



**Università di Trieste**  
**Corso di Laurea in Geologia**

**Anno accademico 2020 - 2021**

# **Geologia Marina**

Parte II

## **Modulo 2.4    Perforazione Oceanica**

Docente

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# Scientific ocean drilling is one of Earth sciences' longest running and most successful international collaborations.



# The International Ocean Discovery Program (IODP)

Exploring the Earth Under the Sea

is an international marine research collaboration that explores Earth's history and dynamics using ocean-going research platforms to recover data recorded in seafloor sediments and rocks and to monitor subsurface environments

<http://www.iodp.org>

*End in October 2023*



Integrated  
Ocean Drilling  
Program  
(IODP)  
2003- 2013

October 2013

International  
Ocean Discovery  
Program (IODP)



Ocean Drilling  
Program  
(ODP)  
1985-2003

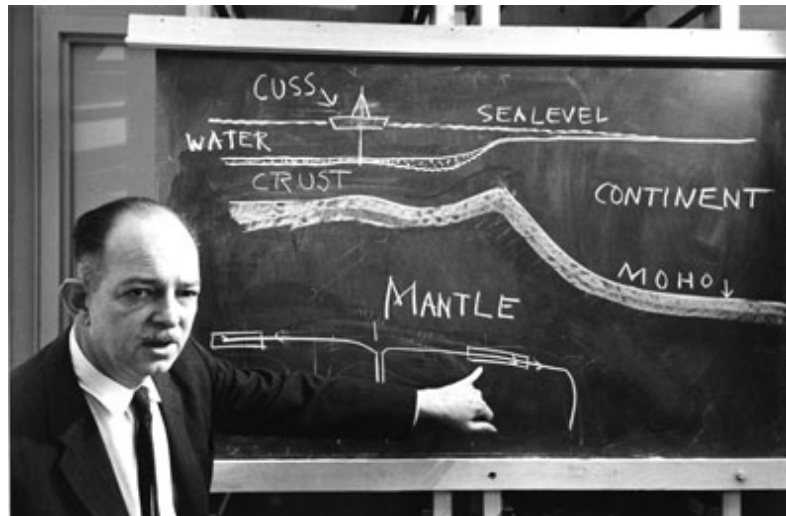


Deep Sea  
Drilling  
Project  
(DSDP)  
1968-1983



MOHOLE  
1958-1966

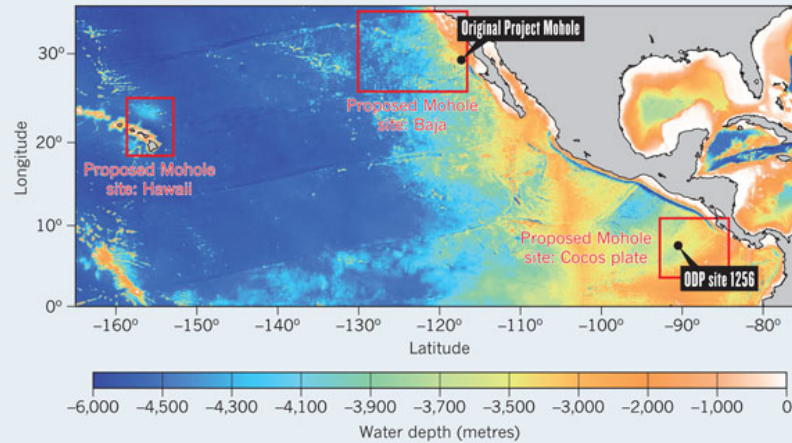
In 1961 scientific drilling took root as a feasible technology to study Earth's subseafloor geology. **Project Mohole**, a concept developed by the American Miscellaneous Society with funding from the National Science Foundation, considered the feasibility of **drilling through the Mohorovičić seismic discontinuity**



Harry Hess, a founding father of the theory of plate tectonics, explains Project Mohole  
Damon Teagle and Benoît Ildefonse, *Nature*, 2011.

