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IPY 2007-2008

Updated on 17/7/05

## Full Proposals for IPY 2007-2008 Activities

Proposed IPY Activity Details



### 1.0 PROPOSER INFORMATION

(Activity ID No: 39)

#### 1.1 Title of Activity

Arctic Palaeoclimate and its EXtremes

#### 1.2 Short Form Title of Proposed Activity

APEX

#### 1.3 Activity Leader Details

Martin Jakobsson

Stockholm University, Dept. of Geology and Geochemistry  
Sweden

#### 1.4 Lead International Organisation(s) (if applicable)

NULL

NULL

NULL

NULL

#### 1.5 Other Countries involved in the activity

Austria

Canada

Denmark

Finland

France

Germany

Greenland

Iceland

Italy

Norway

Poland

Russia

Spain

Sweden

The Netherlands

UK, USA, Ireland

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

183,2,15,33,91,105,106,171,

190,207,210,220,240,378,433,607,622,696,733,777,786,995,988,1000,1001,1003,1005, 1009,  
1011, 1019

#### 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

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### 2.0 SUMMARY OF THE ACTIVITY

It is clear from existing research that the Arctic exerts a critical influence on Earth's climate and that it has been doing so for millions of years. The key environmental archives to study the Arctic's palaeoenvironment and climate history are the terrestrial and ocean sediments, and the past and present ice sheets, glaciers, and landforms. Only by integrating results from terrestrial and marine studies as well as across disciplines will it be possible to develop a comprehensive understanding of the Arctic's role in the global climate system. Therefore, it is necessary to establish an international scientific framework for the synthesis and integration of Arctic palaeoclimate research and IPY provides an excellent opportunity for this to be realized. Furthermore, such a framework can provide an important possibility for the close co-operation between numerical modellers and field scientists as well as a means of coordinating field and laboratory research conducted by research groups in individual institutions and countries. To address these challenges, a group of international scientists from across Europe met in Denmark in October 2004 to develop a new research programme known as APEX - the Arctic Palaeoclimate and its EXtremes. This programme, builds on the

outstanding research legacy of the two previous European Science Foundation (ESF) programs PONAM (POLar North Atlantic Margins) and QUEEN (QUaternary Environments of the Eurasian North). APEX is now through IPY expanded to include research projects from North America and we anticipate establishing the programme both in ESF and NSF. With the focus on Arctic extreme environments APEX is developed around the following defined research themes: Cold extremes: Arctic marine and terrestrial glacial maxima, sea level minima and sea-ice maxima, Arctic Ocean palaeoceanography, ice shelf extent, past atmospheric circulation. Warm extremes: interglacial environments, sea level maxima, sea-ice minima, Arctic Ocean palaeoceanography, ice shelf extent. Hydrological extremes: Fluvial-marine interaction, freshwater budget and ice-dammed lakes. Permafrost extremes: Maximum and minimum extent, rates of change, response to climate change. Glacio-dynamical extremes: Ice sheet instability, palaeo-ice stream dynamics and feedback mechanisms. Biotic change and human occupation: The evolution of the Arctic marine and terrestrial biosphere including human settlements and their response to extreme palaeoclimatic conditions. These related themes provide the basis for a "bottom up" programme structure, within which individual research activities can develop in a dynamic and mutually-supportive manner. A large set of field activities for IPY are identified through the Eol's clustering and will form the base for the APEX program. What do we mean by Arctic EXtremes? By "Arctic Extremes", we mean conditions that occur at the end points of magnitude/frequency behaviour, such as maximum and minimum ice sheet extent, extreme ice flow, maximum and minimum air and water temperatures, or rapid changes in palaeoceanography or vegetation. Their definitions are spatially and temporally specific, and may describe dimensions as well as causal processes. For example, the maximum extent of the Eurasian ice sheet represents an extreme on the glacial-interglacial timescale, whereas the Little Ice Age is the most extreme climatic event during the last thousand years. Importantly we recognise that to define an "extreme" we need a robust understanding of the background, or "steady state" of a particular system. Why do EXtremes matter? One of the main reasons for studying extremes is that they establish boundary conditions that constrain our understanding of the Arctic and the role of the Arctic in global climate change. These extremes are highly relevant to predictions of our future climate and are one of our main motivators for studying Arctic palaeoclimate. From a modelling perspective, extremes also provide excellent targets that will help us achieve close cooperation between modellers and field scientists.

