



Priscu Research Group
Land Resources &
Environmental Sciences
Bozeman, MT 59717-0346
Telephone: (406) 994-3250
Fax: (406) 994-5863
Email: ubijp@montana.edu

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Dr. Peter D Clarkson
Executive Secretary
SCAR Secretariat
Scott Polar Research Institute
Cambridge CB2 1ER
UNITED KINGDOM

Dear Peter,

Subject: Antarctic subglacial environments: A theme for the next IPY. Submitted to the SCAR Executive on behalf of SALEGOS.

Ideas and plans for the next International Polar Year, beginning in 2007 are under development and gaining momentum. The planning is occurring at the national level with individual countries assembling national planning committees. At the international level major science organizations are beginning the process of identifying appropriate Polar Year programs and themes to ensure coordination and cooperation. For example, IASC supported the concept at their meeting in Sweden in April 2003, the European Polar Board has appointed a point of contact and the U.S. Polar Research Board convened an international "brainstorming" session and has secured funding to further the planning process. A proposal will be submitted to ICSU (The International Council of Science) to develop an international clearinghouse for IPY ideas. Major themes that are emerging are exploration of the frontiers of science and examining the links between polar processes and global systems especially targeting global change and ecosystems.

The Subglacial environment beneath ice sheets in polar regions remains unexplored and offers a unique venue for exciting and groundbreaking interdisciplinary science. There is broad recognition that the scientific objectives for subglacial environment exploration and research will require an international and interdisciplinary approach. For instance, biologists, glaciologists geologists and geophysicists have many common interests in subglacial hydrology and in subglacial lakes (especially Subglacial Lake Vostok). A program of subglacial environment exploration and research embodies the characteristics wished for in an IPY program including: compelling and substantive science aims and objectives, vision and inspiration in its emphasis and scope,

multidisciplinary in scope, international in participation, easily understood and recognized by the lay public, a well advanced plan for execution that will assure tangible and achievable outcomes, and the realization of substantial added value by inclusion in the IPY that will ensure the programs implementation, improve its science and recognition, and enhance the ultimate outcomes.

Some of the important interdisciplinary issues regarding subglacial environments include:

Biology

Biologists are interested in investigating life in icy environments in order to expand the limits of Earth's known biosphere, discover potentially novel physiologies, develop new biotechnological tools such as cold resistant enzymes and antifreezes, describe novel microorganisms, examine ancient (paleo) DNA preserved in this novel setting, use the environment as a potential analog for extraterrestrial life, and to better understand the origin and evolution of life on our planet. Of recent importance are the reports, based on results from accretion ice that microbes may exist within Lake Vostok and other subglacial lakes. Recent DNA work has suggested that some of the organisms may be thermophiles implying geothermal energy sources beneath the Antarctic ice sheet. Estimates of the carbon pool within the Antarctic Ice Sheet and associated subglacial lakes indicate that this reservoir is similar to all of our planet's surface freshwaters. This is a global carbon pool that has yet to be considered and deserves further attention. Life may even thrive in veins or grain boundaries in the polycrystalline ice that forms the Antarctic ice sheet. As more data are collected, we may end up changing our view of Antarctic from a continent that is devoid of life to one that is an oasis for (subsurface) life.

Bedrock Geology, Geophysics and Geological Paleoclimatology

Interactions between tectonic processes and ice-sheet evolution are of primary importance to geologists and geophysicists. Crustal evolution and lithospheric architecture of Antarctica fundamentally control tectonic evolution, paleoenvironments and landscape development. These solid-earth processes also provide feedbacks and drivers for ice sheet dynamics and global environmental change. For example, availability of subglacial water controls ice velocity, and is often determined by geothermal heat flux, a parameter also critical for understanding tectonic history. Furthermore, the role that Antarctica plays in global geodynamics is also poorly constrained, both over the long term vis a vis the East Antarctic shield and in younger earth history, vis a vis the rift tectonics of the region. However, the subglacial geological environment remains largely unknown due to the thick pervasive ice cover; major efforts are needed to document the geology by extensive geophysical surveys and subglacial geological drilling. Particular targets include subglacial Precambrian and Paleozoic bedrock geology, subglacial Mesozoic-Cenozoic sedimentary rocks, and subglacial geophysics, and the sedimentary records within subglacial lakes.

Glaciology, Glacial Geology and Glaciological Paleoclimatology

The glaciological community is very interested in the stability of modern ice sheets, which requires: sampling subglacial sediments, direct investigations of ice sliding, geothermal heat flow measurements. All fast ice sheet flow, and hence also any potential rapid response to externally forced changes derives from conditions at the subglacial bed. Thus far very few data are available for constraining the widely divergent models of bed processes that invariably involve different properties of sediment and water, or a combination of the two. These parameters are thought to vary widely both in space and time (and in different dimensions of each of those), and at present, there are virtually no data that can constrain any of this variability at all. Understanding the subglacial water system over large regions is also critical for the study of subglacial lakes as a system. Access holes to obtain these subglacial data can also serve for gathering other critical data too, such as: deep ice cores for paleoclimate records, logging climate proxies with geophysical instruments, borehole paleo-thermometry, and ice rheology studies. Particular targets can include “old ice” (~1 Myr), subglacial lakes, subglacial till, and sub-ice-shelf environments and sediments.

SALEGOS is convinced that subglacial environment exploration and research will be one of the more important “large science” programs conducted in Antarctica during the next decade. International momentum continues to build. With strong support from SCAR, SALEGOS has developed a clear set of plans and objectives for the study of subglacial environments in a timeframe that is compatible with initial plans for the IPY celebrations. It is only fitting that subglacial environments be a major feature of the International Polar Year –2007/2008 and we recommend that SCAR exercise leadership in Antarctic science by being a strong proponent of the inclusion of subglacial environment exploration and research in the IPY program.

Please let me or any other members of SALEGOS know if you require further information on this important topic.

Yours sincerely,

John C. Priscu
Professor and Convener of SALEGOS