

Full Proposals for International Polar Year 2007-2008 Activities

Proposed IPY Activity Details

1.0 PROPOSER INFORMATION

(Activity ID No: 28)

1.1 Title of Activity

Climate of the Arctic and its role for Europe/Arctic System Reanalysis

1.2 Short Form Title of Proposed Activity

CARE/ASR

1.3 Activity Leader Details

Ola M Johannessen
Nansen Environmental and Remote Sensing Center
Norway

1.4 Lead International Organisation(s) (if applicable)

NULL
NULL
NULL
NULL

1.5 Other Countries involved in the activity

USA
Germany
France
Sweden
Finland
Russia
Belgium
United Kingdom
Denmark
Spain
Iceland
Estonia
Romania
Greece
China
Netherlands

1.6 Expression of Intent ID #'s brought together in this proposed activity

133, 179

1.7 Location of Field Activities

Arctic

1.8 Which IPY themes are addressed

1. Current state of the environment
2. Change in the polar regions
3. Polar-global linkages/tele-connections
4. Exploring new frontiers
5. The polar regions as vantage points
6. The human dimension in polar regions

1.9 What is the main IPY target addressed by this activity

1. Natural or social science

2.0 SUMMARY OF THE ACTIVITY

The overall objective of CARE/ASR is to explore, quantify and model Arctic climate change, its interaction with the climate in lower latitudes and its impact on Arctic marine ecosystems, and to assess the socio-economic consequences for Europe. The specific objectives are:

1. To determine the processes responsible for the past and present variability and changes in the Arctic climate system and to improve their representation in climate models.
2. To understand the degree to which recent variability and changes in the Arctic climate system, e.g., shrinking sea-ice cover, thawing permafrost and increased methane emission, are of natural or of anthropogenic origin.
3. To understand and quantify the response of marine biological processes to climate change and their impact on Arctic marine ecosystems and the air-sea CO₂ fluxes and to improve their representation in ecosystem models and inclusion in global climate models.
4. To quantify the impact of the Arctic freshwater budget on the global thermohaline circulation (THC) and its impact on climate, and to assess possible impact on rapid climate change, sea-level change and sequestration of CO₂.
5. To improve capabilities to predict Arctic climate on decadal and longer time scales and design optimal components of an integrated monitoring and forecasting system.
6. To assess the impact of climate change in the Arctic on the THC, marine ecosystems and fisheries, transportation, offshore industry and oil and gas production, coastal infrastructures, and on climate in Europe.

The work will be implemented in six tightly linked workpackages: WP1: Processes determining Arctic climate variability and changes; WP2: Marine biological processes in response to climate change; WP3: Air-sea-ice meso-scale processes and climate variability; WP4: Past climate variability; WP5: Remote sensing and new technology for climate data provision, and WP6: Assessment of Arctic climate change. The main activities will include: (1) Collection, analysis and harmonisation of historical and modern data sets; (2) Field experiments with deployment of new in situ observation systems, using ice breakers, ships, ice drift station and land-based research facilities; (3) Use of state-of-art and new satellite remote sensing; (4) Use of global climate models as well as regional and process-oriented models, (5) Exchange programmes for scientists and training for students; (6) Co-ordinated dissemination and exploitation activities; and (7) Technology development and scientific service transferred to SMEs.

The Arctic System Reanalysis (ASR) use historical data and advanced models to produce smoothed fields of climatically relevant data for the entire Arctic region. The ultimate goal is to develop a high resolution coupled atmosphere-sea ice-ocean-land surface data assimilation system optimized for the Arctic. An assimilation data base will be created from existing data and through assimilation into the coupled model, produce physically consistent fields of data extending back several decades. This activity will promote optimization of monitoring programs, and enable research on Arctic climate processes. In the post-IPY period, the ASR will be transitioned to an operational activity, through which medium range weather forecasts and seasonal to interannual climate outlooks can be produced with added skill. The ASR requires an on-going observational program to provide the data for the initial historical reanalysis and to support the future operational applications. CARE and observational efforts throughout the Arctic during and post IPY will provide these data

2.1 What is the evidence of inter-disciplinarity in this activity?

CARE/ASR will provide inter-disciplinarity through the following disciplines: oceanography, meteorology, sea ice/cryosphere, biology, paleoclimatology, remote sensing and social sciences.

