Idea410

A CHILEAN PERSPECTIVE OF THE IPY

This document contains the basic elements of Chile's approach to the International Polar Year (IPY). Such approach includes the following parameters:

1. **Official Organisation**.
The framework for Chile's participation in the IPY is a National Commission which gathers the most representative ministries, agencies, institutions, universities, involved in Antarctic research. The Commission is headed by a National Committee appointed by the Foreign Minister, which acts as a steering group and supported by a Technical Secretariat located at the National Commission for Scientific and Technological Research (CONICYT). The Commission's Programme will be approved by the Council for Antarctic Policy, an Advisory Body to the Foreign Minister. The main contact point is the Chairman of the SCAR National Committee (CNIA) Dr. Jose Valencia. jvalencia@inach.cl.

2. **Integration of the National IPY Programme into the existent national framework**.
Chilean scientific activities take place under the umbrella of a Five-Year Plan adopted by the national scientific community in a seminar organized by the Chilean Antarctic Institute (INACH). The current Five-Year Plan (2001-2005) will be reviewed next year in order to harmonize its goals for the next exercise (2006-2010) with those of the overlapping IPY (2007-08). The annual Meetings on Antarctic Research sponsored by the National Committee (CNIA) shall also focus on the IPY objectives.

3. **Incorporating new dimensions into existent international programmes**.
The IPY will develop in a different scientific environment from the one existent at the time of the IGY. Linkages between land, oceans and atmosphere, biological, physical and chemical processes, the vital role of the biosphere in the Earth System (Global Change Open Science Conference, Amsterdam, July 2001) require appropriate organisational structures to execute emerging new research strategies: IGBP, IHDP, WCRP and DIVERSIT AS have established an Earth System Partnership; SCAR is developing its First Long-Term Strategic Plan; WHO, IOC, IHO, UNEP, among other agencies, continue to develop or improve global programmes. In that kind of scenario, in some instances, Chilean IPY participation, may be oriented, instead of new projects, to the process of steadily feeding new ideas into the existing institutional channels and programmes, and strengthening the COMNAP-SCAR axis as a strategic alliance.

4. **Consolidating and expanding the present level of Antarctic cooperation.**
Chile intends to strengthen international links and, as a priority, associate to the IPY framework the activity developed by projects such as:
a) LARC (Antarctic Laboratory for Cosmic Rays) located at King George Island and established by INACH in partnership with the Italian Institute of Inter-Planetary Physics/CNR, Rome.
b) GARS (German Antarctic Receiving Station) at O'Higgins Base, a joint effort by BKG (Federal Office for Cartography and Geodesy), DLR (German Aerospace Centre) and INACH.
c) The SAMBA (South-American Meridional B-field Array), which is a Chilean-American magnetometer Chain being developed by UCLA, supported by the USA National Science Foundation, by several Chilean universities and INACH.
d) International partnerships with Australia on the conservation of albatross, with New Zealand on the conservation of whales, other initiatives concerning geo-sciences and paleo-environments, and other scientific fields being considered with European and South-American partners.

5. Formulating new national Antarctic projects open to international participation.

a) Scientific traverse from Patriot Hills to the South Pole.

Based on previous experiences within the framework of the multinational IT ASE programme (International Transantarctic Scientific Expedition) and as a follow-up of research cooperation with Kansas University, it is being undertaken by the Center for Scientific Studies (CECS) from Valdivia and the Chilean Army. Its objectives include glaciological, geophysical and meteorological investigations during a traverse from Patriot Hills to the South Pole, in order to study the accumulation of snow in recent periods (> 200 years), climate change, atmospheric chemistry, current meteorological conditions and the geophysical and geological characteristics of the transition between Western and Eastern Antarctica. The technical development of geophysical sensors carried by terrestrial vehicles, and the development of logistic capabilities to undertake long

inland traverses inside the Antarctic plateau will be tested by this project which will cover a distance of 1084 km during the period extending from 1 sl November to 31 sl December 2004. A Brazilian scientist participates and links with traverses being planned or considered by other national Antarctic programmes over the inland plateau would be welcomed as a further development of the IT ASE network. Analysing and interpreting data extracted from the traverse may take years but when results are incorporated with new data from satellite remote sensing, a far better insight of the role of Antarctica in future global change and the consequent impact on global sea level will emerge.

b) Benchmark glaciers network for mass balance monitoring and validation of remote sensing based methods on the Antarctic Peninsula region.

