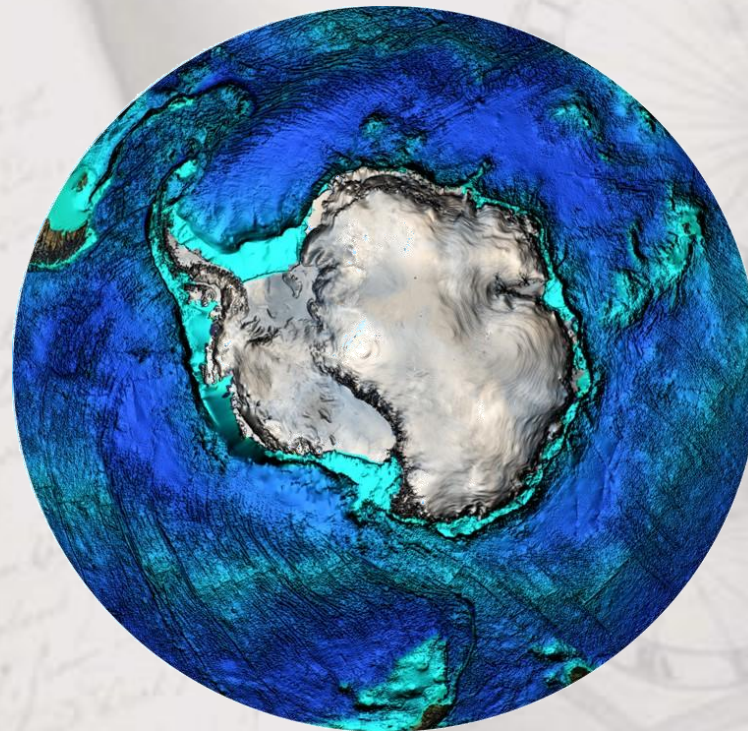


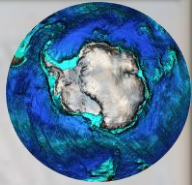


# Hydrography and its Contribution to Antarctic Sciences



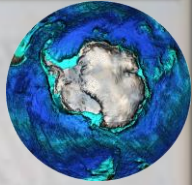
**Hans Werner Schenke**  
Alfred Wegener Institute for Polar and Marine Research  
Bremerhaven, Germany





# Content

- **Hydrography (definition)**
  - Hydrographic measurements
  - Products and scientific results
- **Scientific applications**
  - Bathymetric/topographic geodata base
  - GIS modeling, risk maps and prediction
  - Ocean circulation, benthos ecology
- **Mutual Benefits**
  - Cooperation science and hydrography
  - Data exchange and management
- **Perspectives**
  - Networks



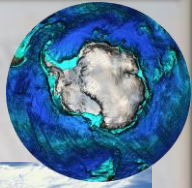
# Definition of Hydrography

**“Hydrography is the total set of spatial data and information, and the applied science of its acquisition, maintaining and processing, necessary to describe the topographical, physical and dynamical nature of the hydrosphere and its borders to the solid earth, and the associated facilities and structures.”**

- geodata base with object information
- seafloor surveying and mapping
- modeling ocean circulation and tides
- harbours and waterways

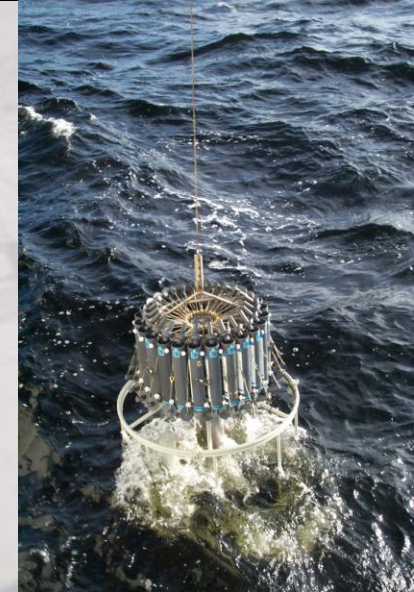
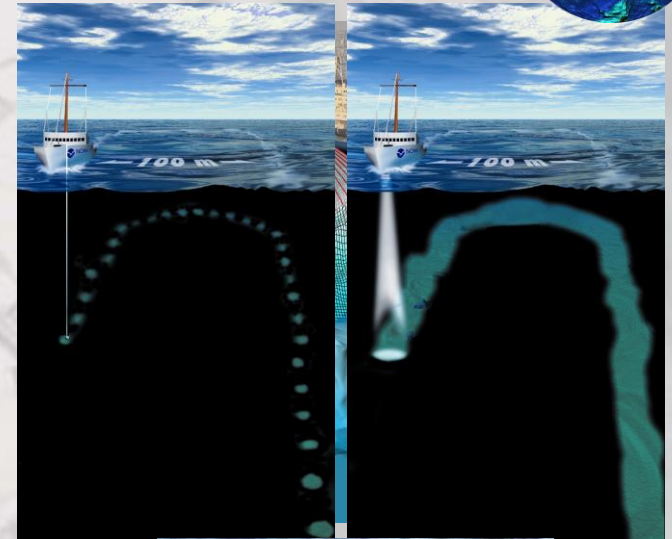


