Strengthening international ocean research and data

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International Ocean Governance - An agenda for the future of our oceans; European Parliament, 30 January 2017

Balance between Fundamental and Applied Science

Cannot sustainably use, govern or protect what we do not understand.

Quest for **knowledge and understanding natural phenomena, processes and governing laws**

Major technological breakthroughs often originate from fundamental science
(e.g. gravity – space exploration; electromagnetism – telecommunications, electronics, TV; quantum mechanics – computers, electronics, atomic clocks, NMR).

Quest for an **immediate application without fully understanding** a system may lead to **unpredictable and complex consequences** sometimes difficult to control.

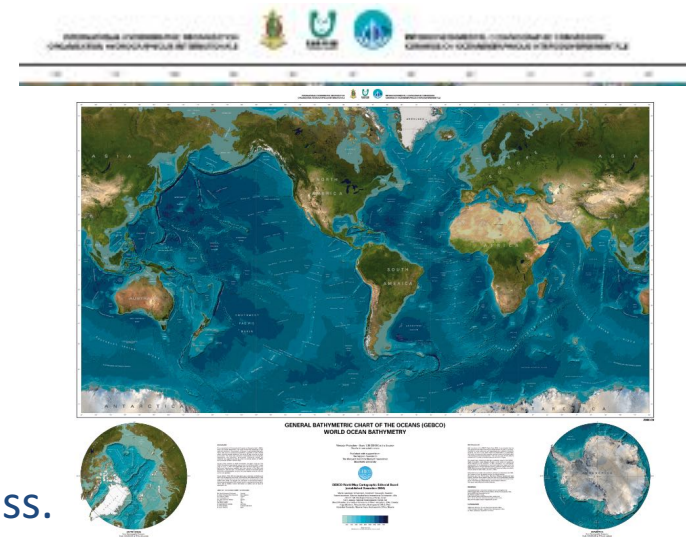
Strengthening ocean research requires a **good balance between fundamental and applied research**. Continue to foster trans-european research and training programs. Strenghten regional ocean research centers.

Need to **support both** and **include long term vision**!

Global Mapping Program of the Ocean Floor

Less than 10% of the world's oceans systematically surveyed with adequate resolution.

Only possible through worldwide international coordinated collaboration and coordination (IHO/IOC). Avoid repetition - "collect once, use many times". Open access.



GEBCO: The General Bathymetric Chart of the Oceans

Europe can have a leading role in promoting/supporting such a program:
(1) through initiatives such as the **Atlantic Seabed Mapping Programme (EU, USA, Canada);** (2) **Encouraging Member States to contribute with data** (including legal continental shelf extension MB surveys, even if partially or with lower resolution) to major world databases such as the IHO Data Centre for Digital Bathymetry (DCDB), which operates with the IOC of UNESCO, the **GEBCO** (General Bathymetric Chart of the Oceans) Project. Include multibeam backscatter imaging for **habitat mapping**; (3) **Promoting and supporting such a initiative at international level.** Fundamental tool for modelling ocean hazards, such as tsunamis. Coordination with the **IOC** and the **UN** to access governments worldwide is particularly important.

Strengthen EU participation in large International Ocean Research Programs

International Ocean Discovery Program (2013-2030)

– absolute need of drilling to test hypothesis and theories

1. **Climate and Ocean Change : Reading the Past, Informing the Future**

   CO_2, Climate variability, Sea-level change, Ocean chemistry, Ocean acidification

2. **Biosphere Frontiers : Deep Life, Biodiversity, and Environmental Forcing of Ecosystems**

   Limits of Life, Deep Biosphere,

   Impact of Environmental and Chemical Changes on Ecosystems

3. **Earth Connections : Deep Earth Processes and Impacts**

   Ocean crust formation, Subduction zones,

   Volcanic Arcs, Magmatic Processes at Ridges

4. **Earth in Motion : Processes and Hazards on Human Time Scales**

   Earthquakes, Landslides, Tsunamis, Fluid Flows, Carbon Storage

MSP expeditions for the Integrated Ocean Drilling Program

ECORD MSP expeditions

Baltic Sea Paleoenvironment (#347 ; 2013)

