

“Scientific Drilling of Polar oceans: opportunities for scientists, students and educators”

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Talk outline

Laura De Santis

Scientific drilling of Polar Ocean



IODP
INTERNATIONAL OCEAN
DISCOVERY PROGRAM



Elisabetta Olivo

OGS Explora 2017 Antarctic cruise – PNRA 32°
expedition



Giulia Massolino

PhD student + outreach and science communication



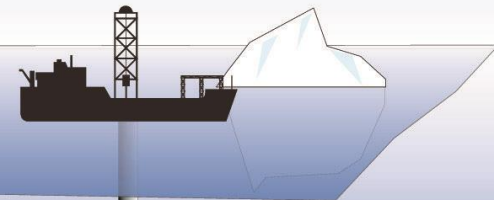
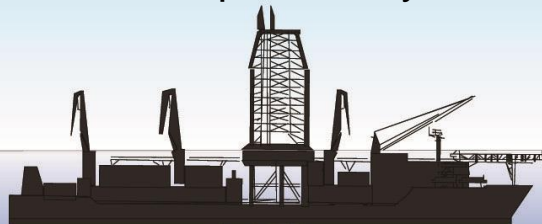
IODP USA & associated
Riserless Drilling
Joides Resolution
4 expeditions/year



IODP Japan
Riser Drilling
Chikyu
1-3 expeditions/year



ECORD
Mission-Specific
Platforms (MSP)
1 expedition/year



Reentry camera

Reentry cone

Sea water

Drill bit



Riser (circulation back to ship)

Blow out preventer

Drilling mud

Drill bit

Sea water

Drill bit



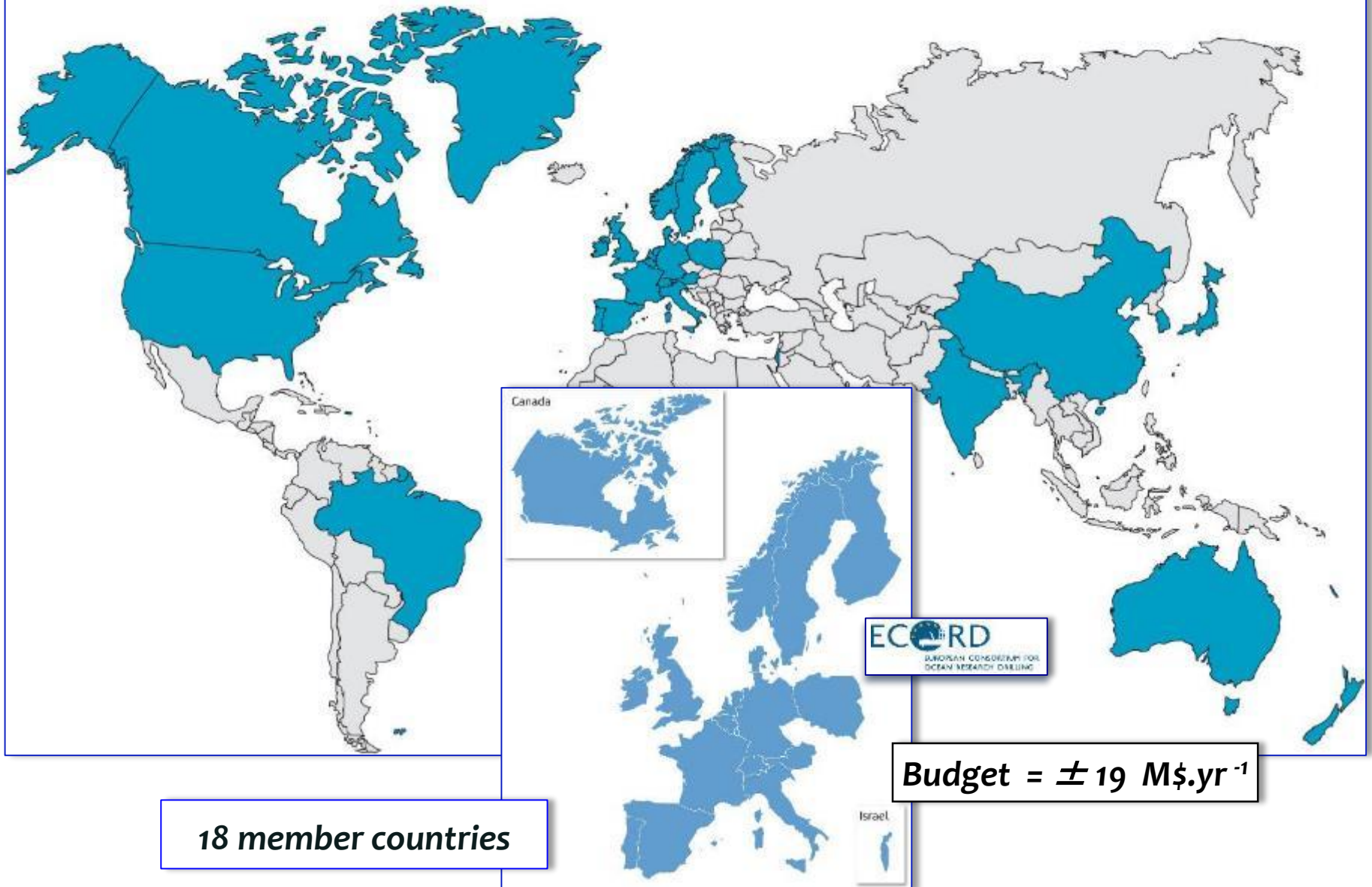
IODP
INTERNATIONAL OCEAN
DISCOVERY PROGRAM

