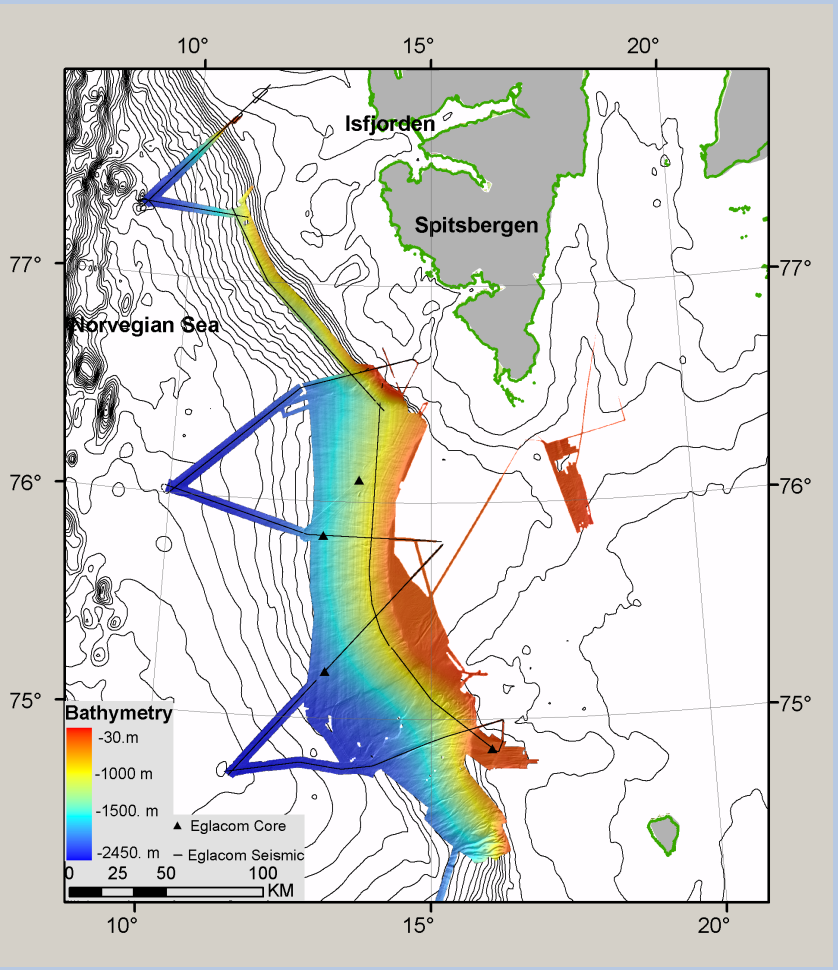


Seismic acquisition at Innerhytta Pingo Adventdalen (Spitzbergen) and and the tomographic model.

PNRA MELTSTORM



MELTSTORM, project aimed at the study of paleoclimate in the Barents Sea with geological and geophysical data of the EGLACOM OGS Explora International Polar Year cruise (http://www.sites.google.com/site/ipynicestreams/meltstorm).

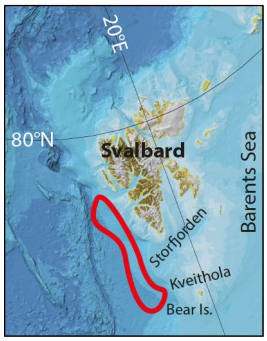


Funding agency: National Program for Research in Antarctica (PNRA).

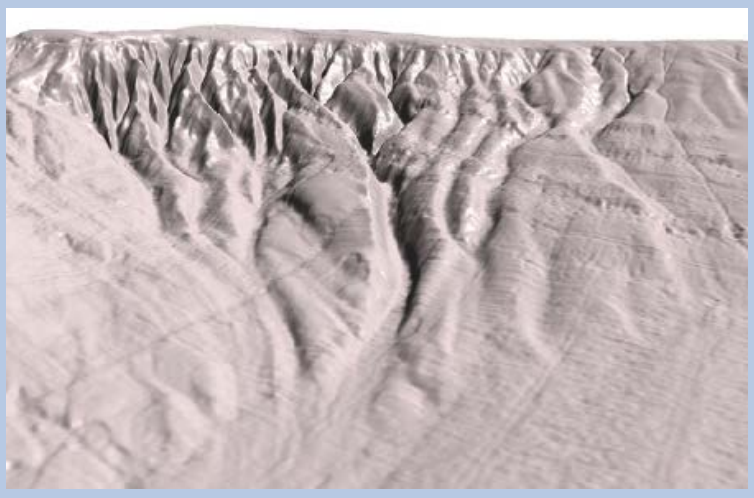
Coordinator and OGS Contact: Michele Rebesco (OGS).