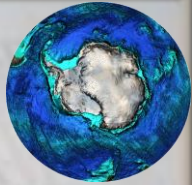
# Hydrographic measurements



- **Single Beam Sonar Survey**
  - Spot soundings, depth
  - One-dimensional profiles
- **Multibeam Echosounding**
  - Spatial sea floor survey
  - High resolution terrain models
- **Oceanographic data**
  - CTD measurements
  - Sound velocity profiles

and more ...

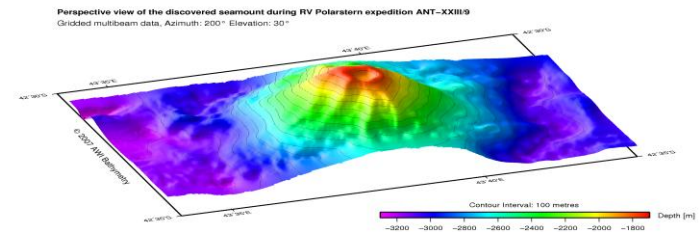
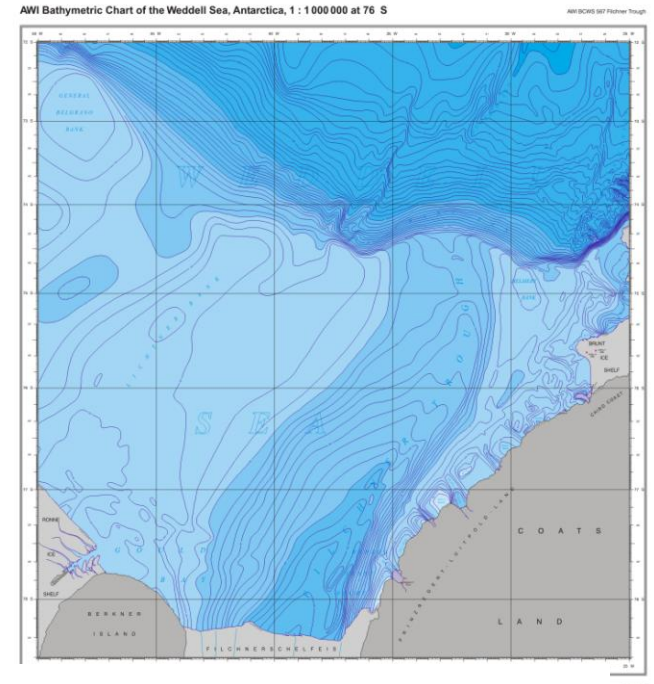
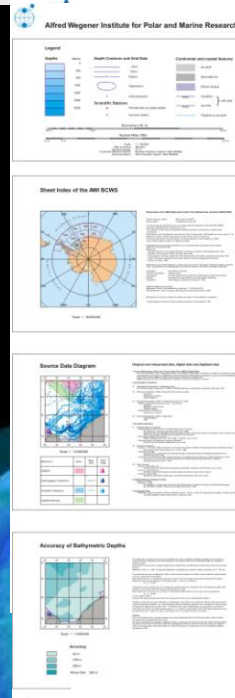




