



ACCESS
Arctic Climate Change
Economy and Society



Project no. 265863

ACCESS

Arctic Climate Change, Economy and Society

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ACCESS NEWSLETTER

Arctic Climate Change
Economy and Society

Issue No. 2
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ACCESS Highlights



The Nordic Bulk Carriers-operated 'Sanko Odyssey' sailed from Murmansk on 31 August 2011 and entered the Northern Sea Route (NSR) on 4 September 2011. On 10 September 2011, the 'Sanko Odyssey' passed the Bering Strait and completed the NSR transit in only 7.4 days – a record time. For further information, please see: (http://www.access-eu.org/en/economic_sectors/transport_tourism/latest_news/nbc_pressrelease.html).

This newsletter is produced three times each year by a consortium of 27 partner organizations from 10 European countries in the 4-year Arctic Climate Change, Economy and Society (ACCESS) project. ACCESS is supported within the Ocean of Tomorrow call of the Seventh Framework Programme. Objectives of the ACCESS Newsletter are to facilitate international, interdisciplinary and inclusive information sharing of our research highlights about natural and human impact associated with sustainable development in the Arctic Ocean in the context of climate change.



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Editorial

This second edition of the ACCESS newsletter is an excellent opportunity to introduce the ACCESS Advisory Board composed of six eminent members and experts in the different domains of activities concerning the European ACCESS project extending from human and geopolitical sciences to socio economy in the context of a marine environment in rapid transition, the Arctic Ocean.

This ACCESS Newsletter N°2 is reporting about the recent activities developed during the past 4 months by the ACCESS partners in the field of climate change in the Arctic Ocean, marine transportation and Arctic tourism, Fisheries and mineral resources extraction, Governance and sustainable development in the Arctic regions. We chose to highlight each theme by selecting a special event or result and presenting short reports related to workshops and international conferences occurring during the past 4 months with an important participation and contribution from ACCESS partners.

The September sea-ice outlook initiated during the Damocles project and the 4th International Polar Year (IPY) in cooperation with the United States Study of Environmental Arctic Change (SEARCH) project, is a good illustration of the kind of activities that ACCESS will promote in the future and at the same time is a good example of the challenge we are facing as far as Arctic sea ice conditions and prediction skills are concerned. Hazards to navigation represent serious challenges for safe and reliable marine transportation and tourism in the Arctic Ocean in the context of climate change preserving the environment and socio economy benefits. Oil spills under sea-ice are a serious concern especially as the potential for offshore hydrocarbons exploitation increases at the same rate as Arctic sea-ice is retreating. Ecosystem Based Management (EBM) for fisheries in particular and Marine Spatial Planning (MSP) in general are key integration tools for ACCESS. Clearly EBM and MSP are the real links that relate the basic research components of ACCESS often represented by arrows in block diagram indicative of the ACCESS project structure.

Finally, a quick overview of various ACCESS field work activities scheduled for 2012 involving both shipborne and airborne logistics is presented as well as major conferences, such as the Montreal IPY conference in April 2012 and the ACCESS General Assembly in Stockholm in March 2012.

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ACCESS Advisory Board Members



Professor Oran R. Young is at the Bren School of Environmental Science & Management, University of California Santa Barbara, in the United States. Prof. Young specializes in the analysis of environmental institutions with particular reference to international regimes. He chaired the Steering Committee of the Arctic Governance Project and has served as Vice-President of the International Arctic Science Committee, Chair of the Board of Governors for the University of the Arctic, and Co-chair of the Arctic Human Development Report. He is the author or co-author of more than 20 books, including *"Institutional Dynamics: Emergent Patterns in International Environmental Governance"* (2010) and *"Science Diplomacy"* (2011).



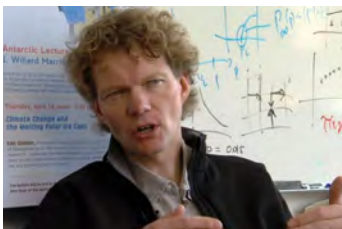
Professor Thomas Sterner is at the School of Business, Economics & Law, Gothenburg University, in Sweden. Prof. Sterner's main research interests lie in environmental economics and the design of policy instruments with diverse applications to resolve energy, climate, resource and pollution issues. Prof. Sterner is active on numerous international advisory boards dealing with resource and economic issues, including as President of the European Association of Environmental and Resource Economists from 2008-09. His many publications and books include *"Policy Instruments for Environmental and Natural Resource Management"* (2011), which is in its second edition, and *"Fuel Taxes and the Poor: The Distributional Effects of Gasoline Taxation and Their Implications for Climate Policy"*, which also was published in 2011.



Honourable Inuuteq Holm Olsen has served as Deputy Minister for the Department of Foreign Affairs of the Government of Greenland since July 2006. Minister Holm Olsen began his career at the Department of Foreign Affairs in 1996 and was Private Secretary to the Premier from 1997 through 1999. He was posted at the Danish Foreign Ministry in Copenhagen and was at the Greenland Representation in Brussels from 2000 through 2003. Minister Holm Olsen earned a BA in Political Science from the University of Alaska Fairbanks in 1994 and a MA in International Affairs from The George Washington University in 1996.



Honourable Hannu Halinen is Ambassador for Arctic affairs at the Ministry for Foreign Affairs of Finland. Amb. Halinen also is a Senior Arctic Official for the Arctic Council and for the Nordic Council of Ministers as well as a Member of the Committee of Senior Officials for the Barents Euro-Arctic Council. Amb. Halinen has provided leadership in many diplomatic arenas, including as: Permanent Representative of Finland to the United Nations (UN) Food and Agriculture Organization; Representative of Finland to the UN Human Rights Commission; Ambassador of Finland in Hungary; and Ambassador of Finland in the Arab Republic of Egypt among other postings.



Professor Hajo Eicken is at the Department of Geology & Geophysics, University of Alaska Fairbanks, in the United States. His research interests include the growth, evolution and properties of sea ice. He is particularly interested in determining how microscopic and macroscopic properties affect sea-ice processes and the climate system. Prof. Eicken's group also investigates different uses of sea ice in indigenous communities, the private sector and the public at large to help decision makers adapt to a changing Arctic. Prof. Eicken chairs the Science Steering Committee for the Study of Environmental Arctic Change (SEARCH) project.



Ms. Adele Airoldi has a master in Polar Studies from Scott Polar Research Institute. She worked at the secretariat of the European Union Council of Ministers in Brussels from 1981 until 2004, mainly on environmental policy issues. During that period she assisted Denmark and Greenland foreign affairs in preparing the 2002 *Ilulissat Conference*. Since 2004, she has been active in the field of Arctic affairs. In 2008 she wrote a report *"The European Union and the Arctic- Policies and Actions"* for the Nordic Council of Ministers, which was updated in 2010.

Work Package Progress

Work Package 1 – Climate Change and the Arctic Environment

The main objective of WP1 is to inform the other WPs about changing ice properties and other physical environmental parameters. Arctic climate projections for the next decades will be improved by better assessments of anthropogenic and natural sources of pollution.

The retreat of the sea ice from the coasts as well as large parts of the eastern Arctic has sparked interest in an intensified economic use of the Arctic Ocean that was inaccessible in the past due to the obstacle of sea ice for shipping and other commercial activities. Clearly, reliable forecasts on timescales from hours to years would be of great benefit for the planning of these activities. To reach such improved forecasts requires additional research into better understanding of the physical system and an improvement in the predictive capabilities for

the atmosphere, the ocean and the sea ice.

ACCESS advances such efforts with a number of activities. For example, the group at the Norwegian Meteorological Institute (met.no) performs an assessment of future weather forecasting capabilities. Contributing to this activity are monitoring of snow, various sea ice properties and sea ice drift. An important issue exists due to large uncertainties in sea ice drift retrieval from remote sensing data in summer.