Partners: University of Siena (IT), University of Trieste (IT), University of Parma (IT), INGV (IT), University of Tromsø (NO), University of Bergen (NO), UNIS (NO), University of Barelona (ES), MARUM (DE), University of Salamanca (ES).

DEGALBAR



DEGALBAR (Deglaciation History of the North-Western Barents Sea from Sediments Generated by Paleo-Ice Streams) project aimed at reconstructing the mechanisms of marine sediment transport and dispersal during the last deglaciation stage of the Svalbard/ Barents Sea Ice Sheet and evaluate the effect of sediment laden melt-water plumes on ocean circulation, benthic habitats and sediment accumulation and distribution on polar continental margins.



The INBIS channel is regarded as an exceptional deep marine channel in polar latitudes (www.ub.edu/web/ub/en/menu_eines/noticies/2019/03/040.html).

Data acquisition (with multibeam swath mapping, sub-bottom profiling, seismic reflection profiling, sediment coring, habitat mapping) took place in 2015 along with project EDIPO on board R/V OGS Explora under the coordination of José Luis Casamor (University of Barcelona, ES).

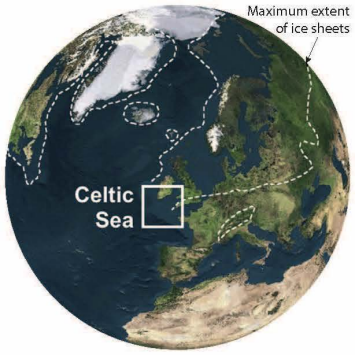
Funding agency: Spanish Ministry of Science and Innovation.

Coordinator: this project was proposed and initially coordinated by Angelo Camerlenghi at the time when he was based at ICREA (ES).

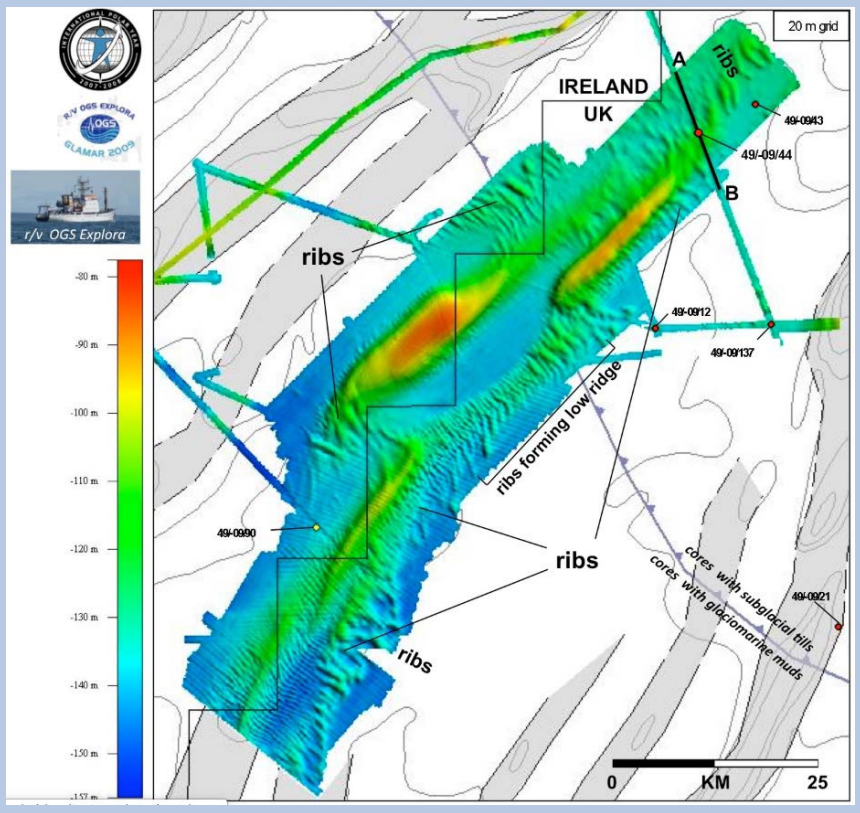
OGS Contact: Angelo Camerlenghi (OGS).