www.iodp.org

26 member countries

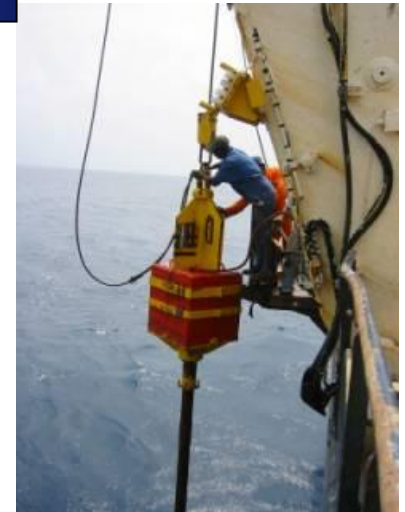


Budget = $\pm 200 \text{ M}\$. \text{yr}^{-1}$



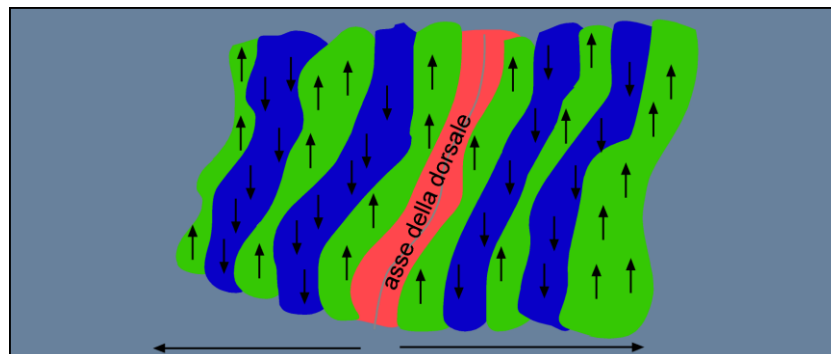
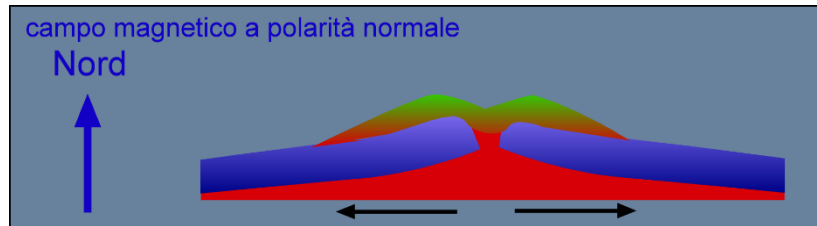
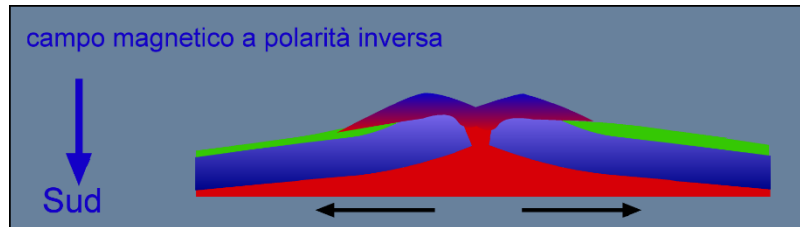
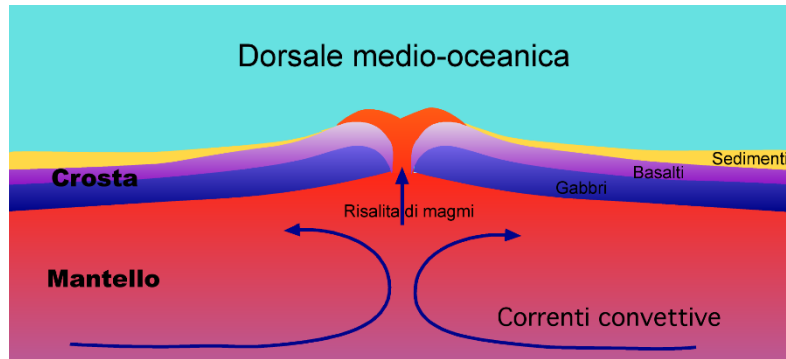


leg 301 IODP ACEX (2004)