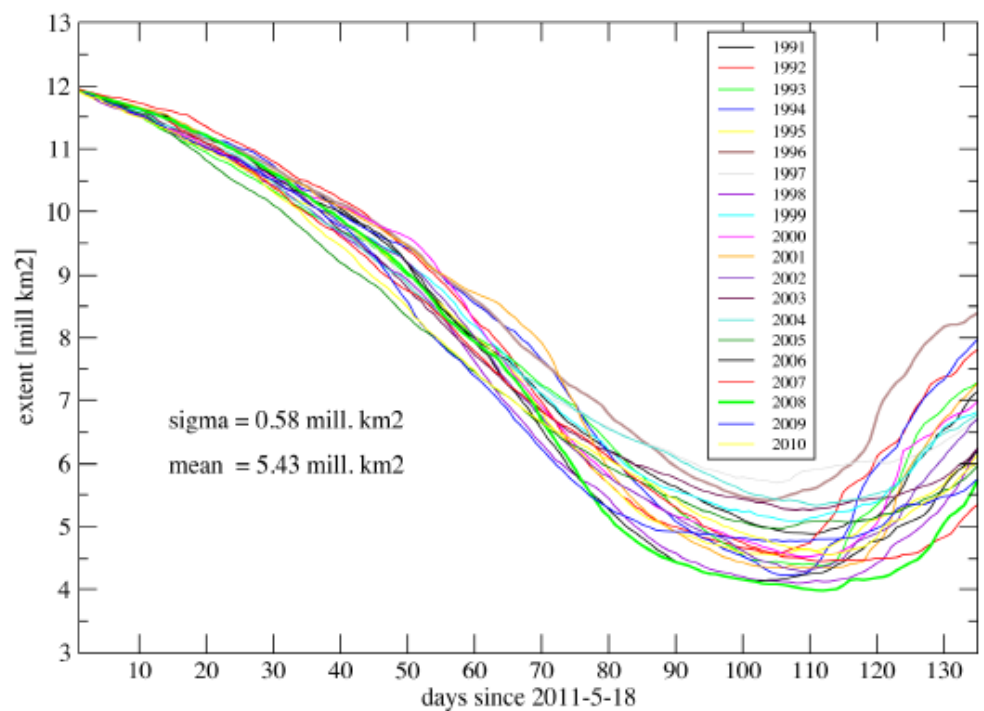


Figure 1: Simulated evolution of the ice extent [million km²] in the Arctic Ocean when forced with atmospheric data from 1991 to 2010. The test abscissa gives the days following the initialization of the forecast 18 May 2011. The data range from days 106 to 135 is used to calculate the September mean minimum of the sea-ice extent.

On the timescale of hours to days, a Numerical Weather Prediction (NWP) system is applied including a state-of-the-art variational assimilation system to assess future operational system capabilities for Arctic atmospheric forecasting. The aim of ACCESS is to identify key factors limiting monitoring and forecasting capabilities, and to provide recommendations for improvement, taking into account forecast quality and user needs.

On time-scales of months to years ACCESS will perform a systematic assessment of the forecast skill of the Arctic coupled ocean sea-ice system, and the requirements for the design of optimized observing systems which are tailored for user needs in areas such as shipping (WP2) or fixed installation safety (WP4).

Further activities related to forecasting capabilities will be

performed in the WPs 2,3 and 4, in close cooperation with WP1. These include assessments of necessary improvements in satellite observing systems and ice monitoring with respect to the threats of icebergs for shipping and oil spill forecasts.

An example for sea ice forecasts on a seasonal scale, beneficial for numerous activities in the Arctic, is the Sea Ice Outlook (SIO), an international effort to produce, compare and evaluate seasonal forecasts of the minimum (September) sea ice extent in the Arctic. Three ACCESS partners, the Alfred Wegener Institute for Polar and Marine Research, FastOpt, and OASys have participated in the SIO in the last few years.

The SIO was initiated after the dramatic sea ice extent minimum in 2007. Reliable spring forecasts for the summer sea ice season would be valuable for the planning and preparation of shipping activities in the Arctic Ocean. While the SIO itself is not intended

Work Package 1 – Climate Change and the Arctic Environment

to provide accurate forecasts for Arctic sea ice conditions during summer, it provides an overview of the current methods and merits of different approaches to seasonal sea ice prediction in the Arctic.

The AWI/FastOpt/OASys contribution consists of an ensemble of ocean-sea ice hindcasts where the ocean-sea ice model NAOSIM is driven by atmospheric forcing taken from 20 previous years. The ensemble integration is started from suitable initial conditions at the end of May (see Figure 1). Besides the likely value for the September sea ice extent, the twenty-member ensemble can be used to generate statements about the likelihood of the sea ice extent to exceed or fall below a certain threshold (e.g. the record sea ice extent of 2007). It turns out that reliable initial conditions for ice thickness are essential for a skilful

prediction. Therefore, the data assimilation system NAOSIMDAS has been used recently to provide initial ice conditions that are consistent with the available observational data. However, in the last years ice thickness data were restricted to regional sources like ice mass balance buoys (IMB) and air-borne electromagnetic measurements collected by AWI. This year, NASA is planning air-borne ice thickness measurements in March (IceBridge campaign) covering a large fraction of the Canadian Arctic. We want to assess the benefit of these data for the SIO with the help of the data assimilation system NAOSIMDAS.

The 2011 post-season summary report is available at <http://www.arcus.org/search/seaiceoutlook/2011/summary> with information about SIO results from previous years at <http://www.arcus.org/search/seaiceoutlook/>

WP1 Meetings

5-6 September 2011 – Workshop on Climate Scenarios and Climate Modeling - Haus de Wissenschaft, Bremen, Germany.

Projections for the impact of climate change can only be achieved in close collaboration between climate scientists and those working on socio-economic issues. Difficulties arise because of the different backgrounds and terminologies between the fields. The aim of the workshop was to communicate to non-climate experts a working knowledge of climate science issues that are important for their research on climate change impacts on different sectors and activities. The workshop gave an introduction to climate change due to greenhouse gases and aerosols, expected and observed changes in the Arctic, natural climate variability, and climate models and their components. The workshop tried to answer questions regarding the generation of climate scenarios, their inputs and the assumptions and uncertainties involved. Distinguished speakers from within ACCESS and external were recruited for ten overview talks. The workshop was advertised on mailing lists and within relevant European Union (e.g. VECTORS and ECO2) and other projects. It attracted almost 40 participants who contributed to the workshop outcome also in two break-out sessions. These discussions focussed on the needs of the users of climate model scenario calculations, the usefulness of climate model results to answer specific questions, mechanisms to generate alternative climate change scenarios and future collaborations. The agenda of the workshop and the presentations can be found on the ACCESS website (<http://www.access-eu.org> under Dissemination – see WP6 below).

24-25th November 2011 – Workshop to discuss fieldwork during the course of the ACCESS project (see Future Activities and Initiatives below with maps of 2012 fieldwork in the Arctic Ocean) - Laboratoire d'Océanographie de Villefranche, Villefranche, France

The workshop involved sessions on: sea ice with Peter Wadhams (DAMTP), Jeremy Wilkinson (SAMS), Dmitry Divine (NPI) and others; atmosphere with Kathy Law (LATMOS/UPMC); ocean with Vladimir Ivanov (AARI), Michel Andre (UPC), Jean Claude Gascard (LOCEAN/UPMC) and others; ACCESS related projects, including SEARCH (<http://www.arcus.org/search/searchscience/>), EQUIPEX-funded IAOS (<http://www.iaos-equipex.upmc.fr>) and ISAC (<http://www.arcticchange.org/>); data outflow and access with Frank Kauker (OASys); and outreach with Nathalie Sennechael (LOCEAN/UPMC). The modelling session led by Rüdiger Gerdes addressed what modelers are expecting from observers during ACCESS in order to improve model prediction during the next 30 years. The experimental design led by Thomas Kaminski (FastOPT) addressed how to design an ensemble of experiments from a theoretical point of view with practical constraints. The fieldwork logistics and calendar session led by Jeremy Wilkinson involved with input to and from the Marine Spatial Planning (see WP5 below), considering interactions with diverse stakeholders.