### DRILLING SITES

Three areas are under consideration for drilling into the mantle. One includes the original Project Mohole drilling site. Another includes a site (ODP site 1256) where scientists will drill this year into the lower crust.



*Drill ship CUSS 1*



Five holes were drilled off the coast of **Guadalupe Island, Mexico**, the deepest to 601 ft (183 m) below the sea floor in 11,700 ft (3,600 m) of water. This was unprecedented: not in the hole's depth but because of the depth of the ocean and because it was drilled from an untethered platform. Also, the core sample proved to be valuable; penetrating through Miocene-age sediments for the first time to reveal the lowest 13 m (44 ft) consisting of basalt.

The next phase of scientific ocean drilling, the **Deep Sea Drilling Project (DSDP)**, began in 1966 using the Drilling Vessel *Glomar Challenger*. This pioneer vessel for DSDP conducted drilling and coring operations in the Atlantic, Pacific and Indian oceans as well as the Mediterranean and Red Seas. The *Glomar Challenger* also advanced the technology of deep-ocean drilling.



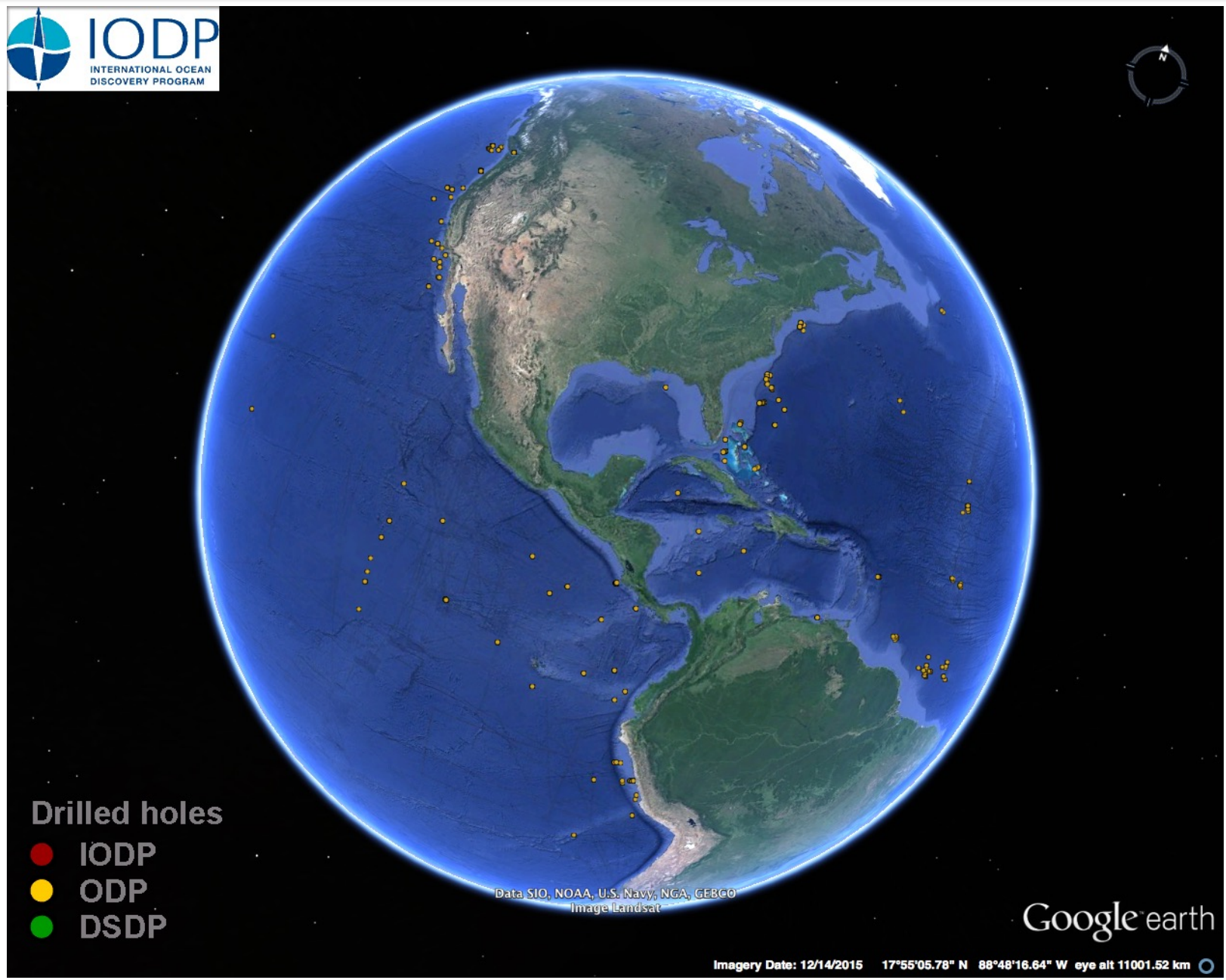
## DSDP drillsites in the Mediterranean and North Atlantic



