Full Proposals for International Polar Year 2007-2008 Activities

Proposed IPY Activity Details

1.0 PROPOSER INFORMATION

(Activity ID No: 20)

1.1 Title of Activity
Air-Ice Chemical Interactions – IPY coordinated studies

1.2 Short Form Title of Proposed Activity
AICI-IPY

1.3 Activity Leader Details
Eric Wolff
British Antarctic Survey
UK

1.4 Lead International Organisation(s) (if applicable)
IGAC (IGBP)
NULL
NULL
NULL

1.5 Other Countries involved in the activity
Canada
France
Germany
Italy
Japan
New Zealand
Norway
Sweden
USA
Others expected
NULL
NULL
NULL
NULL
NULL
NULL

1.6 Expression of Intent ID #'s brought together in this proposed activity
212, 213

1.7 Location of Field Activities
Bipolar

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

1.9 What is the main IPY target addressed by this activity
1. Natural or social science

2.0 SUMMARY OF THE ACTIVITY

The polar atmosphere is often considered both pristine and simple. However, there is a strong dynamic between the lower atmosphere and ice surfaces. Over the polar plateau, production in the snowpack controls the chemistry of the lower atmosphere. Halogen chemistry over the sea ice zone depletes boundary layer ozone, and causes mercury deposition. Persistent organic compounds undergo a distillation which leads to their deposition in polar regions. Biochemical processes in open leads play a major role in formation of cloud condensation (CCN) and ice forming nuclei (IFN), and through cloud formation this process may play a vital role in ice-albedo climate feedbacks.
The IGBP projects, IGAC and SOLAS, have jointly endorsed a task, "Air-Ice Chemical Interactions", to determine the importance of these processes, and assess how they would alter with a warming climate and shrinking cryosphere. IPY offers a unique opportunity to determine the spatio-temporal pattern of chemistry and processes from the ice surface through the boundary layer, including cloud formation, by linking various field activities carried out in the same year. AICI-IPY will provide an overall framework, arrange supporting laboratory and modelling studies and integration of remote sensing data, and organise synthesis meetings. This work will support and link these more focussed field activities:
Polar plateau intensives: studying the influence of the snowpack, and boundary layer structure, by measuring concentrations, fluxes and processes at sites with different characteristics. Summit, Greenland has a long pedigree in air-snow studies, and this will be extended under AICI-IPY. The ANTCI group at South Pole expect to carry out further campaigns in IPY. AICI-IPY scientists will aim to add activities at Concordia (Antarctica).
The Arctic Summer Cloud-Ocean Study (ASCOS) will focus on the processes that control boundary layer clouds north of 80ºN, looking at CCN, IFN, and investigating marine biochemical and boundary layer meteorological processes that control their numbers. ASCOS expects to use the Swedish icebreaker, drifting from North Pole during summer 2007, and this will provide opportunities for synergy with other parts of AICI and related projects.
In the sea ice zone, both Arctic and Antarctic studies of gas phase chemistry are planned. The Arctic studies will mainly be hosted by the related project, OASIS (Ocean-Air-Sea Ice-Snow Interactions – EoI 344). OASIS contains ambitions both wider (biogeochemistry) and narrower (Arctic ocean/coast) than AICI, and will submit a separate detailed plan to IPY. POLARCAT (EoI 244) will provide some vertical context in the Arctic through aircraft campaign. Counterpart Antarctic coastal studies are already planned in Dronning Maud Land.
To provide an overall context for the intensive campaigns, AICI-IPY will determine the year-round spatial distribution of at least that most important molecule, ozone, in the boundary layer. No picture exists of the scale of ozone production and depletion, and its concentration in the boundary layer is not amenable to satellite observations. This work will link other AICI studies, using sensors deployed on autonomous platforms and buoys. AICI will coordinate individual polar operators to fill gaps on the map in the Antarctic and over Arctic land, while OASIS will cover parts of the Arctic Ocean.

2.1 What is the evidence of inter-disciplinarity in this activity?
Although AICI is focussed on atmospheric chemistry, it involves also snow physicists, boundary layer meteorologists, cloud specialists, ice biologists and oceanographers to understand the processes. In addition the results have considerable significance for ice core science (interpreting chemistry preserved in ice), and for environmental scientists (issues such as mercury depletion)

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?
AICI-IPY will provide a first year-round spatial pattern of chemistry (especially ozone) in the polar regions (theme 1). Through the linked process study intensives, this will lead to an understanding of the extent of processes determining boundary layer chemistry, and to models to determine how that chemistry will change (theme 2). These processes probably spill out of the polar regions, and certainly affect air and water quality, so this work will also contribute to themes 3 and 6. The increased activity in atmospheric chemistry will lead to an improved infrastructure, with chemistry studies carried out routinely at more stations (legacy). Specifically, the major advances will be:
A much better understanding of the spatial and temporal scale of processes that have been described until now only as local phenomena;
The provision to modellers of parameterisations of Arctic processes that may be important for climate and atmospheric chemistry on a larger scale;
Integration of Arctic and Antarctic atmospheric chemistry studies, as well as studies over different kinds of ice, to give an integrated picture of how the polar lower atmosphere works.
The most concrete deliverables will be in the form of peer reviewed papers, including a synthesis conference at the end, expected to lead to a special issue or book.