WP1 Presentations, Publications and Outreach

- Beszczynska-Möller, A., Woodgate, R., Lee, C., Melling H. and Karcher, M. 2011. A synthesis of exchanges through the main oceanic gateways to the Arctic Ocean. *Oceanography* 24(3):82-99.
- Duarte, C.M., Lenton, T.M., Wadhams, P. and Wassmann, P. 2012. Abrupt climate change in the Arctic. *Nature Climate Change* (2):60-62.

- Gascard, J-C. 2011. Steps towards an integrated Arctic Ocean observational system. *Oceanography* 24(3):174-175.
- Proshutinsky, A., Aksenov, Y., Clement Kinney, J., Gerdes, R., Golubeva, E., Holland, D., Holloway, G., Jahn, A., Johnson, M., Popova, E., Steele, M. and Watanabe, E. 2011. Recent advances in Arctic Ocean studies employing models from the Arctic Ocean Model Intercomparison Project (AOMIP). *Oceanography* 24(3):102-113.

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Work Package 2 – Marine Transportation and Tourism

The main objective of WP2 is to evaluate the effects of climate change on increased Arctic shipping and tourism, using the results of WP1 and providing recommendations for WP5. We will consider rules and regulations, infrastructure needs, pollution, safety, and socio-economic costs and benefits.

Hazards to navigation represent serious challenges for safe, secure and reliable marine transportation and tourism in the Arctic Ocean. Limited, and in many areas non-existent bathymetric charting, along with various ice phenomena (including sea ice, growlers and icebergs) as well as extreme and variable meteorological conditions (including low temperatures, dense fogs and strong winds) all present risks to Arctic navigation. WP2 is evaluating these challenges in

view of existing infrastructures, notably the *2011 Agreement on Cooperation on Aeronautical and Maritime Search and Rescue*, and emerging solutions, such as the binding polar code that is anticipated from the International Maritime Organization. Additional efforts from WP2 are focusing on lessons learned from shipping emergencies in polar waters (Fig. 2) where there are compounded hazards due to remote operating conditions and extreme environments.



Figure 2: Grounding of the M/V Clipper Adventurer in the Northwest Passage, where it hit a reef (http://www.hydro-international.com/news/id4176-Arctic_Rescue.html).

WP2 Presentations, Publications and Outreach

The Arctic: Territory of Dialogue – Russian Geographical Society, 22-23 September 2011, Arkhangelsk, Russian Federation.

WP2 Contact

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WP2 Meetings:

29 November 2011 – This second meeting of WP2 focused presentations of work-in-progress and the work program for 2012 - Nordic Bulk Carriers (NBC), Copenhagen, Denmark. (see the ACCESS website, <http://www.access-eu.org>, for the meeting agenda)

A list of ice conditions at various regions of the Northern Sea Route (NSR) has been provided by Arctic And Antarctic Research Institute; identified gaps especially data on ice concentrations and ridges will partly be closed by data from Meteorology Institute of Norway and WP1.

Several WP2 partners are preparing and executing full-scale measurements in the Arctic by designing and manufacturing instruments to measure: (a) internal ice pressure by a stress sensor buoy as a function of ice conditions, water current and wind (Hamburgische Schiffbau-Versuchsanstalt, Scottish Association For Marine Science), (b) air pollution from ship emissions by aircraft flights (Deutsches Zentrum Für Luft- Und Raumfahrt and Université Pierre Et Marie Curie), and (c) underwater noise from ships and offshore oil/gas activities (Universitat Politècnica de Catalunya, Shirshov Institute Of Oceanology).

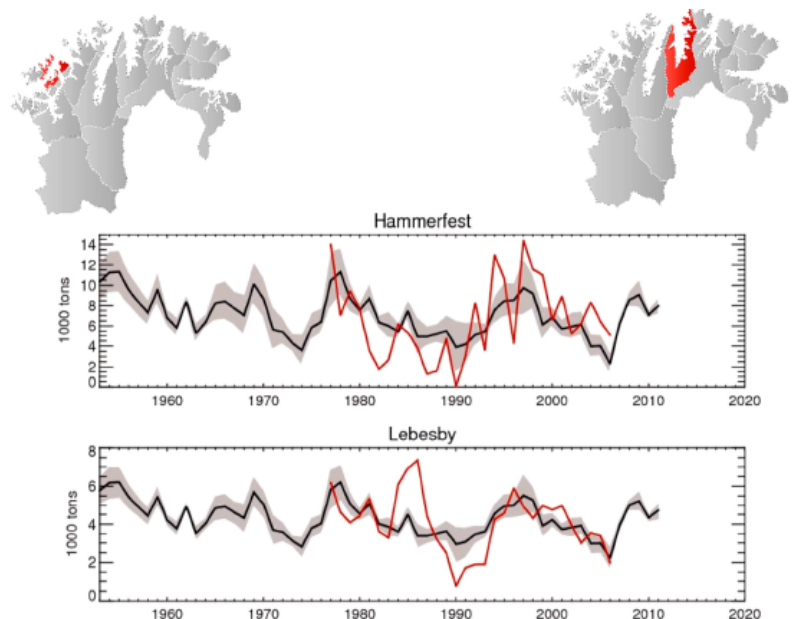
Work Package 3 – Fisheries

The main objective of WP3 is to estimate and quantify how climate changes impact Arctic fisheries and aquaculture, and the livelihood of communities and economic actors depending of these industries.

Ecosystem-based management (EMB) is an integrating approach to holistically consider the biological, physical, geological and chemical dynamics of natural systems in view of human impacts and relevant regulatory systems. EMB is an important component of WP3, requiring close collaboration with WP1 research to assess changes in the Arctic Ocean associated with climate change. The International Council for the Exploration of the Sea (ICES) has implemented EMB by setting up a framework

for the member states of coordinate an Ecosystem Approach to Management (EAM). Ultimately, physical constraints define the limits of the possible ecosystem performance. An example of possible biological and physical coupling in the Arctic Ocean for a commercially important species is shown in Figure 3 with regard to seawater temperatures and fish catches over years in the Barents Sea.

Figure 3: Time series of cod landings from coastal fisheries in the Hammerfest and Lebesby municipalities of the Barents Sea region as observed (red) and reconstructed based on ocean temperatures (black), which are known to influence the early life histories of cod. Reconstruction of landings is based on a statistical model that relates temporal-spatial patterns in observed landings to ocean temperatures simulated by a sea ice-ocean model. Other factors influencing the stocks or even the catch success cannot be treated with this method, such as: fish catch limits, capacity of fish processing facilities, market processes, marine productivity and species interactions. Good agreement on a decadal scale between observed landings and those reconstructed from simulated temperatures suggests close bio-physical coupling and the types of interdisciplinary analyses for ecosystem-based management. The time lag of ocean temperatures to cod landings is five years, interpreted herein as the climate-driven variability in landings data. Results from EU project DAMOCLES by Michael Karcher, Frank Kauker and colleagues (in preparation) with cod landings data courtesy of Trond Havelin, Fiskeridirektoratet, Norway).



WP3 Presentations, Publications and Outreach

- Eide, A. (2012). A bioeconomic MPA study based on cellular automata population growth and distribution. *Fisheries Research* 113:118-132 DOI:10.1016/j.fishres.2011.10.004.
- Eide, A. (2011). On the limits of improved fish finding capacity and its contribution to resource conservation. In Chan, F., Marinova, D. and Anderssen, R.S. (eds) MODSIM2011, *19th International Congress on Modelling and Simulation*. Modelling and Simulation Society of Australia and New Zealand, December 2011, pp. 2493-2499. ISBN: 978-0-9872143-1-7.