# Products & Scientific Results

- **Bathymetric Charts**
  - **AWI BCWS 1:3 Mio**
  - **AWI BCWS 1:1 Mio**

- **3D Visualisations**
  - **High resolution DTM**
  - **Animation**

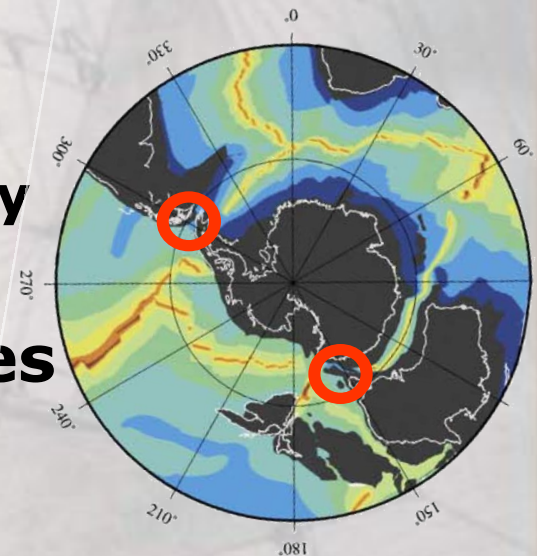
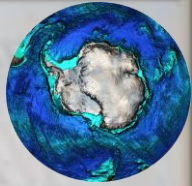


IPY Seamount



# Scientific applications

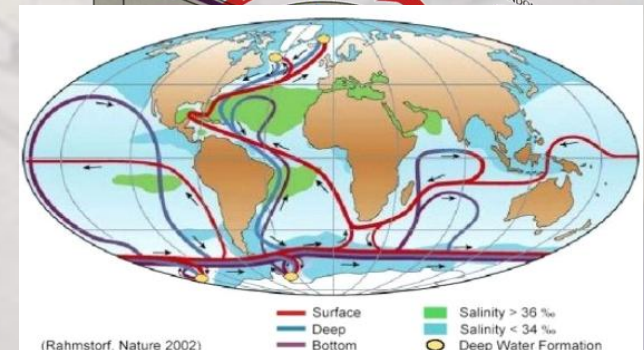
- **Defines gateways and barriers**
  - e.g. Drake Passage, Tasman Gateway
- **Drives currents and gravity waves**
  - e.g. Antarctic Circumpolar Current
- **Controls thermohaline circulation**
  - e.g. Antarctic bottom water formation
- **Influences global climate**
  - e.g. Antarctica's glaciation