A team composed of 2 Chilean scientists (from INACH and CECS) and 2 Brazilian scientists (from the Federal University of Rio Grande do Sul) who may be joined by other specialists (e.g. Argentina, Germany, Korea, Spain, UK) plans to initiate during the IPY the establishment of a network of benchmark glaciers in selected places of the Antarctic Peninsula and South Shetland Islands. This network should provide the required basic data for geological studies in a sector of Antarctica suggested as sensitive and where early responses to change are expected. Using classical methods, representative glaciers can be intensively studied to understand the effects of climate on glacier mass changes and the resulting effect on stream flow. At the same time, complementary dataset will be recorded with the aim to calibrate automatic and semi-automatic methods to extract information using multi-sensor satellite data. This multi-method approach will facilitate densification of information through interpolation and extrapolation of parameters to neighbouring glaciers using high spatial resolution of mass balance estimates in the region, as well as improving our knowledge of the dynamic behaviour of ice masses. Given the harsh environmental conditions and the difficulty of acceeding to remote inaccessible places, the proposal considers definition of benchmark glaciers in the vicinity of the all-year-round operation of Comandante Ferraz Station on King George Island and Bernardo O'Higgins Station on the Antarctic Peninsula. Such geographic locations would make more feasible field surveys and allow for the periodic monitoring of activities being developed under a lon-term basis.

c) Effects of medium scale climate changes on the population sizes of Antarctic marine predators.

Variability in the vital parameters of vertebrate populations dependent on marine nutrition is conducive to changes in their population sizes due to a number of biological processes -such as demographic variability, availability and competition for resources with other predators or human intervention (eg. Fisheries) as well as climate and oceanographic factors extending through the trophic chain. While many long-term studies aim to determine if these populations are increasing or declining, research undertaken by Chilean scientists, based upon continuous monitoring, has build- up a data series which points to changes in the growth rates that could be associated to these processes. Five to ten year population census, yet insufficient to establish statistically valid relationships with the climatic changes in the marine ecosystem of the Antarctic Peninsula region, will become invaluable in few more years. Nevertheless, analysis of the existent data point to strong causal relations with those processes which affect the base levels a trophic chains and in the end affect predators at the higher trophic levels. Thinning of the sea ice cover in the last years seems to correlate with changes in the population growth of Antarctic fur seals at Cape Shireff, as it affects krill recruitment and the consequent abundance of its cohorts. Penguins at Ardley Peninsula experience similar effects, while the trophic ecology and reproduction of the greyhead albatross at Gonzalo island, Diego Ramirez Archipelago, are directly linked to the availability of the calamar *Martialia hyadesi*, a species whose habitat is preferentially the area of the Antarctic Polar Front. Three studies focussing on each of these species will endeavour to advance a research which requires the interdisciplinary linkage of many scientific disciplines and tools, and may attract researchers from several Antarctic nations. Sampling and modelling methodologies will be used. Monitoring population sizes would be pursued until 2007-09, at which time the temporal series would be subject to critical analysis and the environmental variability for each group would be assessed. In the second phase, exploratory models would be developed to attribute comparative values to each relevant factor, using generalized statistical models as generalized lineal models (GLM) or generalized additional models (GAM). This stage would develop specific population models in order to explain the observed changes and impact of the environmental variables identified by the generalized models. Models that would enable to understand and predict ecological changes generated in the medium term as a consequence of physical climatic and oceanographic processes and eventual changes affecting fisheries in the area of the Antarctic Peninsula. This project represents a distinctive contribution to the SCAR programme on Evolutionary Biology of Antarctica (EBA) which inter alia attempts to predict how the Antarctic organisms may respond to future environmental changes.

d) Cape Shireff: a place-based case study of ecosystem changes.