19th International Congress on Modelling and Simulation – Modelling and Simulation Society of Australia and New Zealand, December 2011, MODSIM2011

Seminar on The spatial dimension - A Step Forward for Fish Management? – Institute of Marine Research, 23 November 2011, Bergen – Norway

WP3 Contact

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Workshop on Aquaculture in the Arctic – Nofima, 6 December 2011, Tromsø, Norway

Arctic Tipping Points (ATP) project of the European Commission, Arctic Frontiers Meeting, Tromsø, 25-26 January 2011. Officially ending on 31 January 2012, the ATP project held its last General Assembly meeting in conjunction with the Arctic Frontiers meeting. Several ACCESS partners participated to this final ATP meeting (Anne Sophie Crepin from Beijer Institute in Stockholm, Sweden, Dag Slagstad from Sintef in Trondheim, Norway, Arne Eide from University of Tromsø and Fisheries College in Norway, Joao Rodriguez from DAMTP in Cambridge UK and Jean Claude Gascard from UPMC in Paris France). Results of the ATP project include publications in *Nature Climate Change* and in *AMBIO* in 2012 regarding tipping elements in Arctic marine ecosystems. Coordinator of ATP, Prof. Paul Wassmann, has been invited to participate to the ACCESS general assembly in Stockholm to insure good continuity between ATP and ACCESS regarding research on climate change impacts on Arctic marine ecosystems.

WP3 Meetings

While no WP3 meeting during this period, there have been meetings between Beijer and Nofima to plan Tasks: 3.1 (*Quantification of Economic Effects of Climate Change in a Fisheries System*); 3.2 (*Aquaculture in the Arctic – Implications from Climate Change*); 3.3 (*Climate Change Effects on Factor and Product Markets for Capture Fisheries*); and 3.5 (*Eliciting Behavioural Responses from Relevant User Groups and Stakeholders*).

Work Package 4 – Resource Extraction

The main objective of WP4 is to assess the risks and opportunities associated with the extraction of hydrocarbons from the Arctic Ocean. These assessments will be further considered in view of socio-economic impacts on European and world markets.

Oil spills in the Arctic Ocean are a serious concern, especially as the potential for large-scale energy exploitation increases as the sea-ice decreases. It is generally accepted that open-ocean oil spill models are well established and do a good job in predicting the movement of oil on the ocean surface. Modelling of oil flow in the presence of sea ice is more uncertain because our knowledge of the under ice topography is limited

and as a result we are unable to replicate the complexity or uniqueness of the bottom topography of sea ice. ACCESS partners are developing an under ice oil trajectory model based around the bona fide 3-dimensional (3-D) shape of the under-ice of sea ice (Fig. 4), thus allowing an accurate appraisal of the movement of oil under sea ice along with the potential oil holding capacity of sea ice.

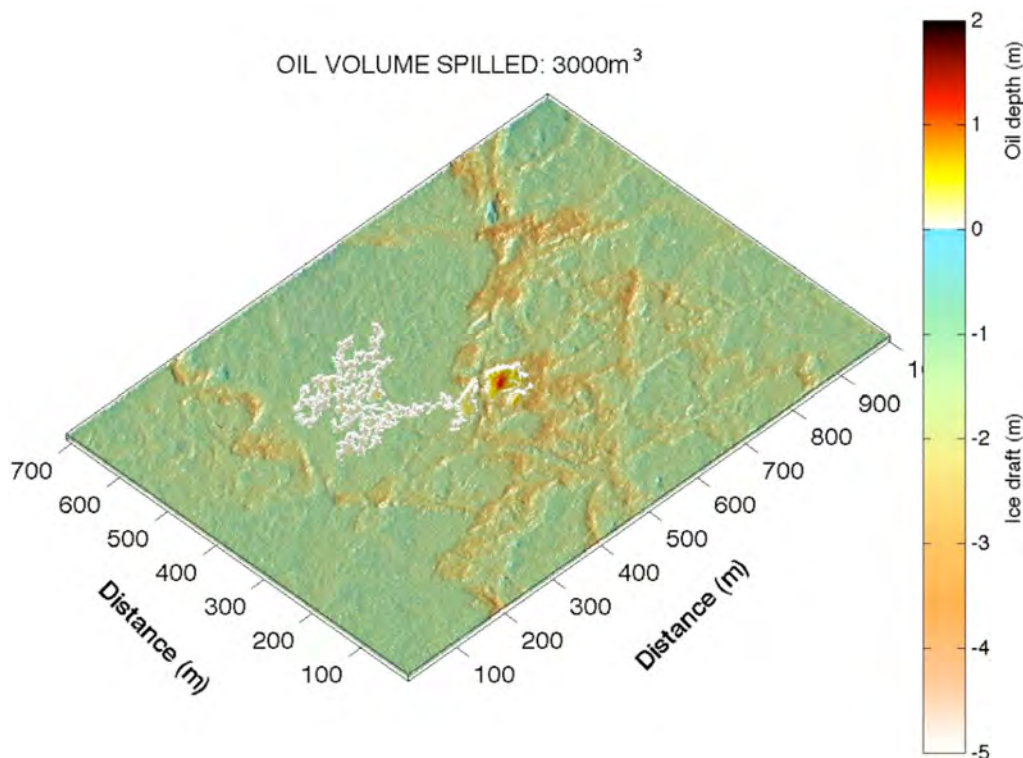


Figure 4: Modelling the movement of oil spilled under sea ice. An example of the output from an oil spill under sea-ice model using real under ice topography is shown. In situ under-ice topography data has been gathered by multibeam sonar mounted on an Autonomous Underwater Vehicle (AUV). Initially oil is completely contained within the region of deformed ice with oil depth about 1 m. Eventually the oil fills up the hollow within the deformed area and overflows to more level ice surfaces. The oil spill continues, but because the under ice surface is level, the oil forms a much thinner layer and spreads over a greater area.

WP4 Presentations, Publications and Outreach

Oil Spill in Sea Ice, Past, Present and Future – Istituto Geografico Polare “Silvio Zavatti”, 20-23 September 2011, Fermo, Italy (<http://www.oilspillsinseaice.net/programme>).

This timely workshop organised by the Istituto Geografico Polare “Silvio Zavatti” (Director: Maria Pia Casarini) involved 33 delegates from 12 countries, including several ACCESS partners, who presented papers covering all aspects of the problem of oil spills in sea ice, including reviews of the large experimental programmes of past years and the question of how best to cope with the impact of a blowout which leads to oil being incorporated into the structure of the ice and transported long distances during the winter. On the final day a panel discussion focused on how can we design an effective, integrated system for dealing with a potential accident in ice-covered waters, and a “Fermo Statement” was agreed listing the most urgent areas for new research on critical aspects of the problem. The Fermo

statement has been submitted to the Arctic Council via the US and WWF memberships, and will be considered by the Arctic Task Force set up by the Council to examine protection of the Arctic against oil pollution. The papers given at the Workshop, including an introductory scene-setting paper by Walter Munk, will be published in a proceedings volume and, after refereeing, in a special issue of “Cold Regions Science and Technology”. Guest editors for this special issue are the organising committee for the workshop, comprising Peter Wadhams (Cambridge), Lawson Brigham (University of Alaska and consultant to ACCESS) and Mark Myers (Vice President for Research, University of Alaska Fairbanks). Financial support was provided by Office of Naval Research Global and by the Zavatti Foundation. Before the Fermo, workshop ACCESS partners involved in oil spill under sea ice research held a smaller meeting to discuss deliverables within Task 4.4.1, comprising assessment and recommendations regarding oil spill response capabilities and technologies in ice-covered waters. ACCESS partners present included: DAMTP, Met.No, SAMS and SINTEF.