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

APEX was developed on the premise that integration of results across disciplines is the only way to develop a comprehensive understanding of the Arctic's role in the global climate system. Interdisciplinary is therefore a foundation block that underpins all of APEX activities, and the project will integrate research across the fields of palaeoceanography, palaeoclimatology, geology, geophysics, biology and archaeology. Another necessity for APEX to reach its defined major goal of developing a comprehensive understanding of the Arctic's climate history will be to work towards collaboration between numerical modellers and field scientists, supported by annual common workshops.

**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?**

APEX will act as a catalyst for the development of a holistic understanding of the Arctic's role in the global climate system. An improved understanding of the palaeoclimate and its extremes are important to improve and test climatic models that predict human living conditions as well as environmental change that will directly affect the entire Earth's biosphere. The concrete deliverables we expect to develop within APEX and included projects include:

- 1) Special APEX volumes of peer-reviewed journals.
- 2) Maps of the Arctic region portraying synthesized results (e.g. maximum/minimum glacial extent, maximum/minimum permafrost, sea ice maxima/minima).
- 3) A searchable database containing results and data of APEX activities.
- 4) A web site containing reports from field work, program publications, outreach material, database portal etc.
- 5) Education material (e.g. 2D/3D visualization of numerical modelling results, interactive maps, etc). Furthermore, APEX projects will investigate and sample scientifically unexplored areas of the Arctic and generate new base mapping data. This will include bathymetric data from the unknown parts of the Arctic Ocean that can contribute to the International Bathymetric Chart of the Arctic Ocean (IBCAO); a database used across practically all Arctic research fields as well as by a variety of other users.

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

Locations	Coordinates
Greenland: Projects #2 (Scoresby Sund area); #171 (Jakobshavn Isbrae at Western Greenland, and Northeastern Greenland Ice Stream); #207 (Western and Eastern Greenland); #733 (Northern and Northeastern Greenland); #777 (Northern Greenland); #1003 (Western Greenland)	
Svalbard: Projects #105 (Kapp Linné, Nordaustlandet, and Homsund); #207, #210 (Central and Eastern Svalbard); #220 (Werenskioldbreen, North Hornsund, Wedel Jar)	
Arctic Ocean: #433 (Bjornøyrenna of the Barents Sea); #696 (Lomonosov Ridge off northern Greenland); #786 (Barents/Kara/Laptev Seas margins); #91 Fram Strait; #	
Arctic Canada: Projects #190 (Yukon Coastal Plain, Tuktoyaktuk Coastlands, and Anderson Plain); #433, #622 (Canadian Arctic Islands and adjacent land areas); #1	
Siberia: Projects #15 (Northeast Siberia between 130° and 150°E); #33 (Lake EL'gygytgyn on Chukotka peninsula); #1005 (Taymyr Peninsula); # 106, #378 Central Y	
Scandinavia: Project #207 (Northern Scandinavia)	
Iceland: Project #207	

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

Arctic Fieldwork time frame(s)	Antarctic Fieldwork time frame(s)
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03/07 – 10/07	
03/08 – 10/08	
03/09 – 10/09	

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

Icebreaker  
Ice drilling capability  
Autonomous Underwater Vehicle  
Remotely Operated Vehicle  
Snow terrain vehicles  
Multi-instrumented platforms  
New field station  
Helicopters

**Further details** – Additional: Ship-based coring capabilities; Fixed wing transport aircraft; Existing field stations; Fuel depots; Land Rock/Sediment-drilling capabilities\*The APEX umbrella programme includes projects that require a large variety of logistical support for their field activities. Although each project is autonomous, APEX will lay the foundation for a close cooperation between projects with one of the main goals of seeking solutions for shared logistics. In fact, this process has already begun within the APEX community. \*#33: Lake sediment drilling rig (to ca. 800 m depth)