2.2 What will be the significant advances/developments from this activity? What will be the major deliverables? What are the outputs for your peers?

New knowledge about the Arctic environment obtained through new observations, model studies and data analysis. Major deliverables:

- data on oceanography, meteorology, sea ice/cryosphere, biology, paleoclimatology, remote sensing and social sciences
- model simulations on physical, biogeochemical and paleo processes
- quantification of the impact on Arctic climate of the processes to be studied in CARE
- assessment of societal impact of Arctic climate.

The ASR will produce a high-resolution coupled model of the Arctic region, the first such model to be developed. It will also produce a climate-quality multi-parameter pan-Arctic data base of unprecedented scope. In the longer term, the ASR will lead to an operational activity that will improve weekly to interannual forecasts.

2.3 Outline the geographical location(s) for the proposed field work (approximate coordinates will be helpful if possible)

Locations	Coordindates
several regions of the European sector of the Arctic	
Deep Arctic Basins	
Arctic shelf seas	
Fram Strait	
Svalbard area	
Greenland	

2.4 Define the approximate timeframe(s) for proposed field activities?

Arctic Fieldwork time frame(s)	Antarctic Fieldwork time frame(s)
04/07 - 08/08	

2.5 What major logistic support/facilities will be required for this project?

- Icebreaker
- Submarines
- Ice strengthened research ship
- Helicopters
- Ship-based drilling capability
- Radars
- Ship recovery of buoys etc
- Existing field stations

Further details – Several research platforms will be provided: 1) ice-going vessels (Polarstern, ODEN, Lance, Jan Mayen), 2) open ocean vessels (G. O. Sars, Håkon Mosby, Oceania). 3) airplanes and helicopters, 4) satellites, 5) UK submarines, and 6) a Russian drifting ice station, 7) land-based research facilities in e.g., Ny-Ålesund, 8) Coupled global circulation models and high performance computing (HPC) and storage facilities. The resources can also be used by other projects.

2.6 How will the required logistics be supplied? Have operators been approached?

Source of logistic support	Likely potential sources	Support agreed

Consortium of national polar operators	Y	
Own national polar operator	Y	
Another national polar operator	Y	
National agency	Y	
Military support	Y	
Commercial operator	Y	
Own support	Y	
Other	Y	Y

2.7 If working in the Arctic regions, has there been contact with local indigenous groups or relevant authorities regarding access?

3.0 STRUCTURE OF THE ACTIVITY

3.1 Origin of the activity

This is a new activity developed for the IPY period

If part of an existing programme please name the programme – IPY-CARE

3.2 How will the activity be organised and managed? Describe the proposed management structure and means for coordinating across the cluster

Overall management:

The project coordinator is Ola M. Johannessen, NERSC, with Jorn Thiede, AWI, as chairman of the steering committee. The co-ordinator will be supported by S. Sandven as project manager.

Steering committee: A project steering committee has been established, with J. Thiede as chairman, to make decisions on higher level scientific and management issues, including technical, exploitation, financial, gender issues, planning and control matters. Members are: L. Bengtsson, (co-chairman) O. M. Johannessen, U. Schauer, I. Frolov, S. Falk-Petersen, L. Anderson, D. Piepenburg, J.-C. Gascard, R. Spielhagen, S. Sandven, L. Bobylev, P. Malkki, P. Lemke, H. Drange, N. Koc, P. M. Haugan, B. Rudels and J. Calder WP Leaders: Each WP will have Leader and Co- Leaders, responsible for co-ordination of all tasks of the WP.

3.3 Will the activity leave a legacy of infrastructure and if so in what form?

CARE/ASR will establish new observing systems for the Arctic, integrating data from satellites, ships, ice-buoys and underwater platforms, and new modelling systems which can be used in forecasting. CARE will build a data infrastructure background against which future observations can be measured, forming an integrated base-state measure. The ASR will leave its modelling and assimilation system, and the prospects of an operational program for continuing near-real time Arctic-wide reanalysis.