Tools are required to address directly the issue of multiple, interacting impacts at a particular place with its unique set of characteristics. Existing and developing methods of integrated regional- scale studies would be applied to an area where Chile has monitored populations of *Arctocephalus gazella*, the Antarctic fur seal, since 1982, and where USA and Chilean scientists coordinate each summer their respective campaigns. The area has a significant past in the history of the sealing period and has been surveyed by Chilean and Spanish archaeologists. In the course of these scientific studies, meteorological data, iceberg observations, aerial photographs and satellite images, as well as archaeological remnants, all of them representing the indispensable basis for time analysis, have been gathered, and a cartographic base for the region has been established. A multidisciplinary study of the impact of global change is proposed including, in particular, glaciology focused on changes experienced by Aranda and Anguita glaciers; biology, with emphasis on physiological studies of the biota and its response to environmental change; geology, with a study of the subglacial cover and analysis of soils and sediments; oceanographical and marine biology studies of the surrounding waters, geomatics, developing and implementing a geographical information system (GIS) and processing digital images; meteorological study of environmental parameters; and assessment of anthropogenic impacts on Cape Shireff s ecosystem, including its main components, soils, waters and snow. This project involves an integration of work on marine, freshwater and terrestrial ecosystems and searches to test the hypothesis that global evolutionary patterns emerge more clearly when small-scale or site-specific measurements are carried out in a consistent and a comparative way across regions, sub-continents and continents. In this manner, the proposal would also test the value of a regional approach to the Antarctic State of the Environment and, by calling upon scientists of multiple disciplines and many nations, it would appropriately address the collaborative vocation of the Antarctic scientific community.

6. Participation in already proposed IPY Activities.
Chile expresses interest *i.a.* in the following **IPY** proposals:

a) Circum-Antarctic Census of Antarctic Marine Life.
b) Polar Ocean Gateways (POGE) (Drake Passage, Scotia Sea, Pacific-Antarctic Ridge)
c) Weather Forecasting Research, including contributing to the Antarctic Weather Forecasting Handbook supported by COMNAP.
d) International Heliophysical Year.
e) Bi-Polar Census of Persistent Global Contaminants.*
f) A Network for Aerosol Measurement in Polar Regions. *
g) JCOMM
* It may be useful to analyse if e) and f) should not be combined with "Micropollutant and Microchemicals in Polar Environments" with a view to contributing to a State of the Antarctic Report.

7. Events.

The Chilean Antartic Institute (INACH) jointly with the Australian Antarctic Division (AAD) are sponsoring the XXVth Anniversaa CCAMLR SymQosium, to be held in Valdivia, Chile, on 4-7 April 2005 within the framework of preparations for the IPY.

In the same context, INACH and the Norwegian Polar Institute, together with Tromso University and the University of Magallanes (UMAG) have exchanged views on the content, scope and timing of a Conference called PANGEA (Poles Apart:Nurturing Global Environmental Aspects) to be held in Punta Arenas, Chile, in 2005 as a contribution to the International Polar Year.

There have been interesting proposals for an International Space University in Antarctica (ISU), an International Polar Year Workshop in Alaska and an International Workshop at Amundsen- Scott South Pole Station. In a similar manner, Chile and Russia would propose holding every austral summer at King George Island a "Bellinghausen Symposium" which would provide the opportunity for scientists of the main cluster of Antarctic scientific stations to share their experiences with a key-note speaker which would rotate among the participating countries.

8. **Infrastructure and Logistic Improvements.**

While steady progress is being achieved towards the goal of improving strategic components of Antarctic infrastructure and associate logistic support in terms of the firm commitment requested by COMNAP, a definitive answer cannot yet be provided on this matter but implementation of the following items is presently being considered:

-----Significant extension of the Frei Runway to allow more than one plane to station itself.
-----Acquisition/lease of a research/logistic vessel
-----A Biological Laboratory as a joint INACH/Army project at O'Higgins Base
-----Further improvement of landing and other facilities at Patriot Hills being coordinated by the Chilean Air Force.
-----For the time being, the Chilean Navy has temporarily closed Prat Base, in order to concentrate on more intensive maritime activities and surveys.