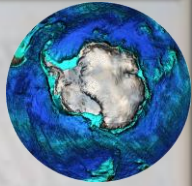
Brown et al., 2006



Schmitz, 1996

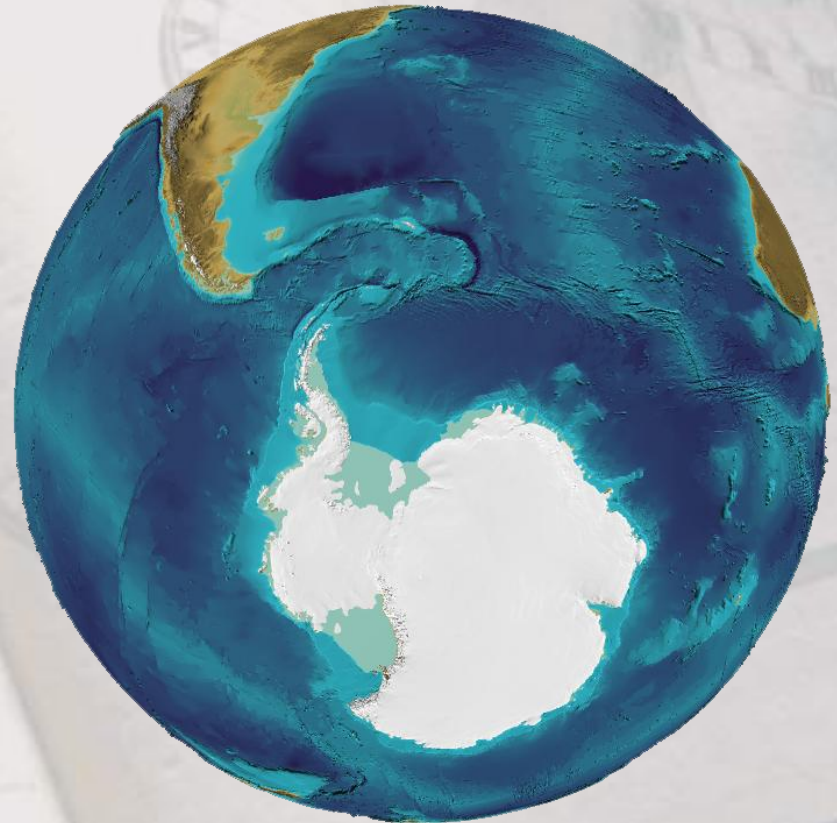


(Rahmstorf, Nature 2002)



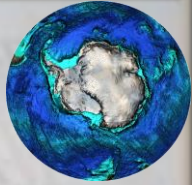
# Value of the Sea Floor Shape

- **Geosciences**
  - seabed processes
- **Physical Sciences**
  - ocean models
- **Life Sciences**
  - ecology
- **Observing Systems**
  - domains and variables

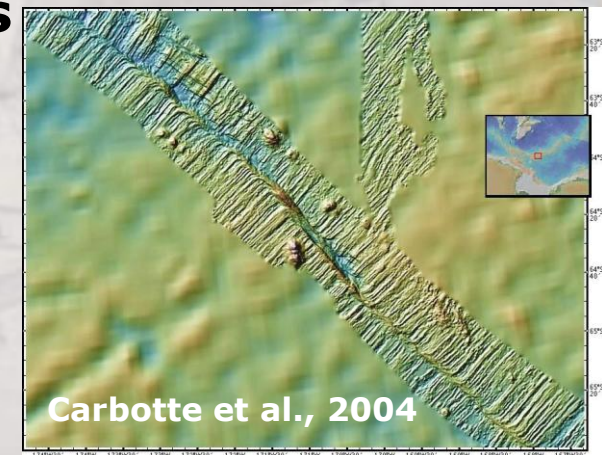
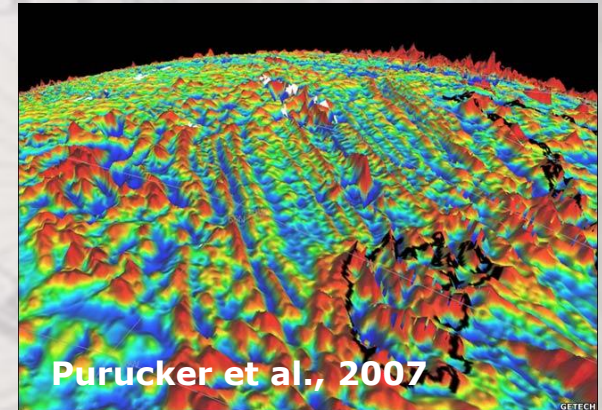




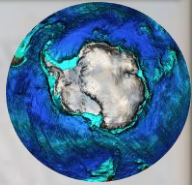
# Sea Floor in Geosciences



- **Ocean-continent boundary**
  - tectonic and igneous activities
  - sedimentation processes
- **Crustal heterogeneity**
  - variations in geophysical anomalies
- **Crustal behavior - seismicity**
  - faults, earthquakes and landslides

