

Full Proposals for International Polar Year 2007-2008 Activities

Proposed IPY Activity Details

1.0 PROPOSER INFORMATION

(Activity ID No: 313)

1.1 Title of Activity

The Prydz Bay, Amery Ice Shelf and Dome A Observatories – A Chinese Key International Program for IPY

1.2 Short Form Title of Proposed Activity

PANDA

1.3 Activity Leader Details

Zhanghai Zhang
Polar Research Institute of China
China

1.4 Lead International Organisation(s) (if applicable)

CLIVAR Southern ocean Panel
ACE/SCAR
CliC

1.5 Other Countries involved in the activity

Japan
Australia
USA
Germany
UK
Finland
France
Korea

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

440, 46, 441, 829, 892, 934

1.7 Location of Field Activities

Antarctic

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

1.9 What is the main IPY target addressed by this activity

1. Natural or social science

2.0 SUMMARY OF THE ACTIVITY

Why Prydz Bay-Amery-Dome A ?

The Dome A region is the highest plateau of the Antarctic ice sheet, and could be the coldest place on the Earth's surface. The transect from Prydz Bay-Amery Ice Shelf-Lambert Glacier Basin-Dome A is an interconnected ocean, ice-shelf and ice sheet system, which plays a very important role in east Antarctica mass balance, sea level and climate change. Dome A is a little known region of the Antarctic and, as it is the highest part of Antarctic ice sheet, it is an ideal place for observing the earth's environmental background and making new scientific findings in a range of disciplines

- The ice thickness at the summit of Dome A was measured as over 3000 m by the 21st Chinese National Antarctic Research Expedition (CHINARE-21) in the austral summer of 2004/2005. Snow accumulation occurs mostly by diamond dust sublimation directly from the troposphere and the oldest ice in Antarctica may be found there. It is hence a potential site to reconstruct a 1.2M year record of the past climate and environment.
- With the extremely cold, dry and stable air found at the summit of Dome A, the area provides the best site on the Earth's surface for the conduct of a wide range of astronomical observations, from optical to millimetre wavelengths.
- Beneath the ice at Dome A and near the centre of the Antarctic Continent lie the unexplored Gamburtsev sub-glacial mountains. Study of these may contribute greatly to theoretical earth science and to understanding the geological history of Antarctica.
- Observations along the Zhongshan-Dome A are important for studying ice dynamic processes and mass balance, recent climate history and SolarWind/Magnetosphere/Ionosphere coupling.
- The ocean circulation in Prydz Bay is one of the major gyres around the Antarctic and it both affects and is affected by interaction beneath the Amery Ice Shelf. Improved oceanographic studies are required of the Prydz Bay circulation, its role in Southern Ocean circulation, and the potential impacts of change on both physical and biological systems.

What we will do for PANDA?

PANDA presents an integrated view of the Prydz Bay-Amery-Lambert glacier basin-Dome A system, with Chinese scientific and logistical leadership, partnership, coordination and cooperation for many international IPY efforts focused on this region and on Antarctica.

Specifically, Chinese leadership and partnership as part of PANDA will support IPY through the following objectives:

- To construct a scientific research station at the summit of Dome A supporting future scientific programs in this region nationally and internationally.
- To establish a long-term observing/monitoring system for climate change research along the Prydz Bay, Amery Ice Shelf, Lambert glacier basin and Dome A transect, a data sparse region of Antarctica. This will involve partnerships with other meteorological, glaciological and oceanographic projects during IPY.
- To improve understanding on variability and physical processes of the ocean and sea ice in the Prydz Bay region, and on their response and feedback to climate change. This will involve partnership with the IPY SASSI programme.
- To understand processes of interaction between ocean and ice shelf and their effect on the stability of the ice shelf and ice sheet.
- To obtain a series of shallow ice cores between Zhongshan and Dome A for investigation of recent climate variability and change, and a medium depth ice core at Dome A.
- To determine site characteristics for deep ice core drilling at Dome A to potentially re-construct a 1.2M year climate record. This assessment during IPY will lead to new efforts to start deep ice core drilling in the summer of 2009/2010.
- To assess site characteristics at Dome A for astronomical observations.
- To find a suitable site for sub-glacial geological drilling in the Gamburtsev Mountains area.
- To establish a chain of magnetometers between Zhongshan and Dome A for studying the dynamics of the solar wind-magnetospheric-ionospheric coupling. This will include

comprehensive upper atmosphere observations at Zhongshan Station and will involve cooperation with the IPY solar-earth coupling and magnetosphere dynamics programmes.

Many of these activities will leave a legacy of an infrastructure capability for international research after IPY.

Planned field activities during 2007-2010:

1. Prydz Bay and Amery Ice Shelf

-During austral summers of 2005/2006, 2007/2008 and 2008/2009: oceanographic and ice shelf surveys in Prydz Bay and Amery Ice Shelf.

-2007/2008: deploy hydrographic instruments into the cavity beneath the Amery Ice Shelf in collaboration with an Australian hot water drilling project. Obtain 2 year's continuous measurements from the instruments.