WP4 Contact

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WP4 Meetings

5 October 2011 – Kiel, Germany, Institut für Weltwirtschaft. Meeting of partners involved in the socio-economic assessment of resource extraction in the Arctic Ocean and to discuss deliverables for Task 4.4.1 (*Assessment and Recommendations Regarding Oil Spill Response Capabilities and Technologies in Ice-Covered Waters*).

Work Package 5 – Governance, Sustainable Development and Synthesis

The main objective of WP5 is to integrate results of WP 1-4, revealing international and interdisciplinary policy options that can be considered by decision makers to ensure sustainable development and environmental protection of the Arctic Ocean.

One of the tools which ACCESS WP5 will use in its development of strategic governance options will be Marine Spatial Planning (MSP). This element of the project will bring together the regulatory, scientific, socio-economic and environmental parameters associated with and affected by long-term climate change in the Arctic

Ocean (Fig. 5). In addition, scientific and research outputs from each of the sector activities studied by ACCESS (Transport and Tourism, Fisheries and Resource Extraction) will be incorporated into the MSP, enabling direct and integrated analysis of the impact of climate change.

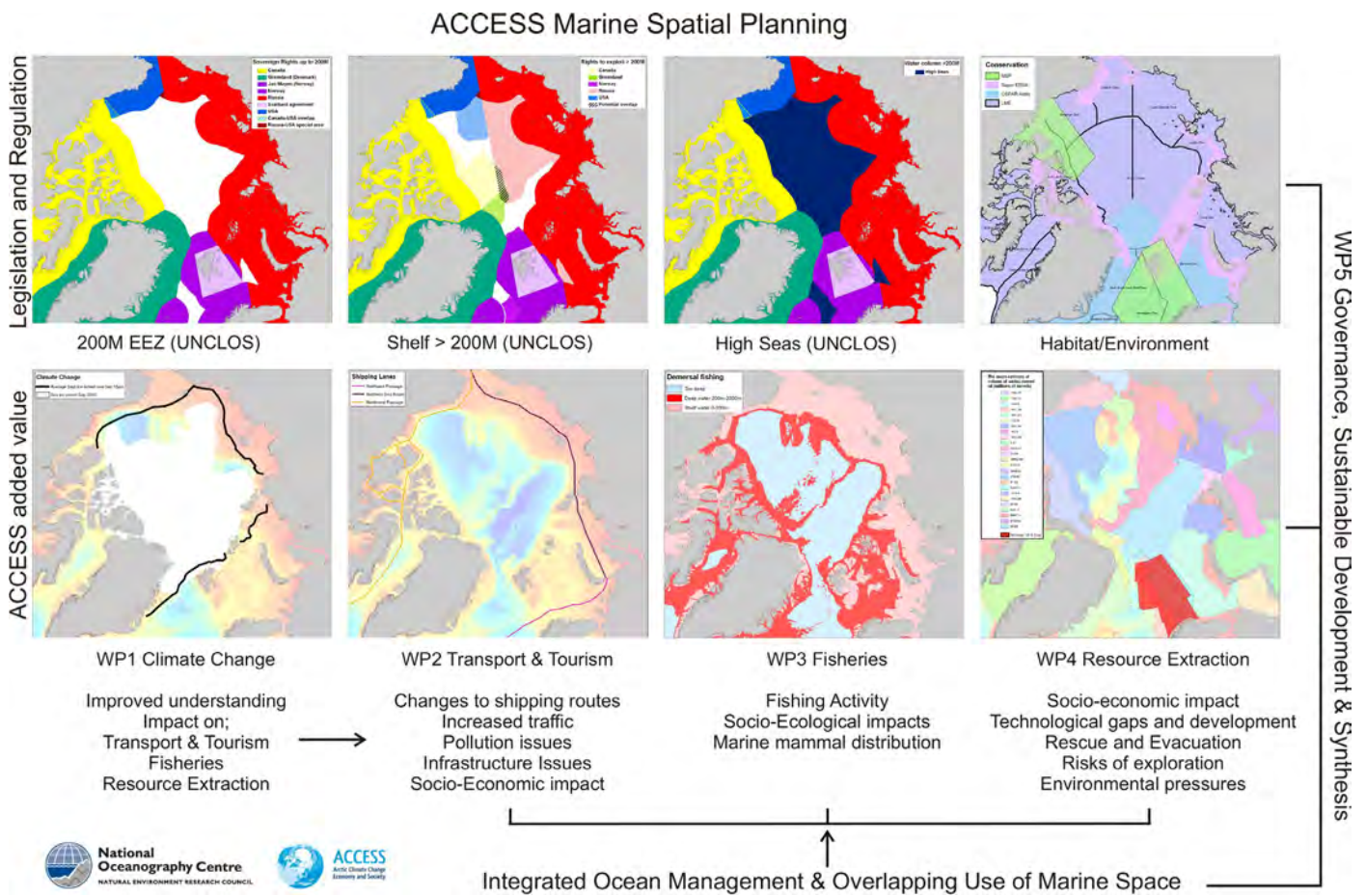


Figure 5: Illustration of the Marine Spatial Planning (MSP) data layers that are being integrated with Geographic Information System (GIS) analyses, which rectify diverse data in relation to their geo-spatial coordinates, to reveal risks and responses for impacts in the Arctic Ocean over the next three decades.

UPPER ROW (Legislation and Regulation Data Layers). In relation to the 1982 United Nations Convention on the Law of the Sea (UNCLOS), there are national regulations that apply landward within the 200-mile boundary of the Exclusive Economic Zones (EEZ) of the five surrounding coastal states: Russian Federation (red), Norway (purple), Denmark / Greenland (green), Canada (yellow) and United States (blue). On the continental shelf and sea floor beyond 200 miles from the coastlines, there may be sovereign rights as well as international rights. In the water column beyond 200 miles is the high seas that involves freedoms of the international community beyond sovereign jurisdictions. Transboundary features of the habitats and large marine ecosystems (LME) also are considered in relation to conservation approaches that are being adopted by other international institutions that have remit in the Arctic Ocean, including the 1992 Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR).

LOWER ROW (ACCESS Added Value Data Layers). Deliverables of ACCESS WP1 involve modelling and in situ measurements to understand and predict sea-ice (white) changes in the Arctic Ocean within and between years. Transport and tourism issues in WP2 are being considered in relation to safe, secure and reliable shipping in the Arctic Ocean, including across the Northern Sea Route and Northwest Passage. Fisheries management strategies in WP3 are being considered in relation to species habitats, such as shallow (pink above 200 m) and deepwater (blue – below 2000 m) areas, with regard to sustainable living resource usage. Non-living resources in WP4, including potential oil and gas deposits, are being considered in relation to their economic and ecological consequences. Integration of such data layers is intended to provide an objective framework for sustainable development in the Arctic Ocean where there are overlapping uses, cumulative impacts and diverse jurisdictional issues.

Work Package 5 – Governance, Sustainable Development and Synthesis

MSP outputs may, for example, demonstrate the changes in transport pathways, increasing traffic and the pollution effects (WP2), changes in fish migratory patterns and biomass (WP3) and the socio-economic impacts of increasing hydrocarbon exploitation and its potential effect on the marine environment (WP4). Incorporating such data into the MSP will provide

an efficient way of observing changes in marine space use and recognition of areas of potential conflict of use. ACCESS WP5 will use the MSP as a tool to conduct an integrated ocean management assessment, where strategic options for promoting the conservation and sustainable use of the marine environment can be developed.

WP5 Presentations, Publications and Outreach

- Berkman, P.A. 2012. "Our Common Future" in the Arctic Ocean. *The Roundtable. Commonwealth Journal of International Affairs*.101(2):1-13.
- Berkman, P.A. 2012. "Common Interests" as an Evolving Body of International Law: Applications to Arctic Ocean Stewardship. IN: Wolfrum, R. (ed.). *Beiträge zum ausländischen öffentlichen Recht und Völkerrecht* (Contributions on Comparative Public Law and International Law). Max Planck Institute, Heidelberg. (in press).
- Berkman, P.A. and Vylegzhanin, A.N. (eds). 2012. *Environmental Security in the Arctic Ocean*. Springer, Dordrecht (in press).
- Gascard, J.C. 2012. From DAMOCLES to ACCESS. IN: Wolfrum, R. (ed.). *Beiträge zum ausländischen öffentlichen Recht und Völkerrecht* (Contributions on Comparative Public Law and International Law). Max Planck Institute, Heidelberg. (in press).