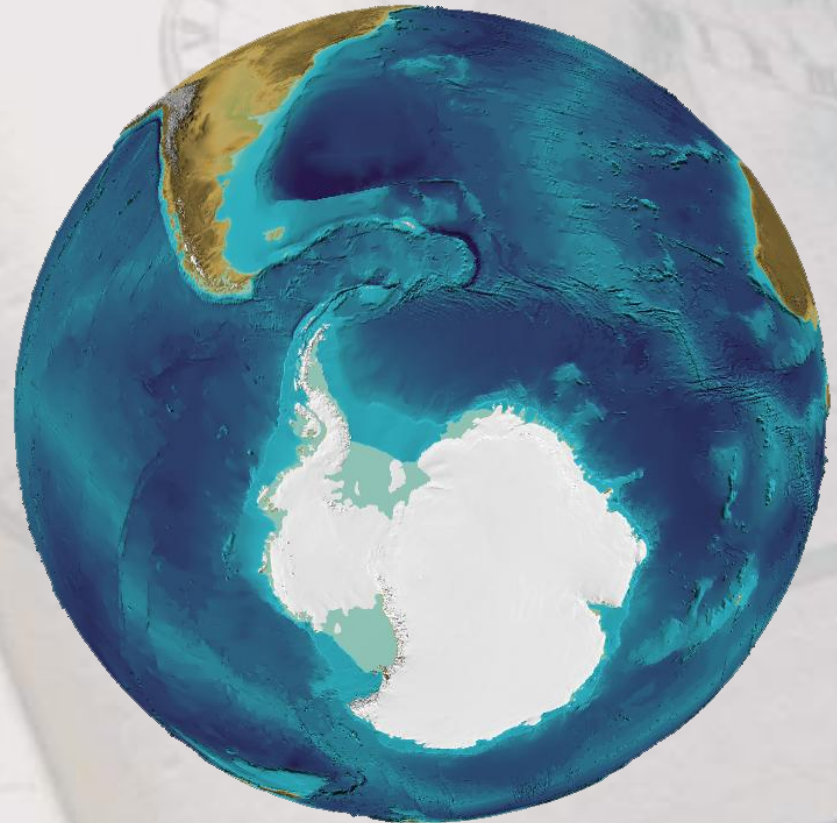


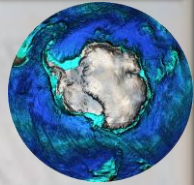




# Value of the Sea Floor Shape

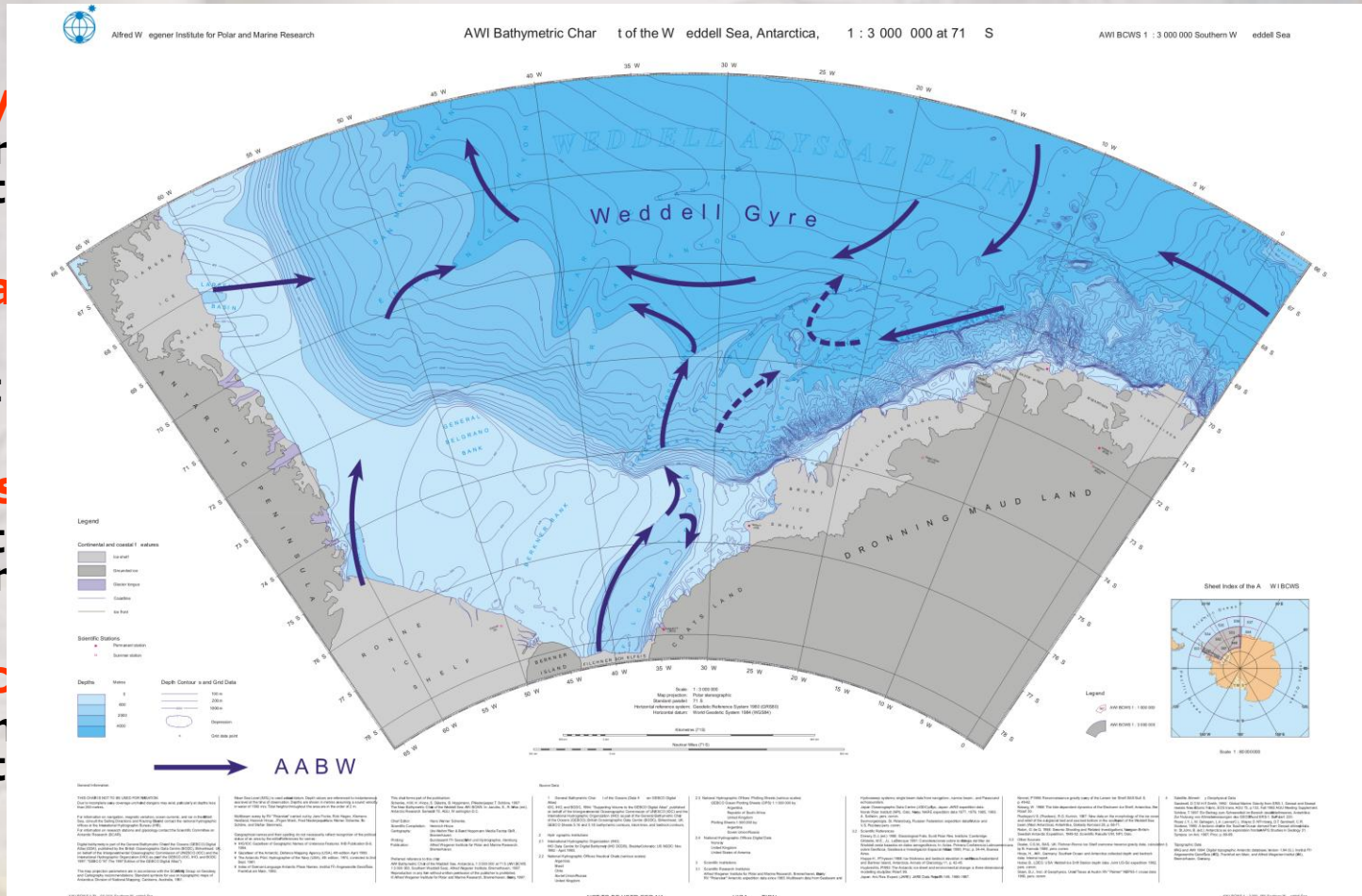
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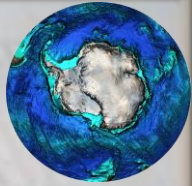