Partners: ICREA (ES), University of Barcelona (ES), CSIC (ES), OGS, University of Tromsø (NO), Institute of Marine Research (NO), University of Salamanca (ES).

PNRA GLAMAR



GLAMAR, project aimed to the study of the glacial history of the Celtic Sea, near the south-west limit reached by the last ice cap and where its maximum extension was uncertain. The data (multibeam morphobathimetry, reflection seismic) were acquired in 2009 on the homonymous OGS-Explora cruise on the Irish margin, in order to understand the depositional processes that occurred in the past phases of glacial expansion and withdrawal.



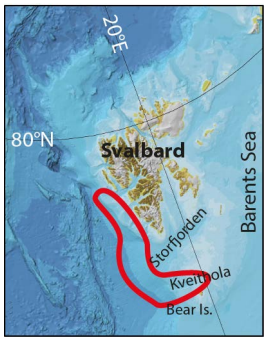
Bathymetric survey with evidence of the extension of the ice sheet during the last glacial maximum

Funding agency: National Program for Research in Antarctica (PNRA).

Coordinator and OGS Contact: Daniel Praeg (OGS, now at Geoazur (FR)).

Partners: Maynooth University (IE)), BGS (UK), Geological Survey of Canada (CA).

EGLACOM



EGLACOM (Development of a glacial Arctic continental margin: The southern Svalbard ice stream-dominated sedimentary system) project aimed at reconstructing the evolution of a northern hemisphere polar continental margin from the Pliocene to the recent-most deglaciation, and to define the sedimentary architecture and seafloor morphology as it changed through time since the onset of glacial conditions. Data acquisition (multibeam swath mapping, sub-bottom profiling, seismic reflection profiling, sediment coring, CTD and water sampling) took place in 2008 on board R/V OGS Explora.

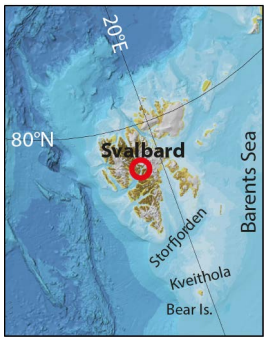
Funding agency: OGS through the Italian Ministry for Research (MIUR).

Coordinator and OGS Contact: Michele Rebesco (OGS).

Partners: ICREA (ES), University of Barcelona (ES), University of Salamanca (ES), University of Tromsø (NO), INGV (IT).

OGS Explora (Photo courtesy: Fabrizio Zgur)