2. Zhongshan-Dome A traverse and activities at the summit of Dome A:

2007/2008 season:

- Glaciological observations along Zhongshan-Dome A transect.

- To carry out glaciological observations and recover a 350-500m ice core at the summit of Dome A.

- Undertake an ice radar survey in the Gamburtsev sub glacial area to search the suitable site for a geological drilling.

- Determine a deep ice core drilling site, and transport a deep ice core drill to the summit of Dome A from Dome F.

- To set up a 100 m² building at Dome A.

- To install several instruments for assessing astronomical conditions at Dome A

- Install 4 low power magnetometers along the track.

- Establish fuel depots at Dome A and at a site 800km south of Zhongshan Station.

2008/2009 season:

- To complete Dome A Station with a building area of 250 m² and facilities for 10 winterers.

- To make a pilot hole for deep ice core drilling and set up deep ice core drilling system.

- Undertake further glaciological observations of the area.

- Other observations.

2009/2010 season:

- To operate the Dome A station and start deep ice core drilling there.

- Other observation including astronomy observations, etc.

Previous work at Zhongshan-Dome A, Amery Ice Shelf and Prydz Bay by CHINARE

During the last decade CHINARE has carried out following research work:

-Four inland traverses from the Zhongshan Station towards Dome A have been made in the summers of 1996/1997, 1997/1998, 1998/1999 and 2004/2005. Glaciological observations were obtained and samples were obtained from shallow cores and snow pits along the route. During the latest traverse, the CHINARE team reached the summit of the Dome by snow mobiles. A series of measurements in glaciology and meteorology were carried out, and two automatic weather stations were installed in collaboration with Australia, one is at the summit of the Dome and one at the mid-point of the transect.

-Glaciological field programs have been conducted on the Amery Ice Shelf in the summers of 2002/2003, 2003/2004, 2004/2005. The major work has included ice radar surveys of ice thickness, GPS measurements of ice velocity, estimation of ice shelf mass balance, recovery of a 296m ice core, and hydrographic observations along the edge of the Amery Ice Shelf.

-Physical oceanography, chemical oceanography, marine biology and geochemistry observations in the Prydz Bay region, have been carried out since 1989. A series of data have been obtained.

-Ground-based observations of the ionosphere (imaging riometer), optical aurora, geomagnetic fields, etc. have been carried out at Zhongshan Station for more than ten years.

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

The PANDA program involves a wide and enthusiastic partnership among oceanographers, glaciologists, geologists, geophysicists and geochemists, astronomers, and climatologists in this large coordinated activity covering a substantial portion of Antarctica.

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?

– A Dome A Station is in place to support deep ice core drilling at the summit of Dome A and carry out long-term observations on earth environment background, glaciology, upper atmosphere physics and astronomy, and to support other national and international scientific programs afterward.

– An observation/monitoring system along the Prydz Bay-Amery Ice Shelf-Lambert Glacier Basin -Dome A transect is completed and long-term observations on oceanography, glacier, atmosphere and geophysics will be available for global change research.

– The implementation of this project will provide the following scientific deliverables: Understanding of the variability & mechanisms of ocean and sea ice circulation in the Prydz Bay region, and their response and feedback to climate; improved understanding of the interaction between ocean & ice shelf and its effect on the stability of the ice shelf and ice sheet; background information on earth climate change at Dome A; advanced preparations for recovering a deep ice core to re-construct a 1.2M year climate record; assessment of astronomical conditions at Dome A; and improved understanding of the dynamics of the solar wind-magnetospheric-ionospheric coupling.

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

Locations	Coordindates
1. Prydz Bay and Amery Ice Shelf	60o~80oE, south of 53oS
2. Zhongshan-Dome A transect	
3. Dome A region	
4. Lambert Glacier Basin	

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

Arctic Fieldwork time frame(s)	Antarctic Fieldwork time frame(s)
	11/07 - 03/08
	10/08 - 03/09
	09/09 - 03/10

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

Icebreaker
Existing field stations
Fixed wing transport aircraft
Multi-instrumented platforms
Helicopters
New field station
Fuel depots
Rock-drilling capability

Further details – There is possibility to share the major logistic facilities listed above with other IPY activities.

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		
Commercial operator		
Own support		Y
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 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

The leadership is in place from the State Oceanic Administration for multidisciplinary Chinese participation and for wide international activity in PANDA. The project will be jointly organized and coordinated by Chinese Arctic and Antarctic Administration (CAA) and the Polar Research Institute of China (PRIC). Field operations and logistics support will be implemented by PRIC. This activity is designated as the China Key Program for IPY 2007-2008. Overall coordination effort will involve about 70 Chinese scientists and many international partners for logistics and scientific cooperation. Chinese scientists and Chinese science institutions will play a leading role in cooperation on workshops and other international meetings with many IPY partner projects.

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

Yes, the activity will leave the legacy of a long-term monitoring system along the transect from Prydz Bay to Dome A through the Amery ice shelf and Lambert Glacier Basin, new options for future deep Antarctic ice drilling, new logistic support for our Antarctic traverses in such a special region and other activities internationally needing support in the area. A new station will be established at the summit of Dome A region to support the international multidisciplinary studies.