# Bathymetry in Ocean Models

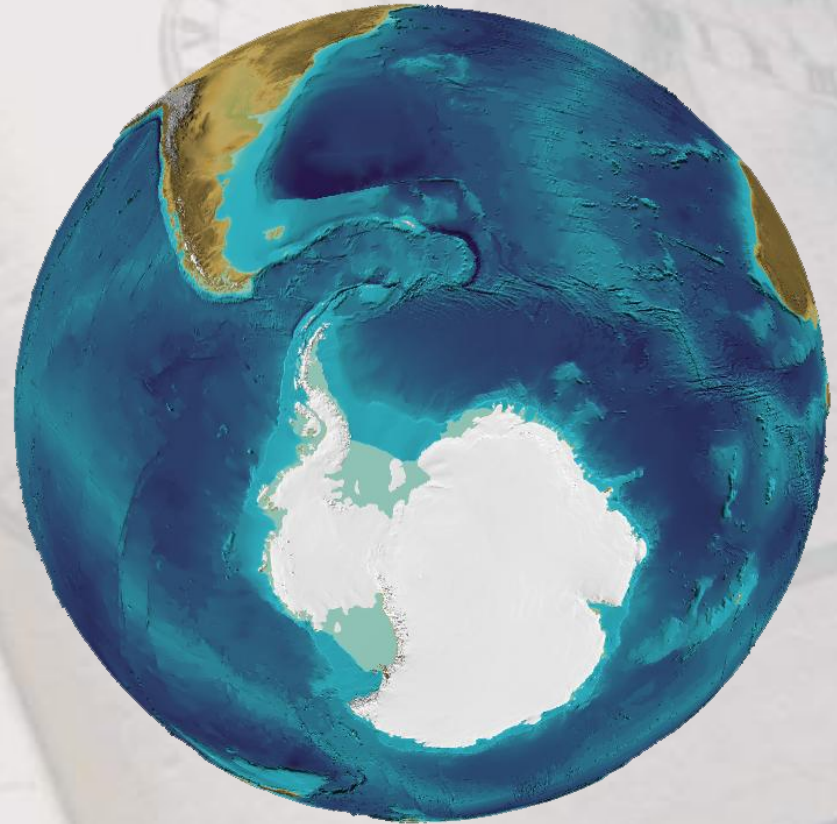
- **Topography**
  - major current bathymetry
- **Sea floor bathymetry**
  - influence transport
- **Models sensitivity**
  - specific bathymetry resolution
- **Limiting factor**
  - improvement bathymetry