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

Locations	Coordindates
Summit, Greenland	
South Pole, Antarctica	
Dronning Maud Land, Antarctica	
Concordia Station, Antarctica	
Swedish Icebreaker	90 to 85 N
Other stations and remote sensors	

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	10/07-02/09

2.5 What major logistic support/facilities will be required for this project?
Existing field stations
Icebreaker

Further details – Existing stations: Summit, South Pole, Concordia, Halley, others.Icebreaker: Swedish Icebreaker

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		
National agency	Y	
Military support		
Commercial operator		
Own support		
Other		

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 pulse of activity during 2007-2009 within an existing programme

If part of an existing programme please name the programme – AICI (IGAC)

3.2 How will the activity be organised and managed? Describe the proposed management structure and means for coordinating across the cluster
AICI-IPY will be managed and coordinated by the AICI SSC, which exists, has been approved by IGAC, and which has support from the IGAC offices. We expect to add members from component sub-projects including ASCOS and the ANTCI activities. The AICI SSC will delegate responsibility for individual components such as OASIS and Summit activities to the executive groups already existing or planned for those components. The AICI SC will form a small task group to promote and coordinate the ozone network.
AICI-IPY forms part of the sub-cluster 4.1 on Clouds, aerosol and chemical composition. It has been agreed that within this sub-cluster there will be meetings of the activity leads in order to foster collaboration between the different activities. It is also proposed to have joint workshops and after the main field phase joint publication in journal special sections involving several activities. The sub-cluster led by the OASIS project (344) will also form part of this grouping as their activities are closely linked to our cluster activities and in particular POLARCAT and AICI.

3.3 Will the activity leave a legacy of infrastructure and if so in what form?
The legacy will mainly be in the form of increased understanding of the scale of different processes in the polar atmosphere. However, it is expected that it will lead to the initiation of atmospheric chemistry studies at some stations that until now have not included this activity, and to a capacity for routine autonomous measurements of some chemical components.

3.4 Will the activity involve nations other than traditional polar nations? How will this be addressed?
All nations that have a presence in either the Arctic or Antarctic could contribute: the ozone spatial network particularly has a low entry price level, and any nation could deploy a single sensor.

3.5 Will this activity be linked with other IPY core activities? If yes please specify
Yes. AICI organised a coordination meeting at the EGU conference in Vienna (April 2005), which involved the leads of several of the Clouds, aerosol and chemical composition cluster. At a planning meeting hosted by POLARCAT (244) in May 2005, the leads of AICI (213), OASIS (344), and ATMOPOL (89) were present. E-mail contacts were also made with ORACLE-03 (542), POLAR AOD (299) and SYNSCOPE (268). Close scientific cooperation was agreed including joint activities such as workshops and the publication of a small series of review papers in 2006 summarising the state of knowledge prior to IPY.

3.6 How will the activity manage its data? Is there a viable plan and which data management organisations/structures will be involved?
Most data will be submitted to national and international data centres. AICI plans to use its emerging web site as a central metadata point for all AICI datasets, linking to the individual data. We will also discuss with other partners in the clouds, aerosol and chemical composition cluster whether to aim for a common format and repository.

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.?
AICI will provide a fascinating research challenge to young scientists, that should enthuse them about the importance of the polar regions within atmospheric chemistry.

3.9 How will this activity address education, outreach and communication issues outlined in the Framework document?
Scientists involved in existing related activities such as Summit, ANTCI (South Pole) and Alert2000 have a strong record of outreach activities including educational web sites, web chat Q and A sessions with schools, and teachers joining field parties. We anticipate making a strong plan to continue such activities.
The AICI chair (Wolff) is on the scientific committee of the European Research Course on Atmospheres, and he will work with ERCA leaders to ensure an increased visibility of polar atmospheres as a result of IPY. We have also contacted the lead of AITI and GELATI (260, 267) teaching initiatives, offering that the cluster can provide atmospheric chemistry content to these initiatives.

3.10 What are the proposed sources of funding for this activity?
Parts of the project already have funding in place from national plans, while some parts (such as ozone sensor deployments) will mainly be subsumed in existing logistic activities. For plateau studies, ASCOS and related OASIS and ITCT activities, individual national funds will be sought based on international science plans.

3.11 Additional Comments
AICI seeks to be a umbrella over specific tasks, with the management of each task firmly at the task level, and AICI providing only the added-value glue of motivation, context, coordination and integrating activities.

4.0 CONSORTIUM INFORMATION

4.1 Contact Details

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4.2 Other significant consortium members and their affiliation

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Jack Dibb	University of New Hampshire	USA
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Kathy Law	Service d'Aeronomie/IPSL	France
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