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

n/a

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

- Deep Ice core -To cooperate with Dome F Group, Japan; Dome C Group, Europe; and Byrd Group, USA. LINKS to IPY project no. 117 (IPICS).
- Ice sheet mass budget assessment. Links to IPY project nos. 88 (ASAID) and 105 (Cryos).
- Ice Shelf and ocean interaction - Australia and Europe. Links to IPY project no. 8 SASSI and 81 (CRACICE).
- Oceanography -To take part in the CLVAR Southern Ocean Program and collaborate with related IPY countries. Links to IPY project no. 8 (SASSI), 132 (CASO) and 136.
- Space environment monitoring -Zhongshan-Dome A magnetometer chain will join the magnetometer network in Antarctica, to monitor space environment jointly with the upper Atmospheric physics observatory in Zhongshan, with SuperDARN, with Cluster-Double Star

and with other ground- and space-based facilities. Links to IPY project no. 124 (AstroPoles).

Astronomy observatory -To join the international astronomy observatory net work. Links to IPY project no. 124

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

All cooperation planned and much involvement with the Chinese Polar Scientific Database (CPSD) and to participate fully in international data exchange.

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.?

Much involvement of young Chinese scientist and wide information about these activities in Chinese education system.

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

The training of undergraduates and graduate students will be an integral component of this activity. All the related information will be shown on the internet. In addition there will be classes, lectures, seminars at schools and universities. Many Chinese medias will be involved in such activity. China will nominate person for participation in IPY Education and Outreach Subcommittee.

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

This plan will be financially funded by the Chinese government and contributions from other countries who are interested in the program are welcomed.

3.11 Additional Comments

PANDA not only brings together a number of EoIs but will also provide data and potential infrastructure resources for a number of major IPY projects operating in this important region of Antarctica. Initial links with many of these projects have already been established, and other are being developed..

In 4.2 we have only listed those individuals who have expressed or we believe they have an interest in being part of PANDA or one of its subclusters. Other names will be added as we progress and determine funding arrangements.

In 2.0 we will modify the field activities when new EoIs from scientists interested to participate the PANDA observatories.

4.0 CONSORTIUM INFORMATION

4.1 Contact Details

Lead Contact

Prof Zhanhai Zhang

Polar Research Institute of China

Polar Research Institute of China, 451 Jinqiao Road Shanghai

200136
P.R China

Tel: +86-21-68507735
Mobile: +86-13918902988
Fax: +86-21-58711663
Email: zhangzhanhai@pric.gov.cn

Second Contact

Prof Jiawen Ren
Key Lab of Cryosphere and Environment
260, Donggangxi Road, Lanzhou, China
730000
P.R China

Tel: + 86 931 4967384
Mobile: +86 13993153061
Fax: +86 931 4967384
Email: jwren@ns.lzb.ac.cn

4.2 Other significant consortium members and their affiliation

Name	Organisation	Country
Ian Allison	Australia Antarctic Division and Antarctic Climate and Ecosystems CRC	Australia
Yoshiyuki Fujii	National Institute of Polar Research	Japan
Robin Bell	Columbia University.	USA
Andrew Nyblade	Penn State University	USA
Edward Brook	Oregon State University	USA
Martin Siegert	University of Bristol	UK
Mervyn Freeman	British Antarctic Survey	UK
Tony Payne	University of Bristol	UK
Anthony Worby	Australian Antarctic Division	Australia
Hideaki Motoyama	National Institute of Polar Research	Japan
Christian Haas	AWI	Germany
Matti Lepparanta	University of Helsinki	Finland
Jiping Liu	Georgia University Technology	USA
Mingyu Zhou	National Marine Environment Forecast Centre	China
Bin Chen	Finnish Institute of Marine Research	Finland
Xiaojun Yuan	LDEO of Columbia University	USA
Lifan Wang	Lawrence Berkeley laboratory	USA
Donald York	University of Chicago	USA
Carl Pennypacker	Space Sciences Laboratory	USA
Jihong Cole-Dai	South Dakota State University	USA
Zhaoqian Dong	Polar Research Institute of China	China
Yue Zhao	Institute of Geomechanics, CAGS	China
Xiaohan Liu	Tibet Institute, Chinese Academy of Science	China
Xiangqun Cui	Nanjing Institute of Astronomical Optics and Technology	China
Jun Yan	Purple Mountain Observatory	China
Yuansheng Li	Polar Research Institute of China	China
Lingen Bian	Chinese Academy of Meteorological Science	China

Huigen Yang	Polar Research Institute of China	China
Yonghua Liu	Polar Research Institute of China	China
Bo Sun	Polar Research Institute of China	China
Jianfeng He	Polar Research Institute of China	China
Cunde Xiao	Chinese Academy of Meteorological Science	China
Jérôme Chappellaz	LGGE (CNRS-UJF), Saint Martin d'Hères	France
Jean Jouzel	LSCE/IPSL CE Saclay, Gif/Yvette	France
Valérie-masson Delmotte	LSCE/IPSL CE Saclay, Gif/Yvette	France
Dominique Raynaud	LGGE (CNRS-UJF), Saint Martin d'Hères	France