



# SCAR Standing Scientific Group on GeoSciences International Bathymetric Chart of the Southern Ocean (IBCSO)



## Background and Objectives

### Introduction

Portraying the **seafloor topography** off Antarctica is of great importance for many applications in the fields of Geosciences, Physical Sciences, and Life Sciences. But existing bathymetric data and charts are scattered throughout many countries and are heterogeneous in terms of age, accuracy, resolution, and documentation.

For this reason the SCAR Expert Group on IBCSO acts as the steering group for the production of a revised bathymetric chart of the Southern Ocean. The IBCSO is realized by a strong **international collaboration** with a great number of individual scientists, institutional data centers, and international scientific programs.

Beside the development of strategies for data collection (input), the Expert Group also defines strategies for data exchange (output) of bathymetric grids, contours, and maps with other scientific programs. Data management and processing of diverse data sets including satellite imagery, gravity and magnetic anomalies, together with topographic data is conducted by use of high end **Geographic Information Systems (GIS)**. This approach assures (i) calculation of optimized digital terrain models and contours with presentation of perspective views, (ii) interoperability for data exchange with other Southern Ocean efforts and (iii) allows production of traditional cartographic paper products and digital web maps.

### Objectives of the IBCSO

Close collaboration is agreed with other Southern Ocean and Antarctic mapping programs, namely Radarsat Antarctic Mapping Program (RAMP), Antarctic Bedrock Topography (BEDMAP2), Antarctic Digital Magnetic Anomaly Project (ADMAR), and Earth Topography (ETOPO2). Due to its distinct interdisciplinary concept IBCSO has been assigned high priority within the IOC Ocean Mapping Program. Main objectives are:

- ▶ Collection of heterogeneous data, information, and knowledge
- ▶ Portraying the seafloor topography around Antarctica
- ▶ Preparation of bathymetric grids, contours and maps
- ▶ Provision of bathymetric grids for the General Bathymetric Chart of the Oceans (GEBCO)

## Services and Products

### Significance of Bathymetry

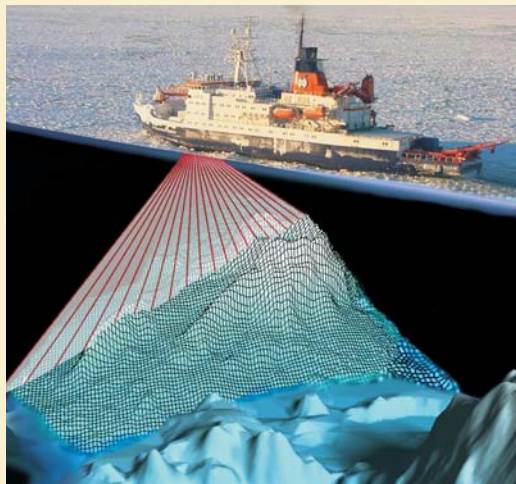
Analysis and modeling of bathymetric data in **Geosciences** enables the generation of paleobathymetric maps with special emphasis on submarine gateways and barriers for an updated plate tectonic reconstruction. The knowledge of fault pattern assists the estimation of crustal dynamics (seismicity) and the localization of potential earthquake epicenter for use in tsunami warning systems. Depth information is also important for the delimitation of the ocean-continent boundary and pre-site surveys.

Bathymetry is of great value to **Physical Sciences** and ocean modeling. It becomes apparent, that major currents respond to the seafloor topography. The shape of the ocean floor influences mixing and transport of water and hence transport of energy or heat. Incomplete bathymetric information is the prominent limiting factor for more precise ocean models. Improvements in ocean modeling can be achieved by more dense and accurate echo sounding data.