3.4 Will the activity involve nations other than traditional polar nations? How will this be addressed?

CARE/ASR will set up international collaborative with non-Polar countries for the future integration of regional and general climate models. The CARE consortium has already members from non-Polar countries (e.g., Romania and Greece)

3.5 Will this activity be linked with other IPY core activities? If yes please specify

CARE/ASR will be linked to the following IPY activities: #564 Kinvikka, #55 BIAC, #101 ACCO-NET, #30 GLACIODYN. The ASR will require additional data from all IPY activities that produce environmental data in the Arctic. Among these are iAOOS, ESSAS, IASOA, CEON.

3.6 How will the activity manage its data? Is there a viable plan and which data management organisations/structures will be involved?

Data management will follow the general principles in EU projects that scientific data should be made publicly available. The producers of the data have the primary responsibility to quality control, format and distribute data created in the project. The CARE web site will offer a single entry point to search and access all data created in the project. Processed and validated data sets will eventually be delivered to data centres which will be responsible for future archiving and distribution. The ASR will draw data from existing data centres and from the data management activities of the on-going observational activities. Model outputs will be archived at the National Snow and Ice Data Centre, and any other centre that wishes to have the data.

3.7 Data Policy Agreement

Will this activity sign up to the IPY draft Data Policy (see website)

Yes

3.8 How will the activity contribute to developing the next generation of polar scientists, logisticians, etc.?

CARE/ASR will contribute to develop next generation of polar scientists, logisticians, etc. by education, training, promotion, facilitate access to data and models for the polar regions and facilitate participation on polar expeditions.

3.9 How will this activity address education, outreach and communication issues outlined in the Framework document?

Education and training: CARE/ASR will provide several Ph. D and Post Doc scholarships, including training and exchange programmes for young scientists and students. Promotion and outreach: Prepare and maintain a public web-site for promotion and dissemination of results. Prepare and distribute brochures, posters, demo-CDs. Announce IPY activities to various user groups and to the general public via newspapers, TV, etc. Prepare popular articles on the public web pages and in popular magazines. Prepare education material for use in schools, colleges and universities. The International Polar Foundation in Brussels will play a key role in the promotion and outreach activities.

3.10 What are the proposed sources of funding for this activity?

Joint funding between national programmes/projects and EU funding.

A new integrated project, DAMOCLES, funded by EU/FP6 will fund essential parts of CARE WP3 and WP5, concerning measurements of physical parameters. DAMOCLES will be funded by 16 MEuro by EU and have 46 partners from European countries. The ASR will be supported by the U.S. National Oceanic and Atmospheric Administration and by other interested agencies.

3.11 Additional Comments

A pre-project with the title IPY-CARE, funded by EU as a Specific Support Action for 18 months (2005 – 2006), will prepare a science plan and implementation plan for CARE, including funding mechanisms on national and EU level.

4.0 CONSORTIUM INFORMATION

4.1 Contact Details

Lead Contact

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4.2 Other significant consortium members and their affiliation

Name	Organisation	Country
Lennart Bengtsson	Max-Planck-Institute für Meteorologie	Germany
Jean-Claude Gascard	Laboratoire d'Océanographie Dynamique et de Climatologie, Université Pierre et Marie Curie	France
Leif Anderson	Department of Analytical and Marine Chemistry, Göteborg University	Sweden
Pentti Malkki	Finnish Institute of Marine Research	Finland
Ivan Frolov	Arctic and Antarctic Research Institute	Russia
John Calder	US NOAA	USA
Hugues Goosse	Université catholique de Louvain	Belgium
John Huthnance	Proudman Oceanographic Laboratory	United Kingdom
Torben Schmith	Danish Meteorological Institute	Denmark
Jan Piechura	Institute of Oceanology of the Polish Academy of Science	Poland
Pere Masque	Universitat Autònoma de Barcelona	Spain
Hedinn Valdimarsson	Marine Research Institute	Iceland
Roxana Bojariu	National Meteorological Administration	Romania
Emmanuel Skarsoulis	Foundation for Research and Technology Hellas	Greece
Huijun Wang	Institute of Atmospheric Physics, Chinese Academy of Science	China