International Bathymetric Chart of the Southern Ocean (IBCSO)

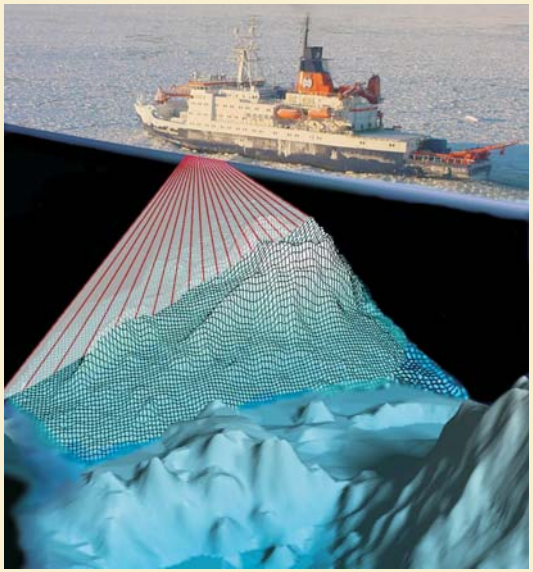
Polar Ocean Mapping: Management Perspectives

AWI Alfred-Wegener-Institut für Polar- und Meeresforschung in der Helmholtz-Gemeinschaft

Background and Work Plan

Introduction

At present, two international initiatives are compiling polar bathymetric data for use in construction of seafloor topography. These are the ocean mapping groups on the International Bathymetric Chart of the Arctic Ocean (IBCAO) and the International Bathymetric Chart of the Southern Ocean (IBCSO). The IBCSO group focuses on the buildup of a revised and updated digital bathymetric database for the entire Southern Ocean with additional data derived from radar satellite imagery, altimetry, magnetic, and gravity. Data sets are provided by a great number of facilities and data centers. Data management and data processing is conducted by use of proprietary **Geographic Information Systems** (**GIS**). This approach assures interoperability for data exchange and allows production of traditional cartographic paper products and digital web maps.



R/V Polarstern has completed more than fourty expeditions to the Artic and Antarctic. This ice-breaker is specially designed for working in the polar seas and is amongst others equipped with a multibeam echo sounding system for depths measurements.

Contact

Dr. Norbert Ott (Norbert.Ott@awi.de)

Dr. Hans Werner Schenke (Hans-Werner.Schenke@awi.de)

Alfred Wegener Institute for Polar and Marine Research

P.O.B. 12 01 61, 27515 Bremerhaven, Germany

Information about IBCSO: www.ibcso.org

Framework

The IBCSO program was adopted as an International Bathymetric Chart mapping project in 2004. Following groups and subcommittees set up IBCSO in an official frame: the SCAR Geosciences Standing Scientific Group (GSSG), the IOC Consultative Group on Ocean Mapping (CGOM), and the Hydrographic Committee on Antarctica (HCA) of the IHO. IBCSO has also liaisons per membership with the GEBCO Sub-Committee on Digital Bathymetry (SCDB), the SCAR/SCOR Expert Group on Oceanography, and the SCAR Standing Committee on Antarctic Geographic Information (SC-AGI).

After a break in 2004, the IBCSO program restarted at the end of 2006 and is based at the Alfred Wegener Institute for Polar and Marine Research in Bremerhaven, Germany.