[The Arctic: Territory of Dialogue](#) – Russian Geographical Society, 22-23 September 2011, Arkhangelsk, Russian Federation

[Polar Code Hazard Identification Workshop](#) – International Maritime Organization, 27-30 September 2011, Cambridge, United Kingdom.

• Sustainable Shipping Conference – *Petromedia*, 12-14 October 2011, Vancouver, Canada.

[Arctic Human Development Report: Regional Processes and Global Linkages \(AHDR-II\)](#) – Sustainable Development Working Group of the Arctic Council, 18-19 November 2011, Copenhagen, Denmark

[Anticipating the Future: Risk Management for Long-term Planning](#) – Centre for Risk Studies, Judge Business School, University of Cambridge, Cambridge, United Kingdom.

WP5 Meetings

[18-19 January 2012](#) – Royal Academy of Sciences / Beijer Institute of Ecological Economics, Stockholm, Sweden. Discussion of WP5 progress with focus on Deliverables 5.11 (Analysis and Synthesis of Extant and Developing Regulatory Frameworks) and 5.81 (Conditions for Integrated Ecosystem Based Management in the Arctic) that are due in Month 13. Additionally, overall WP5 planning was discussed as well as stakeholder engagement and collaborations to broaden the utility of the WP5 deliverables.

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Work Package 6 – Dissemination

The main objective of WP6 is to openly share research results from WP 1-5 with policy makers, industrial and academic stakeholders, and the public-at-large via the ACCESS Website, Flyer and Newsletter as well as through other media.

Effective dissemination of news and results is key to effective collaboration across the ACCESS project. This newsletter as well as the website (Fig. 6) are designed to facilitate timely communications about progress of the ACCESS project in an open and engaging manner. The Wiki provides an important

internal tool for ACCESS scientists to share results and stimulate exchanges that enhance the international and interdisciplinary products of this European Commission funded project for the benefit of society.

ACCESS Website

Layout of ACCESS website (<http://www.access-eu.org>) with diverse materials produced by this international and interdisciplinary project funded by the European Commission, such as the video of the workshop on Climate Scenarios and Climate Simulations that was convened in Bremen, Germany, in September 2011 (see WP1 above). The ACCESS website is intended to serve as a tool of collaboration within the project as well as with stakeholders and other collaborators.

Wiki

In order to support the internal information flow of ACCESS a dedicated wiki solution has been set up. This solution has support for task management and discussion management. Contrary to the website which has a more external user perspective, all registered internal users can read and write on the wiki and dedicated areas has been prepared for each work package to utilise as they wish. The wiki can be used for preparing meetings, providing minutes of meetings and for preparation of documentation.



The screenshot displays the ACCESS website interface. The top navigation bar includes the ACCESS logo (Arctic Climate Change Economy and Society) and the page title "Arctic Climate Change, Economy and Society". Below the navigation bar, there is a breadcrumb trail: "Home / Dissemination / ACCESS workshops / WP1 workshop". The main content area features a video player titled "Rüdiger Gerdes by ACESSEU2011". The video content shows a man speaking at a podium in front of a screen displaying the ACCESS logo and text: "ACCESS Arctic Climate Change, Economy and Society" and "Sustainable development within the vision of Tomorrow's call of the Sustainable Development Framework Programme". Below the video player, the text reads "WP1 workshop on climate scenarios Introduction by Rüdiger Gerdes". The video player controls show a progress bar at 00:02 / 15:02, a CC license icon, 360p resolution, and a YouTube logo. On the left side of the website, there is a sidebar menu with categories: Home, Project Content, Climate Change, Economic Sectors, Arctic Governance, Dissemination (with sub-items: ACCESS in the media, Peer Reviewed Publications, ACCESS workshops, ACCESS expeditions), Partners, Related News, Related Links, and Partners' area. At the bottom of the sidebar, there are links for a Calendar and an RSS file, and the UPMC logo (Sorbonne Universités).

Arctic Information Centre

On 14 July 2011, the European Parliament adopted a Preparatory Action for a "Strategic Impact Assessment of the Development of the Arctic" to increase awareness about the Arctic and its changing political, economic and environmental landscape. The Strategic Impact Assessment would be carried out as a networked undertaking, by leading Arctic communication and research centres and universities within and outside the European Union, creating a bridge that would facilitate two-way information exchange between EU institutions and Arctic stakeholders. Furthermore, the work would facilitate dialogue within the EU, advance Agenda21 and be closely linked with the assessment activities of the Arctic Council as laid down in

its ministerial in May 2011. Finally, the preparatory action would advance the future establishment of an Arctic Information Centre as expressed in 20 November 2008 Communication from the European Commission on the "European Union and the Arctic Region" (http://eeas.europa.eu/arctic_region/docs/com_08_763_en.pdf) and 20 January 2011 Resolution from the European Parliament on "Sustainable EU Policy for the High North" (<http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P7-TA-2011-0024+0+DOC+XML+V0//EN>). ACCESS partners, notably the Arctic Centre in Rovaneimi, are involved in planning for the Arctic Information Centre.

Ongoing and Future Activities

ACCESS Fieldwork in the Arctic Ocean During 2012

2012 will correspond to a major phase for ACCESS partners involved in fieldwork activities. All the working groups of ACCESS are concerned and the planning of operations both from ships, land stations (figure 7) and/or aircrafts (figure 8) is stretched from Spring to Fall and even Winter of 2012-2013.

Some specific details are provided indicating organisations involved, time, location and type of activities concerned. Persons of contact are also mentioned for each activities and much more information is accessible on the ACCESS web site.

