

# Full Proposals for International Polar Year 2007-2008 Activities

## Proposed IPY Activity Details

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### 1.0 PROPOSER INFORMATION

(Activity ID No: 42)

#### 1.1 Title of Activity

Subglacial Antarctic Lake Environments – Unified International Team for Exploration and Discovery

#### 1.2 Short Form Title of Proposed Activity

SALE-UNITED

#### 1.3 Activity Leader Details

Mahlon C. Kennicutt II  
Texas A&M University  
USA

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

Not applicable

NULL  
NULL  
NULL

#### 1.5 Other Countries involved in the activity

Belgium  
Russia  
NULL  
NULL  
France  
United Kingdom  
NULL  
NULL  
Germany  
NULL  
NULL  
NULL  
Italy  
NULL  
NULL  
NULL

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

876, 22,598, 944

#### 1.7 Location of Field Activities

Antarctic

**1.8 Which IPY themes are addressed**

2. Change in the polar regions
3. Polar-global linkages/tele-connections
4. Exploring new frontiers

**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**

Subglacial Antarctic Lake Environments (SALE) will be an important target of exploration and research during the International Polar Year (IPY). Major campaigns by several nations that will culminate in a series of activities during the IPY have agreed to participate in SALE-UNITED. SALE-UNITED is closely aligned with the Scientific Committee on Antarctic Research (SCAR) Scientific Research Program Subglacial Antarctic Lake Environments (SALE). SALE-UNITED will advance an ambitious set of scientific objectives previously outlined in EoI #876.

SALE-UNITED is a coalition of scientists, modellers and technologists from Belgium, Germany, France, Russia, Italy, the United Kingdom and the United States.

The interdisciplinary objectives of SALE-UNITED have been agreed during a series of international workshops and meetings of the SCAR SALE Group of Specialists (SALEGOS) over the last 6-7 years. SALE-UNITED will be an intensive period of exploration and study of subglacial lake environments advancing scientific discovery in glaciology, biogeochemistry, paleo-climate, biology, geology, tectonics, and ecology. The portfolio of SALE-UNITED projects will advance our understanding of the evolution of subglacial environments; their physical, chemical, and biological settings; the interconnectivity of subglacial hydrological networks; the coupling of ice sheets, climate and life; the tectonic settings; and the role of biogeochemical cycles in sustaining life in these harsh environments. The SALE-UNITED research and exploration program will span Antarctica in order to investigate subglacial lake environments of differing ages, evolutionary histories, and physical settings. These comparative studies will provide an holistic view of subglacial environments over millions of years and under differing climatic conditions.

SALE-UNITED brings together 5 EoIs and coordinates its activities with an additional 30 or more EoIs including Gamburtsev Mountain exploration, major traverse projects and surveys, studies of climate change across the poles, and characterizations of polar ecosystems. Each of these programs will inform and contribute to the accomplishment of the scientific objectives of SALE-UNITED. SALE-UNITED's overarching objectives can only be realized by a coordinated program of exploration and research in multiple subglacial environments over many years. The wished for outcomes cannot be achieved by a single nation or program. Each component of SALE-UNITED will be an independently managed campaign with specific scientific objectives, logistical requirements, and management structures. Individual programs benefit from sharing resources, experiences, expertise, logistics and technologies. SALE-UNITED will be lead by an International Science and Technology Steering Committee (ISTSC). The ISTSC will form topical committees as needed to address major scientific and technological challenges. Standing Committees for Technology; Data and Information Management; and Education, Outreach and Communications (EOC) will be formed. SALE-UNITED will adhere to the SCAR Communications Plan, Capacity Building Strategy and Data Management Practices and Policies. Individual SALE-UNITED projects will adhere to their national standards for data management, access, and archive. A SALE Program Office and web site have been established and will serve as a focal point for information dissemination and as a data portal. SALE-UNITED will adhere to the ICSU/WMO data policies and actively participate in all ICSU/WMO EOC activities. The ISTSC will include the leaders of national SALE programs and be augmented by international experts. The development, implementation and promotion of environmentally benign procedures for subglacial lake environment exploration and research programs will be a key guiding principle of SALE-UNITED exploration and research. SALE-UNITED will assist technology development and exchange while promoting environmental stewardship.