Paleokarst



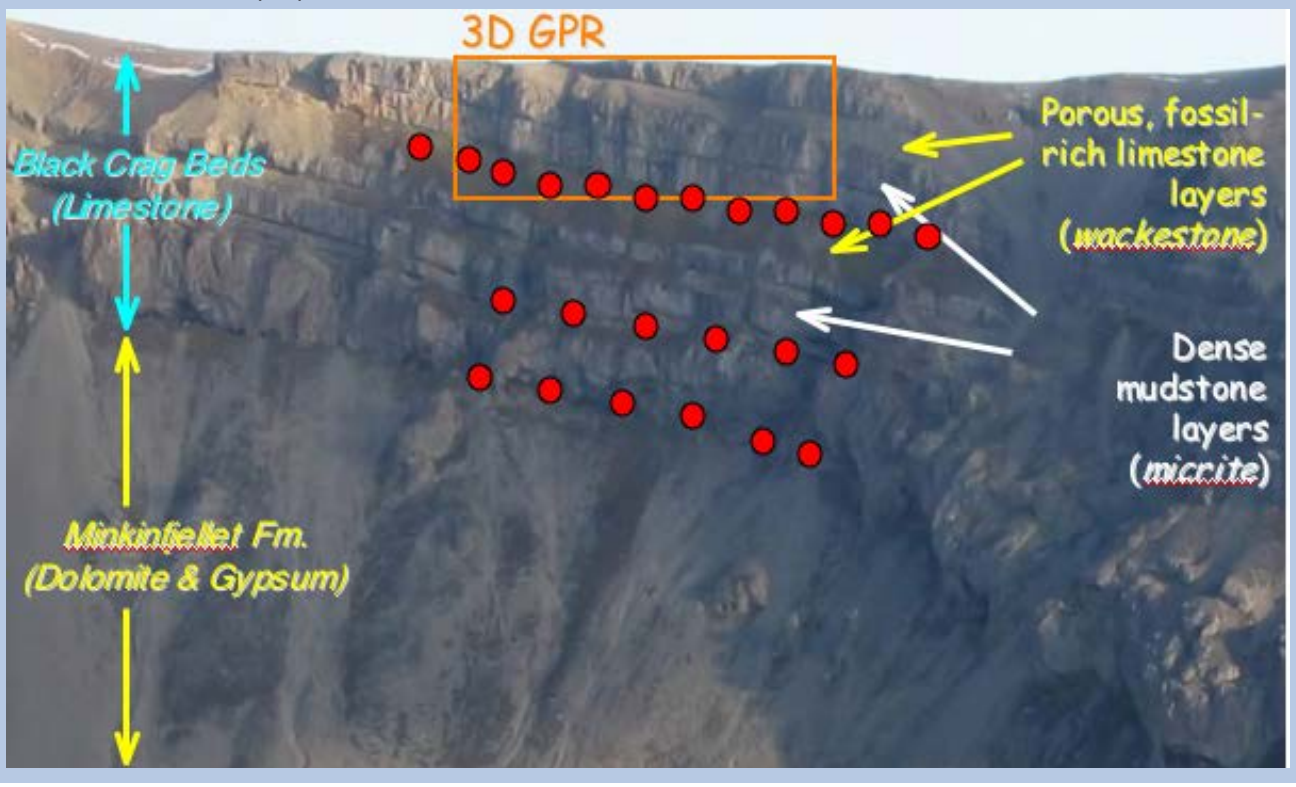
Paleokarst aimed at an integrated geophysical and geological study of karst structures of the formation Wordiekammen (Svalbard Islands), as analog for the oil and gas reservoirs in the Barents Sea. The results of the survey performed on the Wordiekammen plateau on July-August 2009 have been presented in international conferences and partially published.

Funding agency: Norwegian Research Council in collaboration with Statoil and DetNorske.

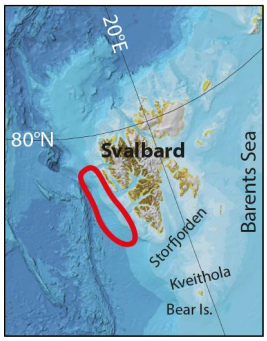
Coordinator: University of Bergen (NO).

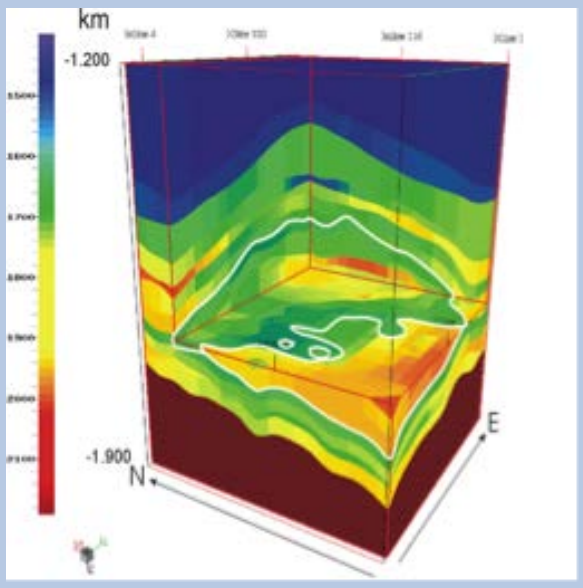
OGS Contact: Giuliana Rossi.

Partners: UNIS (NO), Norwegian Geological Survey (NO), Copenhagen University (DK), University of Nebraska at Omaha (US).



Hydratech





FP5 EU project Hydratech was aimed to investigate techniques for the detection and quantification of methane hydrate in continental margins, through two offshore 3D 3C seismic acquisitions offshore Spitzbergen in July 2001 and on the Storegga margin offshore Norway in July 2002, including OBS recording. Laboratory experiment and theoretical modelling complemented the seismic data inversion and interpretation. It originated a high number of high quality publications from the whole group and from the single researchers involved.

Funding agency: EU.

Coordinator: University of Birmingham (UK).