Objectives of the IBCSO

- International collaboration with facilities and data centers
- Collection of heterogeneous data, information, and knowledge
- Buildup of an interoperable digital database SOGIS
- Portraying the seafloor topography around Antarctica
- Generating bathymetric grids and maps
- Electronic data exchange (e.g. GEBCO, ETOPO2)
- Linkage to IPY goals (e.g. data sharing, observation program)

Seafloor topography with morphological features

- Reflects long-term tectonic processes (e.g. sea floor spreading)
- Provides information about the geological evolution
- Defines submarine barriers and gateways (e.g. Drake Passage)
- Drives ocean circulation systems (e.g. ACC)
- Effects global climate changes
- Background for sensitive Antarctic ecosystems

Project management perspectives

- Establishment of the expert group
- Buildup a communication network
- Set up the IBCSO website and mailing list

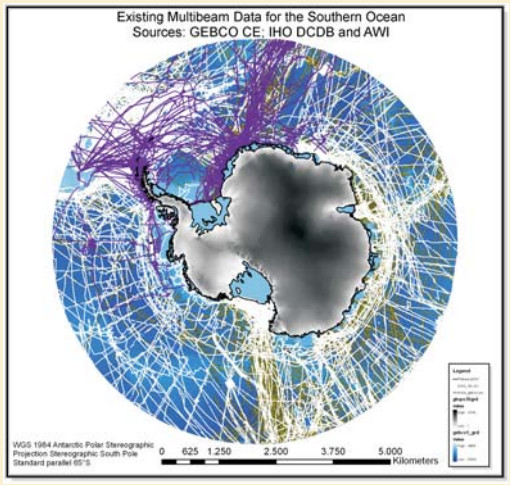
Data management perspectives

- Ensure continuous data transfer to the database
- Compilation of heterogeneous data sets
- Data merge of georeferenced data sets
- Data analysis and optimization
- Evaluation of processing techniques
- Iterative quality control

Data Processing and GIS Modeling

GIS architecture of the IBCSO

- High end GIS by use of proprietary software
- Full data capabilities and exceptional functionality
- GIS concepts: from Desktop to Server GIS
  - Desktop GIS tools for authoring, editing, and analysis
  - Server GIS for dynamic spatial data management
  - Internet map server for providing web maps
- Data storage: object oriented geodatabase (DBMS)



Ship tracks with bathymetric data provided by GEBCO CE, the IHO DCDB and AWI for the IBCSO map compilation. More data exist from other facilities, but large data gaps still occur in the South Pacific.

Data processing comprises

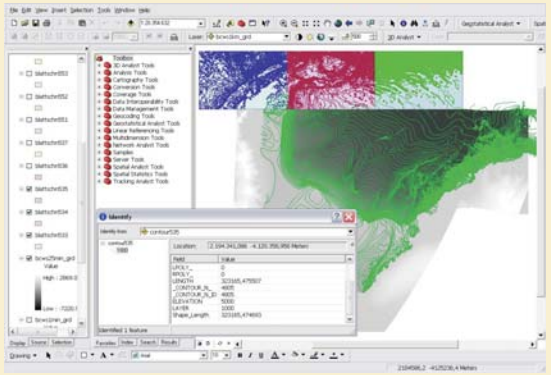
- Processing of NBS and MB echo sounding data
- Geometrical control by track lines
- Quality control of processed data

GIS based data modeling

- Data import, export, and exchange
- Georeferencing of the data sets
- Data modeling and data conversion
- Data merge and mosaicking

Final products

- Hardcopy maps (printed on demand)
- Softcopy maps (digital web maps)
- Digital database, metadata, and documentation



Screenshot of the graphical user interface for GIS projects. The different windows show from left to right: data sets listed within the Weddell Sea mapping program, available tool boxes for data processing, map window for graphical display of data sets, and identifier window with attribute data for selected objects.

Bathymetric data

- National and international data centers
- Academic facilities and hydrographic offices

Additional data

- Radarsat imagery, satellite altimetry and satellite gravity
- Magnetic anomalies and isochrons
- Topographic and bedrock data of Antarctica
- Global data sets from GEBCO and ETOPO2v2

Metadata

- XML metadata with track control

The Bathymetry working group at AWI hosts one of the largest databases of mainly multibeam data for polar areas. As a result, the Bathymetric Chart of the Weddell Sea (BCWS) was published by AWI in cooperation with Vernadsky Institute. The BCWS map series is the nucleus for the IBCSO data compilation.