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

SALE exploration and research, by its very nature, has been cast as interdisciplinary and international from the earliest stages of planning. The SALE-UNITED program brings together glaciologist, geologists, paleo-climatologists, biologists, geophysicists, limnologists, geochemists, and technologists. The primary scientific goals cross most disciplinary boundaries and include the study of life in extreme environments under the ice; the interplay of climate, tectonics, and evolution; and the coupling of ice sheet evolution and the development of subglacial environments. SALE-UNITED exploration and research requires interdisciplinary teams studying multiple subglacial environments across 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?**

During the IPY, SALE-UNITED will produce expanded lake inventories, improved seismic and geophysical surveys, detailed subsurface models, and possibly the first entry into subglacial environments. Accreted ice studies will continue on the biology and geochemistry of the occluded materials from lake water. Clean technologies for drilling, lake entry, and sampling will be developed. A wide array of sensors will be assessed, adapted and developed to measure properties in these environments. Drilling technologies will be evaluated to determine the best access and entry techniques to explore SALE. A web site, scientific publications, scientific meetings proceedings, educational materials, and promotional materials will be produced. Documentaries and lay public articles will be produced. Data repositories and archives will be made readily accessible to future generations of scientists. Subglacial lake environments have not been accessed and directly sampled. During the IPY, first entry may be accomplished. The first entry will most likely involve direct measurement of lake properties, if possible deployment of observatories and recovery of discrete samples. Since so little is known about these environments, every observation will be new and groundbreaking. Most SALE-UNITED initiatives are scheduled to last far beyond the IPY and serve as a focus for Antarctic research for at least the next decade if not longer.

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

| Locations                 | Coordinates    |
|---------------------------|----------------|
| Subglacial Lake Ellsworth | 90 W 7.5 S     |
| Concordia Station         | 123.3 E 5.1 S  |
| Subglacial Lake Concordia | 124.9 E 74.1 S |
| Subglacial Lake Vostok    |                |

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

| Arctic Fieldwork time frame(s) | Antarctic Fieldwork time frame(s) |
|--------------------------------|-----------------------------------|
|                                | 10/06 - 05/07                     |
|                                | 10/07 - 05/08                     |
|                                | 10/08 - 05/09                     |

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

Ice drilling capability  
 Fuel depots  
 Multi-instrumented platforms  
 Snow terrain vehicles  
 Observatories  
 Existing field stations  
 Rock-drilling capability  
 Fixed wing geophysical aircraft

**Further details** – Ice coring techniques will need to be developed as clean technologies that can penetrate 4 km of ice. Deep field support will be needed for both East and West Antarctic field sites. Cooperation with traverses is planned to gain access to remote areas. Geophysical surveys will require air support and land surveys will require tractor convoys. These logistical requirements are being planned within each national program. Planning for cooperation and coordination through joint programs has occurred in the past and will be continue for future field operations for SALE-UNITED countries.

## 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                        |                          |                |
| 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 – SCAR SALE**

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

SALE-UNITED will be overseen by an International Science and Technology Steering Committee (ISTSC). The ISTSC will include at a minimum one representative from each participating country. In addition the leaders of major SALE programs will complement the ISTSC. The ISTSC currently totals 12 members. ISTSC will be supported by the formation of committees as needed. Standing committees for Technology (R Powell); Data and Information Management (R Bell); and Education, Outreach and Communication (I Tabacco) have been formed (Chair). A web site has been established and all relevant materials will be posted to this site. Most communications will be via email. The ISTSC will meet at least once a year. Meetings of opportunity will be scheduled at major national and international science meetings when a quorum of members is present.