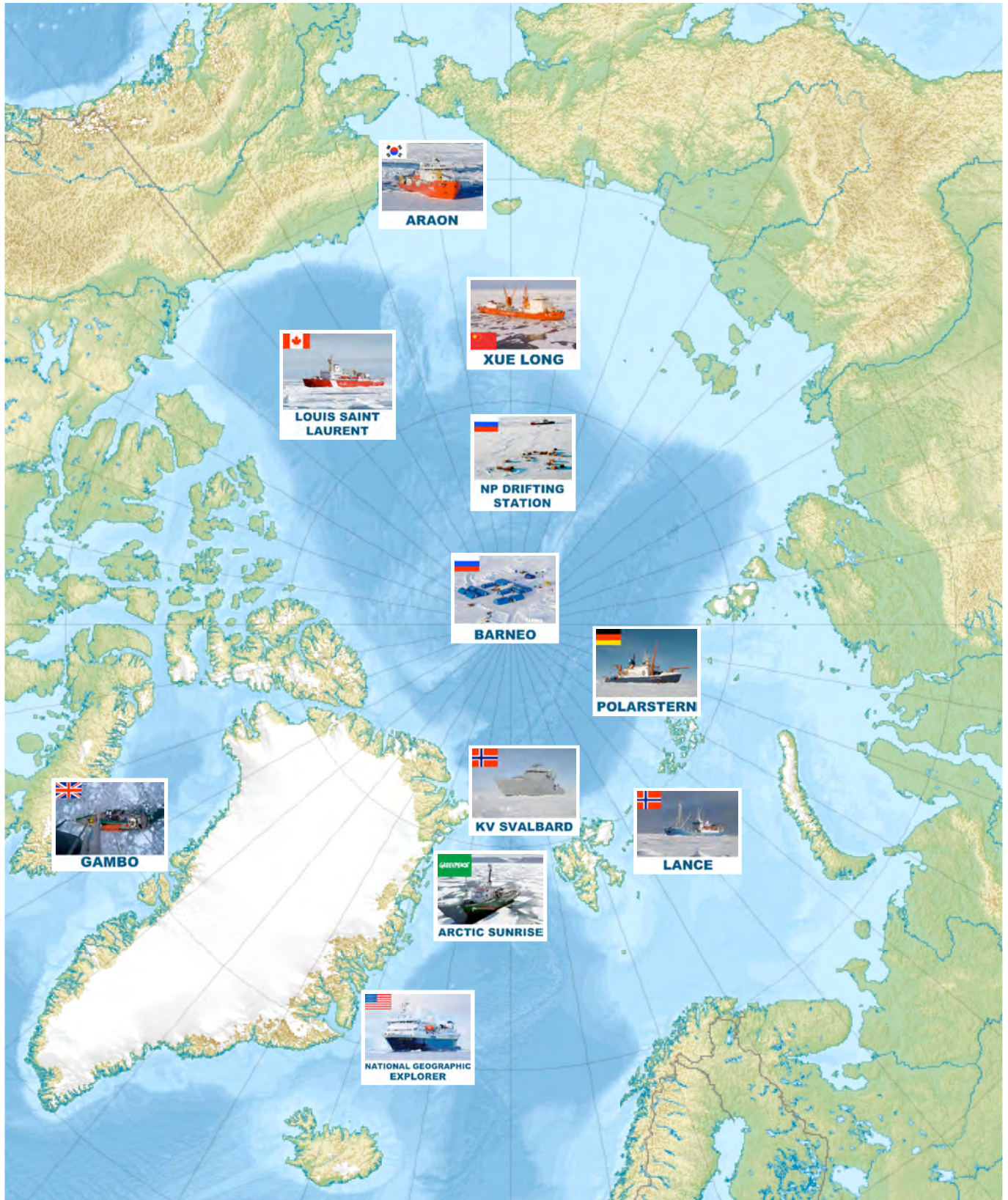


Figure 7: Shipborne fieldwork involving ACCESS scientists in the Arctic Ocean during 2012, showing ship platforms.

ACCESS Fieldwork in the Arctic Ocean During 2012

Descriptions of shipborne field activities associated with the ACCESS project in the Arctic Ocean during 2012 (Fig. 7).



ARAON

Korea: RV Araon
Korean Polar Research Institute (KOPRI)
August 2012- Nome-Nome 1 month cruise – biology ocean and ice physics (SAMS)
ACCESS contact: J. Wilkinson – Phil Hwang (SAMS)



XUE LONG

China: RV Xue Long - Chinese 'Snow Dragon'
Polar Research Institute of China (PRIC)
June-Sept 2012 - Trans-Arctic cruise (pacific-atlantic).
Biogeochemistry and atmosphere, ice and ocean physics. 3 week ice camp.
ACCESS contact: D. Ruiz Pino & J.C. Gascard (UPMC-LOCEAN)



LOUIS SAINT LAURENT

Canada: Louis Saint Laurent Ice breaker
Woods Hole Oceanographic Institution (WHOI)
Sept-Oct 2012-Moorings and buoy deployments, Ice Mass Balance (IMB) profilers, Ice Tethered Platforms (ITP), in the Beaufort Sea. WHOI contact: Andrey Proshutinsky
ACCESS contact: M. Doble (UPMC-LOV)



NP DRIFTING STATION

Russia: Drifting Station 88 N 130 W North Pole drifting station (NP39)
Arctic and Antarctic Research Institute (AARI)
1-year operations. Resupply in April, September/October
ACCESS contact: Vladimir Ivanov (AARI)



BARNEO

Russia: Barneo - Ice Camp at the North Pole
12-17 April 2012- Deployment of the IAOOS prototype platform drifting from April to September 2012- Platform including an ocean profiler and a SAMS Ice Mass Balance profiler for ice and snow depth measurements
ACCESS contact: P Lattes & J.C. Gascard (UPMC-LOCEAN)



POLARSTERN

Germany: RV Polarstern
Alfred Wegener Institute for Polar and Marine Research (AWI)
Aug-Sept 2012 - IceArc 2.5 m - biological stations, ice stations on-top and under the sea ice (ROV, divers, landers, traps). Ecosystem driven cruise - how ecosystem reacts to changes in ice conditions. Light distribution. (Pelagic-benthic coupling).
ACCESS contact: R. Gerdes (AWI)



KV SVALBARD

Norway: KV Svalbard (ACOBAR)
Mid-Aug to mid Sept (also March cruise in Fram Strait, UNIS/Smedsrud)
Nansen Environmental and Remote Sensing Center (NERSC) + UPMC-LOCEAN
ACCESS contact: J.C. Gascard (UPMC-LOCEAN)



LANCE

Norway: RV Lance
Norwegian Polar Institute (NPI)
-17 July-6 August (tentative dates) – Process studies on sea ice energy balance north of Svalbard, Longyearbyen-Longyearbyen
ACCESS contact: S. Gerland & Mats Granskog (NPI)
-19 August-13 Sept (tentative dates) - Sea-ice work, oceanography and mooring recovery and deployment in Fram Strait, Longyearbyen-Longyearbyen.
ACCESS contact: Edmond Hansen & Mats Granskog (NPI)



GAMBO

Gambo Polar Yacht
Aberystwyth University
June 2012- September 2013 - Ice sheet-ocean interactions at nearby outlet glaciers (Rink Glacier to the north of Uummannaq, and Store and Lille Glacier to the south). Contact: Alun Hubbard
ACCESS contact: J.C. Gascard (UPMC-LOCEAN)



ARCTIC SUNRISE

Arctic Sunrise Polar Yacht,
GreenPeace
May 2012 - Fram Strait - Measurements of the three-dimensional topography of the ice underside using a multibeam sonar on an AUV (autonomous underwater vehicle)
ACCESS contact: Peter Wadhams (UCAM-DAMPT)



NATIONAL GEOGRAPHIC EXPLORER

National Geographic Explorer expedition vessel
Lindblad Expeditions
22 July-12 Aug. 2012-« Heart of the Arctic Cruise » is an opportunity for the ACCESS project to participate directly in an Arctic Ocean activity that will reflect tourism practices along three Arctic coastal states and to get feedback from the passengers and crew regarding security issues for Marine Transportation and Tourism.
ACCESS contact: P. Berkman (UPMC-LOCEAN)

ACCESS Fieldwork in the Arctic Ocean During 2012

Figure 8: Airborne fieldwork involving ACCESS scientists in the Arctic Ocean during 2012, showing aircraft and general research locations.



AWI Polar 5 aircraft

Alfred Wegener Institute for Polar and Marine Research (AWI)

- 20 March-8 April 2012 - PAMARCMIP 2012 : measure of sea ice thickness when it is near its maximum extent and thickness (EM-bird surveys) and when aerosols and trace gases show important variations.
- summer 2012 : TIFAX (Thick Ice Feeding Arctic Export) from Station Nord.