**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	Y
Own national polar operator	Y	Y
Another national polar operator	Y	Y
National agency	Y	Y
Military support		
Commercial operator	Y	Y
Own support	Y	Y
Other		

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

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**3.0 STRUCTURE OF THE ACTIVITY**

**3.1 Origin of the activity**

This activity is the start of a new programme that will outlive IPY

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

APEX activities will be managed by a Steering Committee consisting of an appointed member from each involved country. The Steering Committee will organize workshops and publications in special volumes of peer-review journals. The administrative work (Website, meeting arrangements and agendas, etc.) will mainly be carried out by the chairman and an appointed secretary. The presently proposed APEX Steering Committee is as follows:  
Martin Jakobsson (Chairman)Sweden  
Igor Demidov, Russia  
Brenda Hall, USA  
Kurt Kjaer, Denmark  
Thijs van Kolfschoten, The Netherlands  
Gerhard Krinner, France  
Antony Long, UK  
Juha Pekka Lunkka, Finland  
Robert Spielhagen, Germany  
John Inge Svendsen, Norway  
To be appointed, Poland  
To be appointed, Austria  
To be appointed, Spain  
To be appointed, Italy  
To be appointed, Canada  
Claus Andreasen, Greenland  
Ólafur Ingólfsson, Iceland  
Additional Steering Committee members will be included as the project expands. In addition to the Steering Committee, APEX will have a Project Committee consisting of representatives from each of the included projects, in most cases the project PIs. This group is presently consisting of the co-authors of this proposal. The Project Committee's main role will be to discuss and organize collaboration between projects including logistical arrangements for field activities.

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

The project will continue beyond IPY as a European Science Foundation (ESF) initiative committed to the promotion of international research in polar regions, using a the model previously advocated by PONAM and QUEEN. The infrastructure legacy of APEX will include intellectual advances, institutional collaboration, and training of the next generation of polar scientists.

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

Project members of several nations that traditionally have no large research activities in the Arctic region are included in APEX.

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

APEX has natural links through its involved projects to identified IPY core activities such as Tectonics and Gateways, CARE, BIPOMAC, and Svalbase.

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

The common data management plans include the use of the PANGAEA database hosted at the University of Bremen and the National Snow and Ice Data Centre (NSIDC). APEX will devote a large effort towards facilitating data delivery to the above data repositories for the participating projects. This will require the establishment of an APEX data management task group which will be responsible for developing data protocols and delivering a robust data repository from individual IPY projects.

**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.?**

APEX will involve young people on several levels in the program. Several projects already include high-school students and teachers as a part of their outreach activities, as well as masters and PhD students that will contribute to one or several of the APEX defined themes. By bringing this new generation into the core APEX activities we hope to inspire a new generation of polar scientists, teachers, logisticians, etc.

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

An APEX web page will be hosted at Stockholm University; synthesized results will be assembled and made available as maps and computer visualizations via this web site. As mentioned under 3.8, we anticipate that a large number of master and PhD students will be recruited to work on APEX defined scientific challenges and, in addition, there are several planned projects that already have outreach activities that include, for example, high-school teachers.

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

An APEX proposal will be submitted to the European Science Foundation (ESF). A Steering Committee meeting is planned to take place at Stockholm University in October 2005 with the main purpose of drafting an ESF APEX proposal. APEX will in this proposal seek to provide funding for APEX meetings, workshops, publications in special volumes, and outreach. In addition, our North American participants are currently exploring the possibilities for NSF funding to support their participation in APEX. All included projects will be self-funded for field- and scientific work through their national or cross-national funding agencies.

**3.11 Additional Comments**

APEX is intended to become a five year ESF programme and several of the included projects have activities starting before, or extending beyond, IPY 2007/2008. However, note that we only list the field activities during 2007/2008 under section 2.4 above.

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**4.0 CONSORTIUM INFORMATION****4.1 Contact Details****Lead Contact**

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**4.2 Other significant consortium members and their affiliation**

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