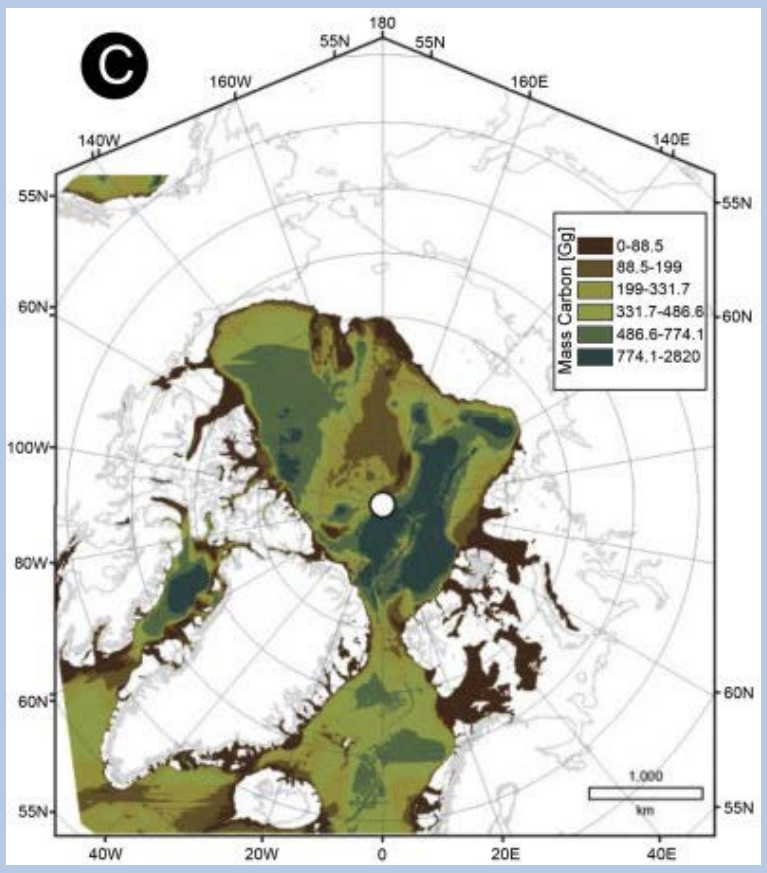
OGS Contact: Angelo Camerlenghi.

Partners: OGS, IFREMER (FR), IFM-Geomar (DE), NERC-SOC (UK), RF-Rogaland (NO), SINTEF (NO), University of Southampton (UK), University of Tromsø (NO).

OGS in Arctic educational activities

ARCHANGE (Talents Up, Marie Curie Action)

ARCHANGE (**Arctic ocean gas hydrate stability versus changing climate and geohazard**) with one fellowship (Hector Marin Moreno) from 15/5/14 to 15/8/15. Main objectives: to collect data and key information related to Gas Hydrates (GH) and climate changes in order to identify reliable future climate sceneries; to define the areas, where at the moment there are the conditions for GH stability; to identify the areas more sensitive to climate changes and where the dissociation of GH is foreseen; to estimate the amount of the gas produced because of GH dissociation; to estimate the time lag between the warming of the seabed and the release of the gas on the sea bed that can reach the atmosphere; to identify the area where the sediments have the greatest potential to be altered by the effects of GH dissociation.