New Jersey Shallow Shelf (#313; 2009)

Arctic Coring Expedition (#302 ; 2004)

Tahiti Sea Level (#310; 2005)

Great Barrier Reef Environmental Changes (#325 ; 2010)

Ice covered areas

Shallow water environments (coral reefs, continental shelf)

- Climate change, ice sheet dynamics and sea-level change
- Atlantis Massif (2015); Chikxulub Impact crater (2016)

Courtesy G. Camoin (ECORD)

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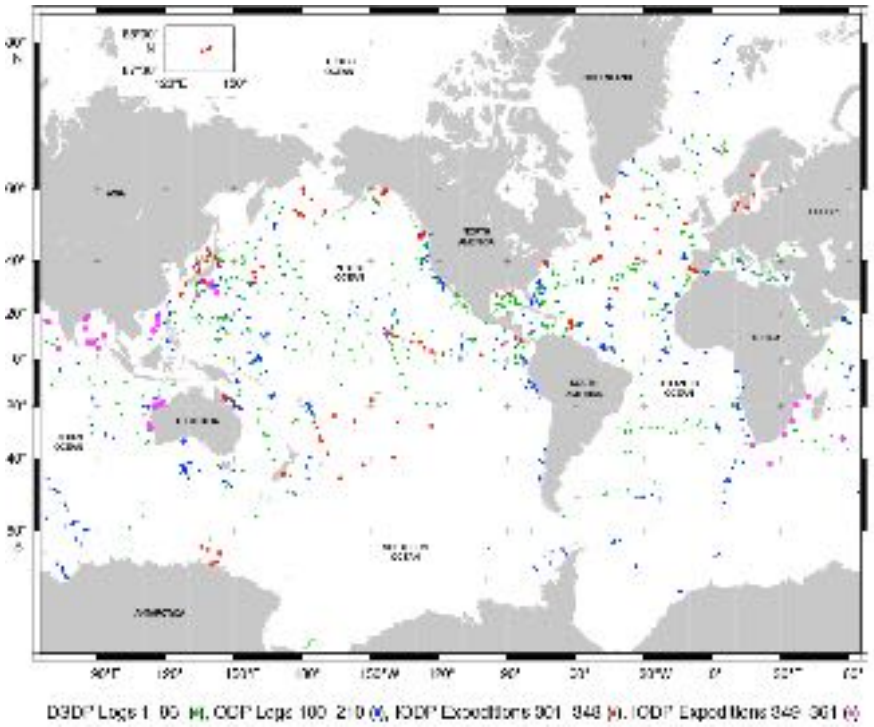
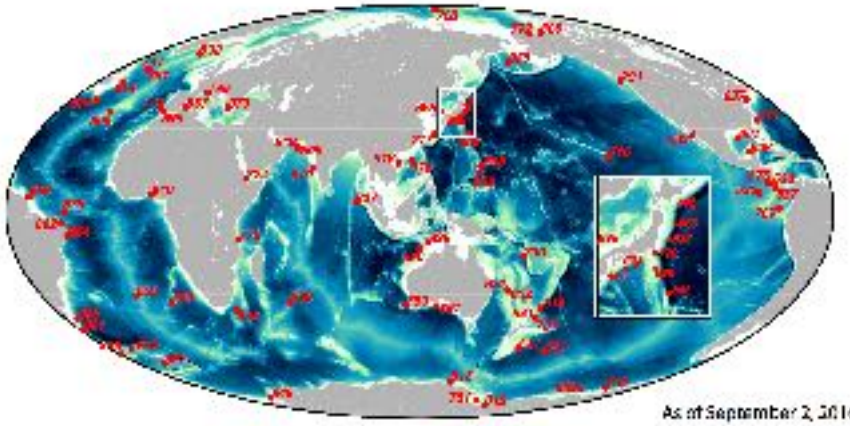
International Ocean Discovery Program





- **Public access to cores and data**

Bremen Core Repository

- *> 152 km of cores*
- *Atlantic Ocean, Arctic Ocean, Mediterranean Sea*

Core Repositories
BCR – Bremen, Univ. Bremen, Germany
GCR - Gulf Coast Repository, Texas A&M Univ., College Station, Texas
Rutgers/NJGS Repository satellite reposit. New Jersey/Delaware land cores
KCC - Kochi Core Center Kochi University, Japan

Coherent Strategy on Ocean Observation and Data Management

Coherent International Ocean Observation Strategy
Joining of efforts between governments. IOC/UN

Assessing current needs and voids, development and integration of **new tools and technologies** – satellite, ship-borne, long term observatories, AUV's/Drones.