In 1985, *JOIDES Resolution* replaced the *Glomar Challenger* at the start of a new program, the **Ocean Drilling Program (ODP)**. ODP was truly an international cooperative effort to explore and study the composition and structure of the Earth's subseafloors. The *JOIDES Resolution* conducted 110 expeditions for ODP at 2000 drill holes located throughout the world's ocean basins.







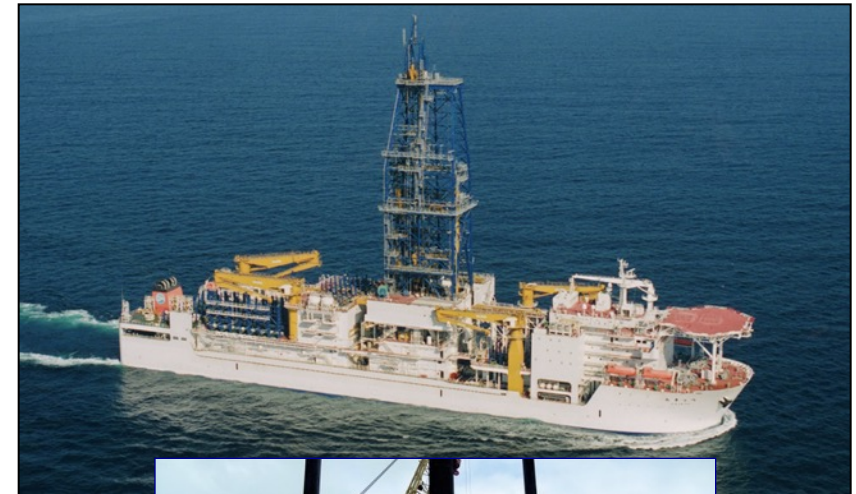
**Drilled holes**

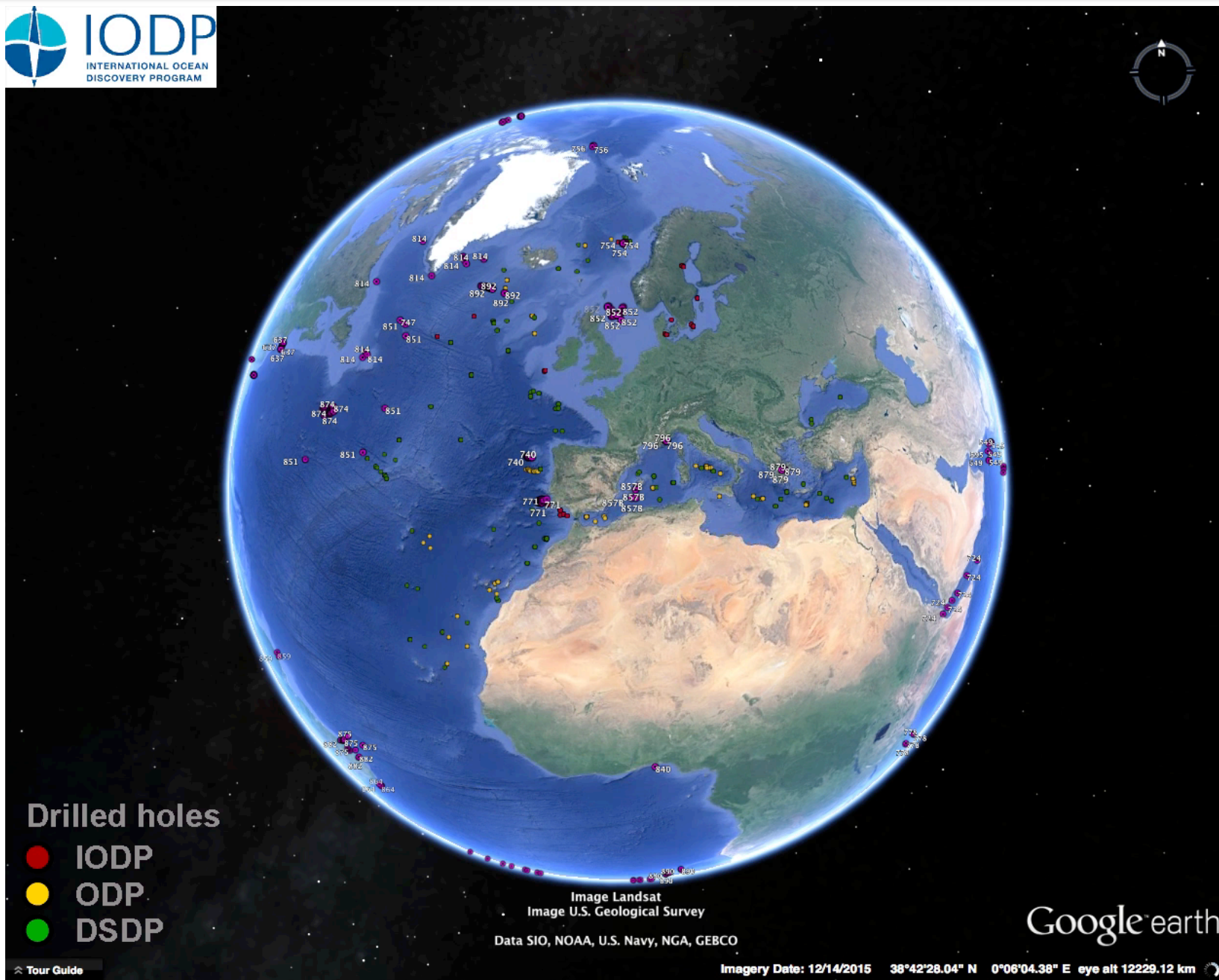
- IODP
- ODP
- DSDP

Data SIO, NOAA, U.S. Navy, NGA, GEBCO  
Image Landsat

Google earth

The **Integrated Ocean Drilling Program (IODP 2003-2013)** built upon the international partnerships and scientific success of the DSDP and ODP by employing multiple drilling platforms financed by the contributions from 26 participating nations. These platforms - a refurbished *JOIDES Resolution*, the new marine-riser equipped Japanese Deep Sea Drilling Vessel *Chikyu*, and specialized Mission-Specific-Platforms - were used to reach new areas of the global subsurface during 52 expeditions.