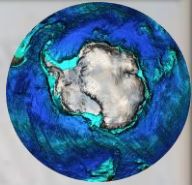




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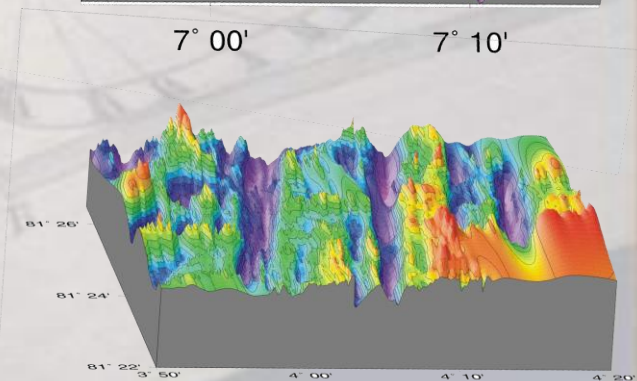
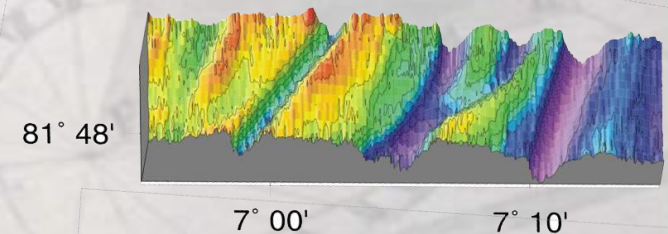
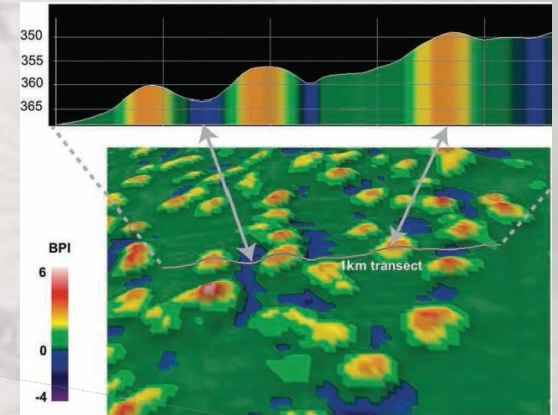
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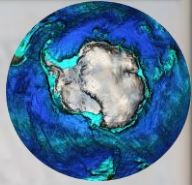




# Biodiversity Conservation

- **Multi-scale terrain analysis**
  - Slope, aspect, curvature, variability
- **Bathymetric Position Index**
  - Predictive habitat modeling
  - Characterization of habitats
- **Benthos Ecology**
  - Iceberg groundings
  - Disastrous seafloor damages



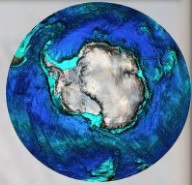


# Mutual Benefits

## Information & data Exchange:



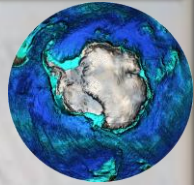
- **Bathymetric/hydrographic data**
  - SCAR and HCA MS
  - Digital raw data, grids, contours, and maps
  - Archive IHO DCDB in Boulder, CO
- **Topographic data of Antarctica**
  - DEM, satellite imagery, RAMP data, etc.
  - Coastline, grounding line, ice front, etc.
- **Oceanic data and observations**
  - Currents, CTD, Met Data
- **Additional data, metadata**
  - Geographic names, limits of the sea, etc.



# The Message

- Hydrographic data are of **greatest importance** to most scientific research activities.
- The availability of precise bathymetric and topographic data in Antarctica is crucial for the creation of a scientific **geodata base** and for the production of **Nautical Charts**.
- In the sparse data area of Antarctica, the continuous **meta and raw data exchange** between the national Hydrographic Offices and research institutions is vital.
- **Collaboration** would improve the integration of sensitive indicators for ocean modeling, climate change, and ocean ecology.
- The **IBCSO**, established under the auspices of IHO, IOC, and SCAR, could serve as a **scientific and hydrographic** Southern Ocean Geographic Information System.

<http://www.ibcso.org>



# Network



– International Hydrographic Organization / HCA



– Intergovernmental Oceanographic Commission



– Scientific Committee on Antarctic Research



– General Bathymetric Chart of the Oceans

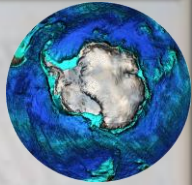


– International Bathymetric Chart of the Southern Ocean



– Alfred Wegener Institute for Polar and Marine Research

and more ...



Thank you!

**Hans Werner Schenke**

Alfred Wegener Institute for Polar and Marine Research  
Bremerhaven, Germany