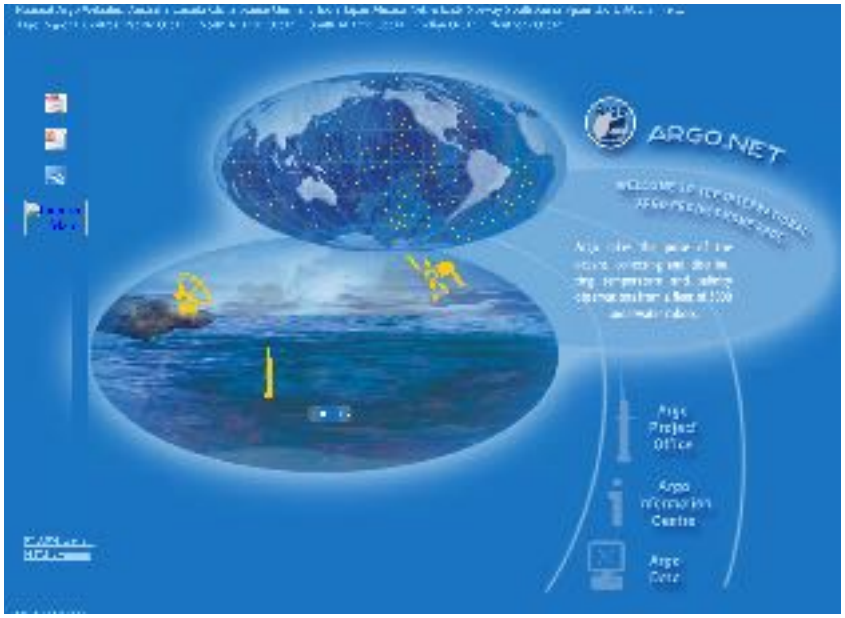
Collaboration with **industry** is essential. **Innovation**.

Coordination with **GOOS**, the ocean component of the **Global Earth Observations System of Systems GEO/GEOSS**.

Clear standards for data acquisition, quality control/validation. Long term time series Deep sea observatories - **EMSO**.

Coherent Strategy on Ocean Observation and Data Management

ARGO, GTSPP, CCHDO
World Ocean Database
World Ocean Atlas,
World Ocean Circulation Experiment (WOCE)
SeaDataNet
Medar/Medatlas



International integration and coordination – open access!