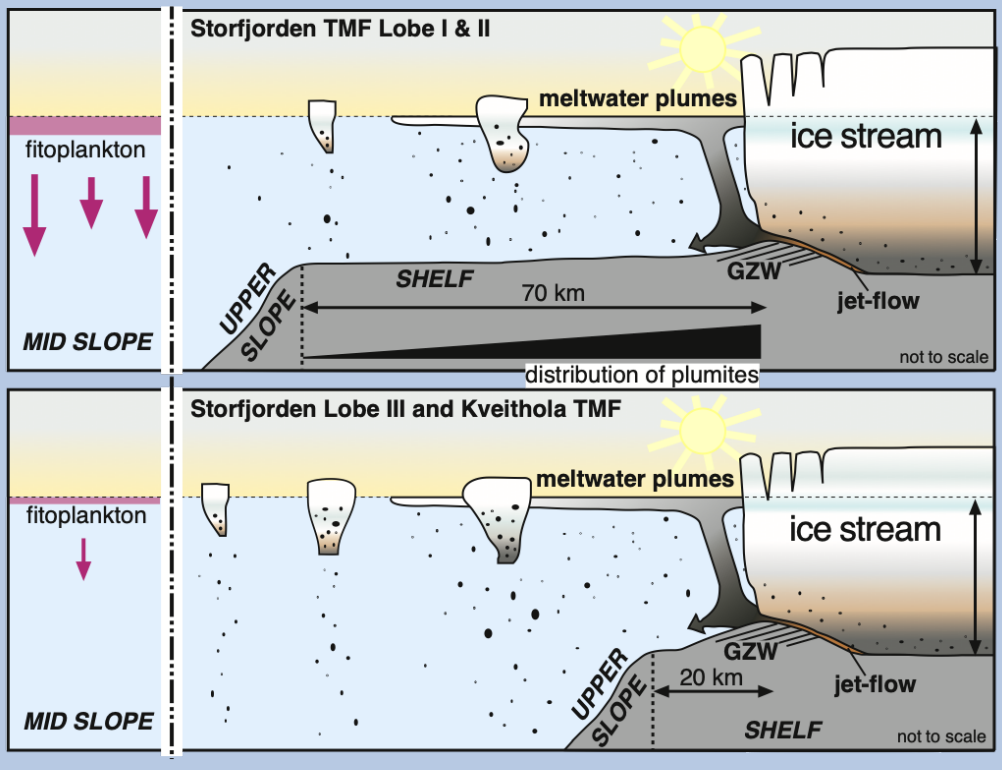
Mass of carbon stored in GH in the Arctic Ocean (Marin-Moreno et al., 2016)

OGS Contact: Umberta Tinivella.

PLUMES (Intra European Marie Curie Action)

PLUMES (Impact of subglacial meltwater plumes on sediment dispersal, ocean circulation, ecosystems and climate change) was motivated by the possibility that subglacial meltwater from Greenland and Antarctic Peninsula could affect the oceanic circulation in the future due to global warming. The main objective of PLUMES were to identify and quantify the sediment input derived from glacial meltwater during the last deglaciation of the Western Barents Sea paleo-ice streams from the marine sediment record and to evaluate the effect of sediment laden meltwater plumes on ocean circulation and ecosystems.

OGS Contact: Renata G. Lucchi.



Suspended sediments can limit sun penetration in surface water masses inhibiting the primary productivity (photosynthetic organisms).

The presence of fresh meltwaters at the sea surface enhanced sea ice formation (lower freezing point) modifying the albedo both contributing to climate cooling (cold stadial between Bølling and Allerød interstadials).

Cold meltwaters may have interact with the deep ocean circulation modifying the characteristics of the thermohaline circulation in turn forcing climate change.

Academic lectures for PhD students

Ice Sheets and Glaciers in the Climate System is a two folders series of lectures addressed to the PhD courses inScience and Management of Climate Changes (University Ca' Foscari of Venice, Italy) and Earth Sciences, Fluid Dynamics and Mathematics (University of Trieste, Italy). This academic course gives a review of modern research into processes and dynamics of the global cryosphere at mid and high latitudes (e.g. the European Alps glaciers and Polar cryosphere), permafrost on polar and alpine landscapes, and their connections with climate.

OGS Contacts: Renata G. Lucchi, Florence Colleoni and and Michele Rebesco.

Recent publications

Bazzaro M., De Vittor C., Lucchi R.G., Morigi C., Sabbatini A., Talarico F. (2017). ***Trophic state of marine sediment from an apparently stagnant, possibly chemosynthetic, environment in the Drift area of the inner Kveithola Trough Mouth (NW Barents Sea)***. XIII Incontro dei dottorandi in Ecologia e Scienze dei Sistemi Acquatici, Palermo, 3-5 May 2017.

Bazzaro M., De Vittor C., Lucchi R.G., Morigi C., Sabbatini A., Talarico F. (2017). ***Trophic state of marine sediment from an apparently stagnant, possibly chemosynthetic, environment in the Drift area of the inner Kveithola Trough Mouth (NW Barents Sea)***, Summer School Bubbles 2017, UiT-CAGE, Tromsø, Norway, 6-15 June 2017.

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Giustiniani M., Tinivella U., Jakobsson M., Rebesco M., in 2013, ***Arctic Ocean Gas Hydrate stability in a changing climate.*** Journal of Geological Research vol. 2013, Article ID 783969, 10 pages, 2013. doi:10.1155/2013/783969.

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