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

SALE-UNITED will develop the technologies and methodologies needed to explore subglacial environments. SALE research and exploration will continue far beyond the IPY. The drilling and access technologies, clean sampling techniques, and sensors and probes developed during the IPY will find application for many years. Logistical infrastructure, instruments, drilling systems, and other systems will provide a basis for SALE research for years to come. Databases and information systems for sharing data will be a legacy of SALE-UNITED. The web site and the associated resources will be maintained for a decade or more and passed on to the next generation of scientists. SALE-UNITED proposes a ten year program of exploration and research that

extends far beyond the IPY time frame. It is expected that the ice drilling capabilities will benefit other programs in the field and provide a much needed capability to the community that will last beyond IPY. Specialized coring and sampling devices with protocols for clean sampling will be useful for other projects and programs. The program will also train a new generation of scientists and verse them in the importance of subglacial dynamics to the global system.

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

SALE-UNITED has an expression of interest for A Greek Scientist. SALE-UNITED will be widely publicized and involvement from non-traditional polar countries will be encouraged. We will locate and apply for funds to promote these activities. SALE-UNITED will be widely advertised and scientists will be recruited for the program in all venues available. Personal networking with colleagues in other countries will be an important mechanism to attract new partnerships.

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

SALE-UNITED will fully subscribe to and participate in core ICSU/WMO Data Management and Education, Outreach and Communications activities. SALE-UNITED has established preliminary contacts with a number of EoIs that will be conducting complementary activities. The following EoI's projects have agreed to be SALE-UNITED collaborating programs: 583, 888, 607, 881, 479, 934, 788, 944, 934, 412, 292, 186, 256, 933, 41, 349,267, and 260. Another 20 or more EoIs have been contacted and are expected to agree to be collaborating programs. Collaborative efforts will include providing links to related programs on web sites, including interested participants in email notification systems, exchanging updates on activities, and coordinating planning efforts when it is mutually beneficial. As the IPY develops additional avenues for collaboration will become apparent.

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

SALE-UNITED will adhere to the data management policies and procedures of SCAR and the ICSU/WMO IPY JC. The precepts of the SALE-UNITED data policy include free and unrestricted exchange, timely exchange, quality control, preservation of data, easy access, usage of national and international mechanisms and centers for data submissions and archive, and adherence to reporting requirements by the IPY PO. The Terms of Reference agreed to when the SALE-UNITED coalition was formed contained several references to data management: 1) open and timely access to data and samples will be provided for other SALE-UNITED programs and the broader scientific community while protecting the intellectual property of individual investigators and programs; 2) participation in inter-comparisons and inter-calibrations of techniques and methodologies will be conducted to ensure quality and comparability of information across SALE-UNITED programs; 3) agreed data management protocols and standards will be adopted; and 4) technological developments and "lessons learned" will be shared while protecting ownership and/or proprietary information.

The SALE-UNITED Program will generate several types of data including: remote sensing data (ice-penetrating radar, GPS and seismic reflection surveys); ground-based ice dynamics data; ice bore-hole geology, glaciology and geophysics; limnological measurements of physical, chemical and biological lake processes; material samples of ice, water, sediment, rock and biota; and various visual and measured/quantitative data and material samples from robotic vehicles. SALE-UNITED will employ a 2-pronged approach to data management, access, and archive utilizing national repositories and a general virtual gateway or portal to SALE data. SALE-UNITED's will seek guidance from SCAR's Joint Committee on Antarctic Data Management (JCADM: <http://www.jcadm.scar.org>), but ultimately each program will deposit their data with the appropriate national and international repositories, such as the British Antarctic Survey's Antarctic Digital Database (<http://www.add.scar.org/>), the Alfred Wegener Institute's PANGAEA data base (<http://www.pangaea.de/>) and the National Snow and Ice Data Center in Boulder, Colorado, USA. The data will have a proprietary hold until statutes of limitation terminate, the timing of which will depend on the rules and laws governing each national Antarctic program. SALE-UNITED will seek funding to develop a portal that tracks each of its

ongoing projects, including metadata on samples recovered and the laboratories where they are being analyzed and studied. The portal will enhance networking and provide for a comprehensive context for understanding and interpreting results.