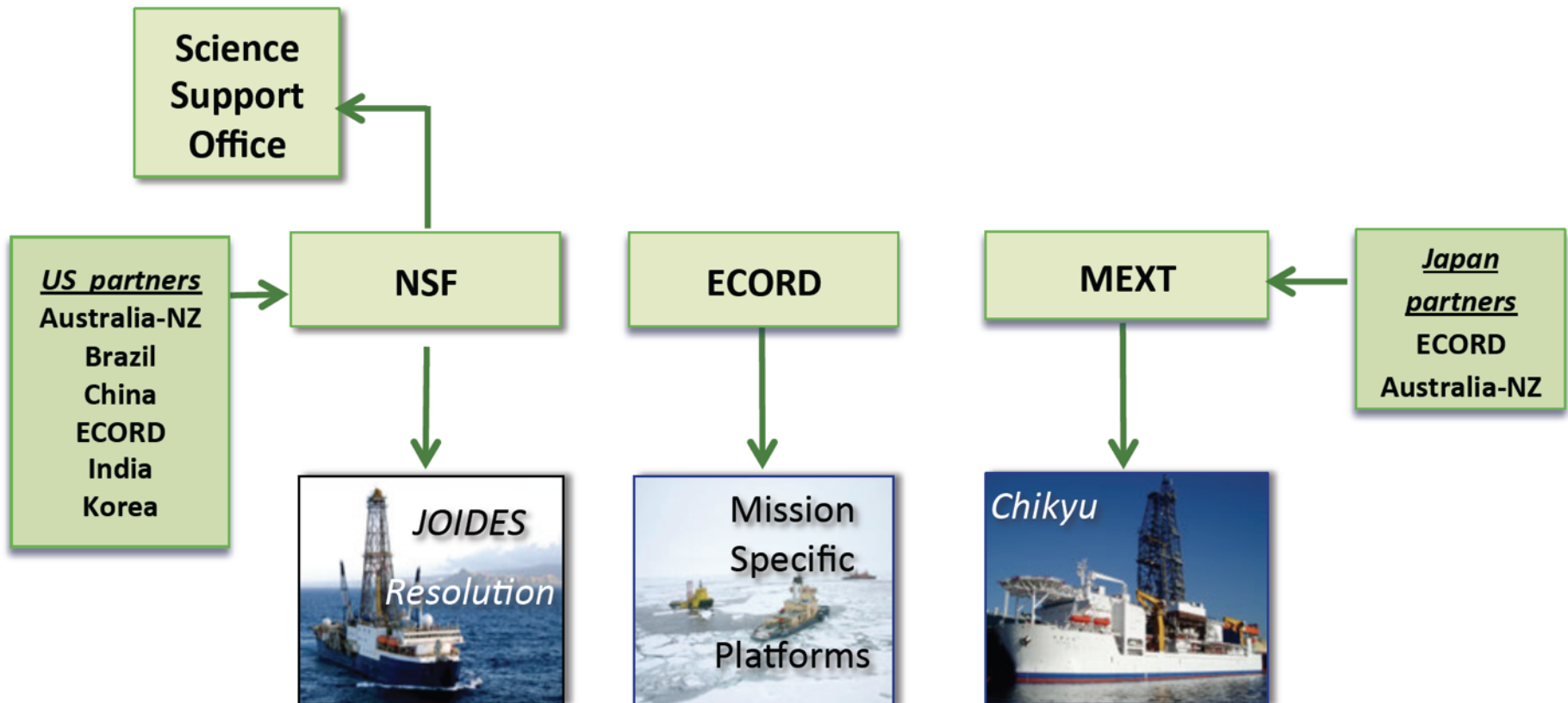


# Fundamental principles of IODP

- **science driven project**
- **science plan**
  - **Climate and Ocean Change:** Reading the Past, Informing the Future
  - **Biosphere Frontiers:** Deep Life, Biodiversity, and Environmental Forcing of Ecosystems
  - **Earth Connections:** Deep Processes and Their Impact on Earth's Surface Environment
  - **Earth in Motion:** Processes and Hazards on Human Time Scales
  - Education AND OUTREACH
- **multiple platform approach to drilling**

# IODP Funding Model

- Each platform operated independently by respective country or consortia
- Science Support Office funded by NSF





Science Community

Support Office  
and Site Survey  
Data Bank

Science Evaluation Panel &  
Environmental Protection and Safety Panel

JR partners  
ANZIC  
Brazil  
China  
ECORD  
India  
Korea

US  
Facility  
Board

NSF

ECORD  
Facility  
Board

ECORD

Chikyu  
IODP  
Board

MEXT

Chikyu partners  
ANZIC  
ECORD



I  
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M

→ Flow of proposals

IODP members ;  
Industry ; Other countries

→ Annual funding  
-→ Project-basis funding



## HOW MUCH DOES IT COST? Example from end of IODP phase

<b>NSF and MEXT</b>	Total program costs (75 M USD / anno) Platform operation costs Science operation costs
<b>ECORD</b>	7 M USD / year (2003-2006) 16.8 M USD (2006)
<b>MOST</b>	5.5 M USD 2003-2008 (1.0 - 1.5 M USD / year)