ACCESS contact : R. Gerdes (AWI)



DLR Falcon aircraft

DLR-Institute of Atmospheric Physics

- First 3 weeks of July 2012- Sampling in the exhaust plumes of dedicated source ships and oil/gas extraction facilities. Survey flights (to analyse shipping-related trace species on regional scale ; to sample «background» data of air composition in the Arctic)

ACCESS contact : H. Schlager & A. Petzold (DLR)

International Conferences

International Polar Year (IPY) Meeting – From Knowledge to Action – Montreal, April 2012

The final synthesis meeting of the IPY will be convened in Montreal, Canada, from 22-27 April 2012 (<http://www.ipy2012montreal.ca/>). Please see the IPY website for additional information and registration. Several sessions in this IPY meeting are being convened by principal investigators in the ACCESS project with presentations by ACCESS scientists throughout the meeting (in blue):

SESSION. 1.1.2. - Polar Ocean Processes

- Vladimir Ivanov: *Arctic shelves – Alternative Source of the THC – Driving Dense Water in the Warmer Climate?*
- Rudels, B., Korhonen, M. Sergey Pisarev, Rabe, B., Schauer, U., and Wisotzki, A.: *The Influence of the Barents Sea Inflow Branch on the Arctic Ocean Circulation and Water Mass Transformation Processes?*
- Michael Karcher, Rüdiger Gerdes, Frank Kauker and Smith, J.N.: *Should we Modify our Understanding of the Arctic Ocean Circulation?*
- P. Bourgain and Jean Claude Gascard: *Large Staircase-like Microstructure in the Deep Arctic Ocean.*
- P. Bourgain and Jean Claude Gascard: *The Arctic Ocean haloline and its interannual variability from 1997 to 2008.*
- N. Chauche, Jean Claude Gascard, Hubard A., Provost C., Box J., Bates R. and Gillet-Chaulet F.: *Large Staircase-like Microstructure in the Deep Arctic Ocean.*

SESSION. 1.2.1. - Atmospheric, Physical and Chemical Processes in the Polar Regions

- Jean-Christophe Raut, Thomas, J. L., Law K. S., Ancellet G., Rasch P., Fast, J., Pfister, G. and Emmons, L.: *Transport of Anthropogenic Pollution and Boreal Forest Fire Emissions to the Arctic During Summer 2008.*

SESSION. 1.2.3. - Diminishing Snow and Ice

- Rüdiger Gerdes: *Sea Ice Retreat and its Consequences for Fram Strait Ice Export and the Arctic Ocean Fresh Water Balance.*
- Kathrin Riemann-Campe: *Changes in Arctic Sea Ice Distribution and Variability During the Next Decades.*

SESSION 1.3.2. - Polar marine ecosystem: status and change:

- Ruiz-Pino D., Chen J., Coupel P., Bouvet A., Gascard J.C., Garçon V. and Horner R.: *Impact of sea ice decrease and freshening on phytoplankton and carbon cycle in Western Arctic.*

SESSION. 1.4.1. - Natural resource exploration, exploitation and commercial activities including tourism

Convenor: Lawson Brigham (United States), Co-convenor: Andrii Fedchuk (Ukraine).

- Jean Claude Gascard (France) and the ACCESS Consortium. Arctic Climate Change Economy and Society: the ACCESS EU project..

SESSION 1.5.2. - Polar Observing Systems, including Observations from Space

- Provost C., Jean Claude Gascard, Pommereau J.P., Lattes P., Calzas M., Drezen C., Abchiche A., Amarouche N., Desautez A., and Descloitre J.: Arctic ice, atmosphere, ocean observing system: the EQUIPEX-funded IAOS project.

SESSION 1.5.3. - Advances in technology in polar research, including subglacial exploration

Convenor: Jeremy Wilkinson (United Kingdom), Co-convenor: Denis Samyn (Belgium).

- Jean Claude Gascard, Lattes, P., Brault, P., Simon, P., Smerdon A. and Lefevre, N.: *An Autonomous, Long-Term, Long-Range Drifting System for Sea-Ice and Underwater Observations: The ACOBAR Cluster.*

SESSION 2.2.7 – Sustainable Arctic Development: Integrated Perspectives

Convenor: Paul Arthur Berkman (United Kingdom), Co-convenors: Oran R. Young (United States) and Sandra Rodrigues Balão (Portugal).

SESSION 2.4.5. - Polar Governance, Policy and Management in the Face of Change

- Kathrin Riemann-Campe: *Interdisciplinary Collaboration and the Forecasting of Arctic Futures.*
- Lindsay Parson, Anne-Sophie Crépin, Jean Claude Gascard, Michael Karcher and Katrin Rehdanz and ACCESS Partners. *The EU ACCESS Project – Stress-Testing Governance Options in the Arctic Over the Next Thirty Years of Climate Change.*

SESSION 2.5.4. - Accessing, Sharing and Preserving Data: Defining an IPY Legacy

- Godoy, Ø. (Norway), Klein, H., Støren, E., Torget, Ø. Aalberg, G. and Sannes, P.: *Arctic Data Center.*
- Godoy, Ø., (Norway), Klein, H., Støren, E., Torget, Ø, Aalberg, G. and P. Sannes, P.: *Global Cryosphere Watch from the Data Management Perspective.*

SESSION 2.5.5. - Improved Projections and Forecasts from Climate and Weather Models

- P. Bourgain, Garric G., Jean Claude Gascard and Ferry N.: *Models validation using recent observations in the Arctic Ocean.*

International Conferences

Arctic Frontiers

Sustainable Arctic Observing Network (SAON) taskforce of the Arctic Council, Arctic Frontiers Meeting, Tromsø, 25-26 January 2011. The SAON Board met in Tromsø in conjunction with the Arctic Frontiers meeting to discuss: (1) terms of reference for Board members representing various institutions, national and international organisations; (2) role of the SAON Board members; and (3) review of the 17 Tasks proposed to SAON and potentially identified as SAON Tasks. The following countries were represented at the SAON meeting: Canada, Germany, China, Finland, Iceland, Italy, Poland, Norway, Japan, Russia, Sweden, Spain and USA. In addition there were representatives of international organisations such as CliC, EEA, EU commission, ISAC, ICES, WMO, UNESCO/IOC, ICC. It was clearly suggested that a National SAON coordinating committee should be put in place in each countries willing to participate and to contribute to SAON activities. The next SAON Board meeting will be organised in Potsdam, Germany, during the Fall 2012.

International Arctic Research Collaboration

The “*Responding to Change*” workshop was convened at the Queen’s University, School of Policy Science, in Kingston, Ontario, from 30 January to 1 February 2012 (<http://www.arcticchange.org/>) to provide a stepping stone for future discussions about transatlantic collaborations regarding climate change impacts on sustainable development in the Arctic Ocean. Objectives of the Responding to Change workshop were to engage a spectrum of stakeholders to develop a common understanding about what is meant by responding to Arctic environmental change and to establish partnerships that will enhance information sharing about Arctic issues. This workshop evaluated the alignment between data flowing from Arctic observing networks and stakeholder needs for information that can be applied to the generation of risk assessments over the short-term as well as to the implementation of adaptation and mitigation strategies over the long-term.

ACCESS General Assembly - Stockholm, March 2012

The annual ACCESS General Assembly will be organised in Stockholm, Sweden at the Royal Academy of Sciences on March 8 and 9, 2012. This is a very special event for ACCESS since it is the second time the whole consortium will meet following the kick-off meeting that occurred one year ago in Paris, France. On this occasion, for the first time the ACCESS consortium will meet with the ACCESS Advisory Board and several Arctic stakeholders. The ACCESS working groups will organise internal meetings in breakout and parallel sessions on March 7. During the plenary session on March 8, each ACCESS working groups (Climate change in the Arctic, Marine transportation, Fisheries, Oil & Gas extraction, Arctic Governance and ACCESS communication and outreach) will present general activities accomplished during the first year of the project (2011) and those activities scheduled for the second year (2012) including field work for most of them. Interactions between ACCESS partners and Arctic stakeholders, internal communication between ACCESS working groups and external communication and networking with other Arctic working groups (Arctic Council, IASC etc..) will be highlighted. Special attention will be given regarding special link between the ACCESS consortium and the European Commission based on a recent meeting organised in Brussels on February 20, 2012. On March 9 a plenary open discussion will be set up involving the ACCESS Advisory Board and the ACCESS consortium. The ACCESS steering committee will meet in the afternoon of March 9, 2012. An extended report will be released in the ACCESS newsletter N°3 at the end of April related to the 2012 ACCESS General Assembly.

All the publications mentioned in the ACCESS newsletter reflect only the authors view.

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Comments and suggestions for the ACCESS Newsletter are most welcome
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