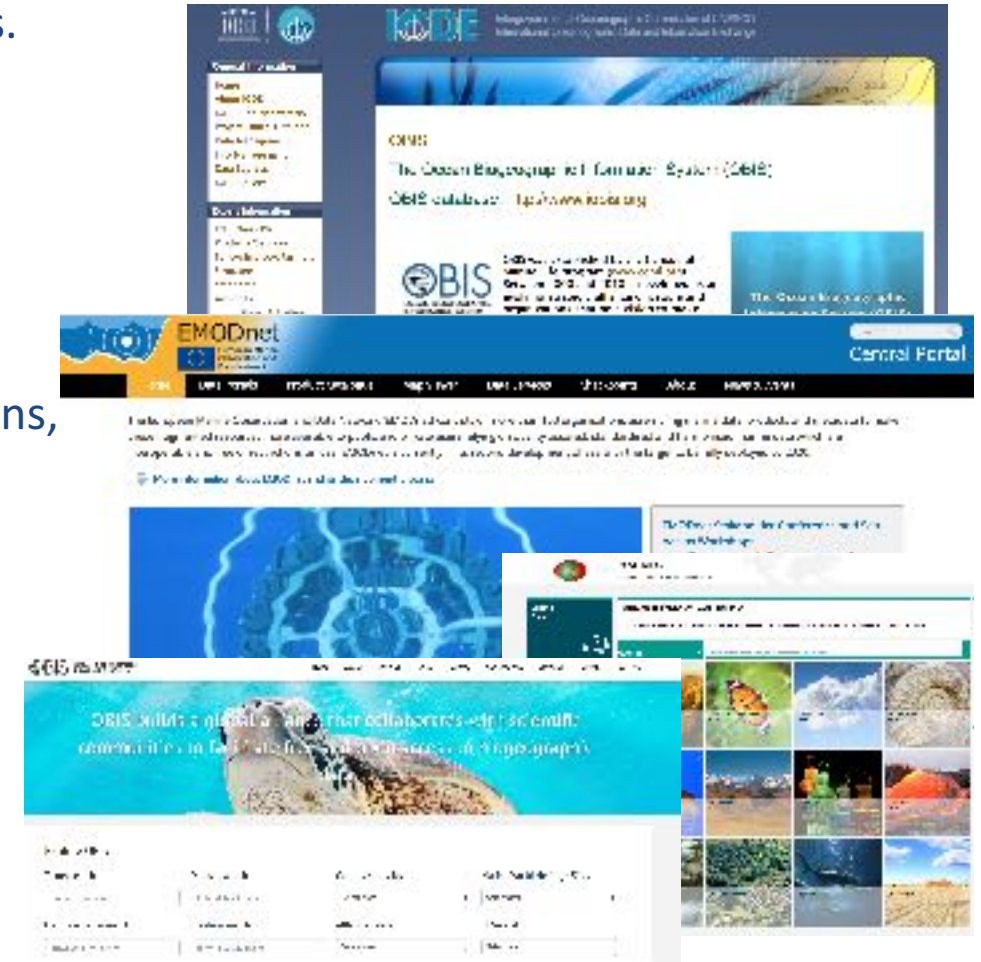
Coherent Strategy on Ocean Observation and Data Management

Strenghten existing EU/International ocean databases and promote coordination and data merging accessible through regional nodes.

Policy of **open free access to ocean data**.

EMODnet - A major breakthrough!
The **European Marine Observation and Data Network** – The Gateway to marine data in Europe. More than 160 contributing organisations, quality-assured, standardised and harmonised marine data.

OBIS (IODE Steering Group, Ostende, IOC)
National Ocean Data Centers (NODC).
Promote greater collaboration and interchange of information.
PANGAEA (Marum/AWI) / **LEVITUS** (NOAA)



Training the 21st Century Marine Scientist

Need for Trans-national Cooperation in Training Programs for young marine scientists
Training Through Research Program (IOC), M. Curie Networks, EUROFLEETS
Marine Board Working Group, New Hampshire Ocean mapping courses.

Access to Large Scale Facilities

Foster trans-national research cooperation and access to large-scale ocean research facilities.

Strengthen regional centers. **EUROFLEETS**. ERVO, OFEG.

Oceans - a Common Heritage of Mankind

*" **Governments need to work together with greater urgency**, to address the many natural and man-made issues concerning the ocean; they need to **understand better the role that ocean science can play** and they need to **develop much stronger ocean governance mechanisms** to profit from the knowledge obtained".*

(Troubled Waters: ocean science and governance, Holand and Pugh, 2010)

Global Challenge! Important to reinforce the role of **Intergovernamental Oceanographic Commission (UNESCO IOC)**, that has a clear mandate to coordinate ocean research, observations, capacity development, research and observations technology transfer under the **UN system**. Resources available for fulfilling the mandate are far from sufficient and action needs to be taken. Established by UNESCO and being a part of UNESCO, IOC enjoys functional autonomy in UNESCO.

IOC MS will propose an International Decade of Ocean Science for Sustainable Development (2020-2030)- towards the Ocean We Need for the Future We Want to the UN Ocean SDG Conference, in June 2017.

Many thanks for your attention!