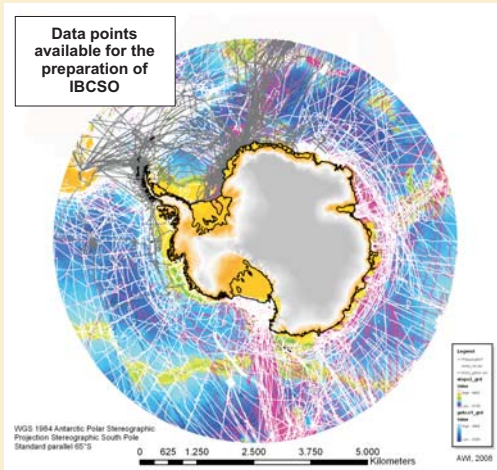
GIS based analyses of bathymetric data provide depth information and digital terrain model parameters, e.g. slope, aspect, curvature, and terrain variability. Results of multi-scale terrain analyses are important descriptors for benthic habitat mapping in **Life Sciences**. Terrain analysis enables prediction of habitats and supports conservation of the sensitive ecosystems and unique biodiversity in Antarctica and the Southern Ocean.

Finally an updated portrayal of the Southern Ocean sea floor topography supplies **Observing Systems** like the planned SOOS with additional input parameters. Bathymetry also provides essential system variables, e.g. depth, slope, orientation, roughness, salinity, and coupling of those variables. Interactions of system domains comprise all domains defined by the geosphere, atmosphere, hydrosphere, cryosphere, and biosphere.

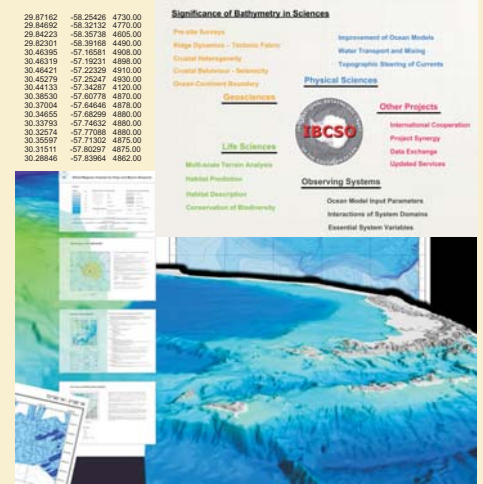
IBCSO will deliver various products to other SCAR groups as well as to other Southern Ocean efforts by use of desktop GIS tools with server capabilities and exceptional functionalities for authoring, editing, and manipulation.



RV Polarstern has completed more than forty-five expeditions to the Arctic and Antarctic. This ice-breaker is specially designed for working in the polar seas and is equipped with a multibeam echo sounder for depths measurements.



Ship track inventory with bathymetric data provided by GEBCO CE, the IHO DCDB and AWI for the IBCSO map compilation. More data are available from other facilities, but large data gaps still occur especially in the South Pacific. Additional multibeam data is required to improve the IBCSO.



The final products of the Expert Group on IBCSO comprise digital maps as well as printed maps. Use of digital tools in a GIS environment enables the generation of optimized digital terrain models (DTM) and calculation of DTM derivatives like slope, aspect, and variability.

### Framework

IBCSO was adopted an International Bathymetric Chart project of the Intergovernmental Oceanographic Commission (IOC) Ocean Mapping Program and is one of the Expert Groups within the SCAR Geosciences. In detail the IBCSO is endorsed by specified **Groups and Committees**:

- ▶ SCAR Standing Scientific Group on GeoSciences (SSG-GS)
- ▶ IOC Consultative Group on Ocean Mapping (CGOM)
- ▶ Hydrographic Committee on Antarctica (HCA) of the IHO

IBCSO has close liaisons with:

- ▶ GEBCO Sub-Committee on Digital Bathymetry (SCDB)
- ▶ GEBCO Sub-Committee on Undersea Feature Names (SCUFN)
- ▶ SCAR/SCOR Expert Group on Oceanography (EG Ocean)
- ▶ SCAR Standing Committee on Antarctic Geographic Information (SC-AGI)



### Products and Byproducts

- ▶ Hardcopy maps (printed charts), scheduled 2009
- ▶ Softcopy maps (web maps), scheduled 2009
- ▶ Digital bathymetric database, metadata, and documentation
- ▶ An operational Expert Group focused on polar ocean mapping

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