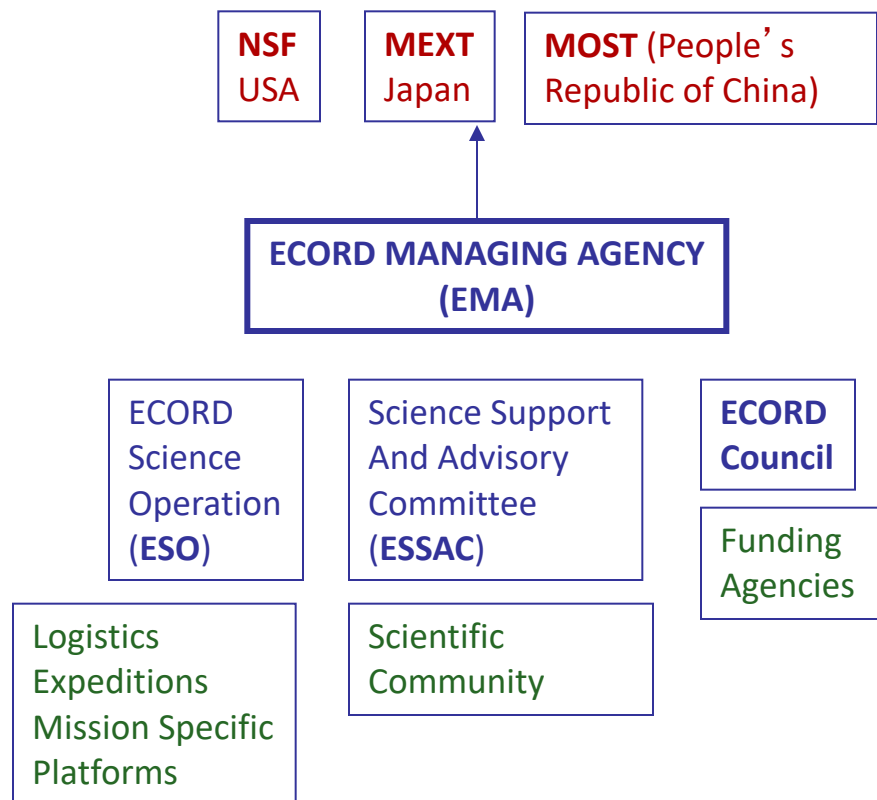
## ECORD

(European Consortium for Ocean research Drilling).



### 16 European nations + Canada

Austria	Italy
Belgium	The Netherlands
Canada	Norway
Denmark	Portugal
Finland	United Kingdom
France	Spain
Germany	Sweden
Ireland	Switzerland
Iceland	



Prevision 2005: *ECORD 12.5 Million USD, ~ 17 % of IODP*



## ECORD Science Operation (ESO)

**ESO** is a consortium of European scientific institutions created to manage the operations of the **Mission Specific Platforms-MSP** on behalf of ECORD in the framework of the [Integrated Ocean Drilling Program-IODP](#).

**ESO** is composed by:

- The [British Geological Survey - BGS](#), (co-ordinator) responsabile of the overall management, under contract with EMA as indicated by the ECORD Council;
- The [University of Bremen](#), sub-contracted by BGS to manage the core repository and the data management with the WDC-MARE/PANGAEA ([IODP-MSP data portal](#)). GFZ Potsdam contributes with by supporting ESO with the Drilling Information System (DIS) for offshore data acquisition;
- The [European Petrophysical Consortium](#), sub-contracted by BGS to manage the Wireline Logging operations and petrophysical activities. The Consortium is composed by:
  - University of Leicester (co-ordinator), U.K,
  - the Université de Montpellier 2, France,
  - RWTH Aachen, Germany and Vrije Universiteit of Amsterdam, Netherlands.