### **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.?**

The involvement of young investigators and students will be a focus for SALE-UNITED. Funds will be pursued to allow for new scientists and technologists to participate in various programs that compose SALE-UNITED. SCAR offers fellowships targeted at the participation of young investigators in SCAR SRPs such as SALE. A number of SALE investigators are already applying for educational grants to enhance the participation of the next generation in all aspects of SALE.

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

SALE already has engendered great public interest as testified to by the many articles that continuously appear in the popular press. SALE-UNITED will benefit from its designation as an IPY program and the IPY will be a showcase to bring SALE exploration and research into its main phase of operation. SALE-UNITED will be closely coupled with SCAR SALE and will follow all SCAR policies and procedures related to capacity building and communications as outlined in the SCAR strategic planning documents. SALE-UNITED will comply with and participate in any and all ICSU/WMO IPY JC EOC opportunities and programs. The SALE-UNITED web site will be a portal to all databases and archives in each national program that participate in the IPY program. The SALE-UNITED web site includes extensive materials on subglacial lakes including a bibliography of reports and publications. SALE-UNITED will encourage members to present at scientific meetings and organize oral and poster sessions. SALE-UNITED members will be available to the press for comment and interviews. To provide a focus for SALE-UNITED EOC outreach, an EOC Committee has been formed. The Committee will explore outreach and education options as well as draw on the comprehensive communication, education, and information dissemination plan of SCAR. Outreach efforts will include, but not be limited to: the creation of promotional materials, developing an available speaker and topics list, creating interactive tools for educating the public, posting of meeting reports, and providing contact information for the media.

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

National funding agencies. SALE-UNITED is a coalition of national programs and each program will operate autonomously while garnering benefits from cooperation and partnerships. Each program will procure funding based in its usual national mechanisms

### **3.11 Additional Comments**

Each program is dealing with logistics internally within their own national programs. Intensive field efforts will be required for extended periods of time. Discussion is still on-going whether large drilling platforms and field camps are preferred or a more mobile ice drilling system that could be rapidly deployed for access and sampling then moved to the next location is the preferred approach. Existing field facilities will be activity focii subject to scheduling and availability. Where feasible logistics will be coordinated through COMNAP. There is also interest in linking SALE with planned traverses that will be conducted near the study sites. Specialized ice drilling, sampling devices, coring devices, and observatories are to be developed.

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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**

| Name              | Organisation  | Country |
|-------------------|---|---------|
| Robin Bell        | Lamont Doherty Earth Observatory at Columbia University | USA     |
| Ross Powell       | Northern Illinois University                            | USA     |
| Jean Robert Petit | LGGE  | France  |
| Valery Lukin      | Arctic & Antarctic Research Institute                   | Russia  |
| Sergey Bulat      | Petersburg Nuclear Physics Institute                    | Russia  |
| Martin Siegert    | University of Bristol                                   | UK      |
| Ignazio Tabacco   | DST Geofisca  | Italy   |
| Frank Pattyn      | Vrije Universiteit Brussels                             | Belgium |
| Michael Studinger | Lamont Doherty Earth Observatory at Columbia University | USA     |
| Christoph Mayer   | Alfred Wegner Institute                                 | Germany |
| Reinhard Dietrich | TU Dresden  | Germany |
| Stefan Vogel      | Norther Illinois Univeristy                             | USA     |
| Berry Lyons       | Ohio state University                                   | USA     |
| Salwek Tulaczyk   | University of Santa Cruz                                | USA     |
| Brain Lanoil      | Unniveristy of California Riverside                     | USA     |
| Frank Carsey      | Let Propulsion Laboratory, NASA                         | USA     |
| Peter Doran       | University of Illinois at Chicago                       | USA     |
| Joan Fitzpatrick  | US Geological Survey                                    | USA     |
| Brent Christner   | Montana State University                                |         |