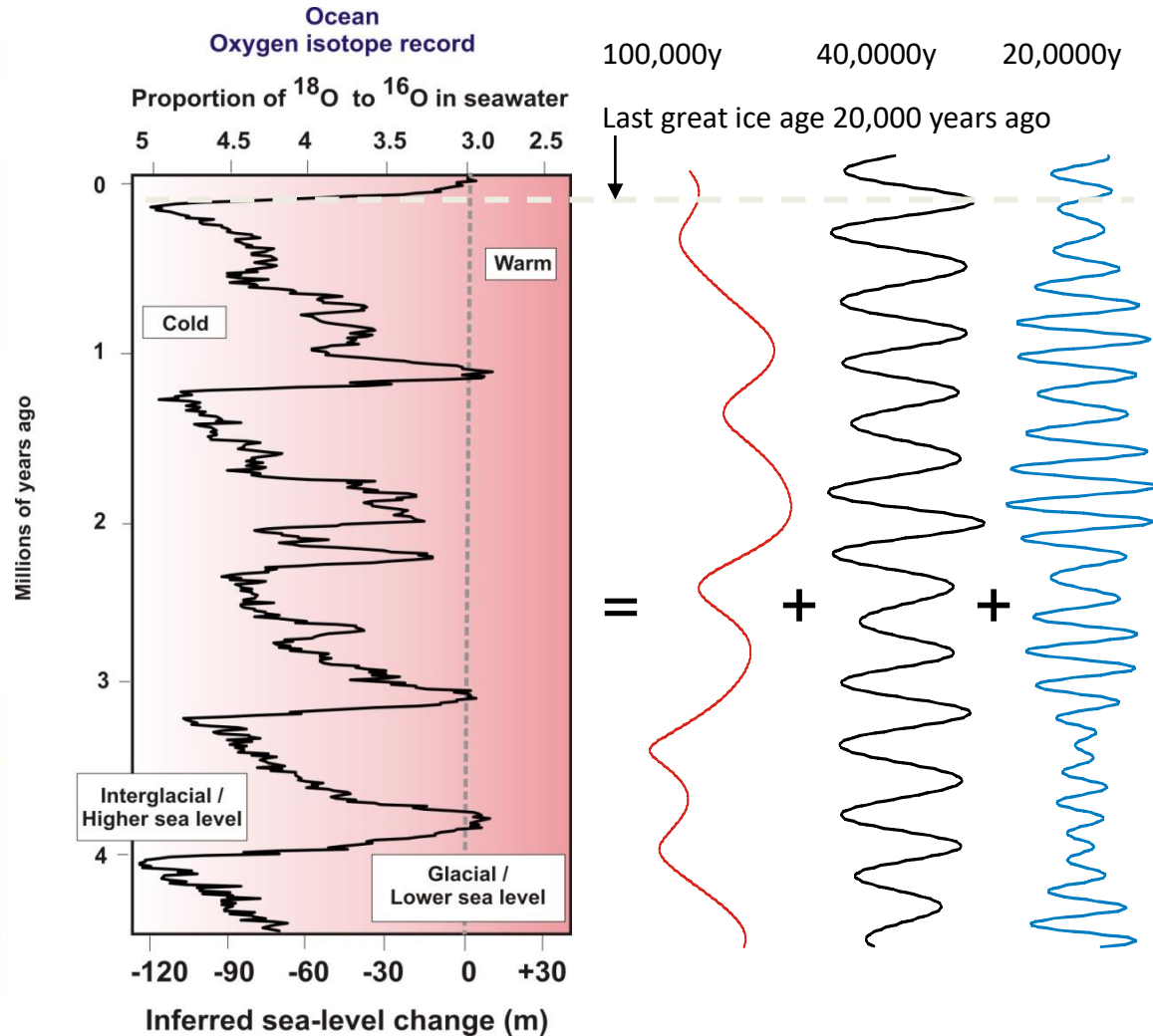
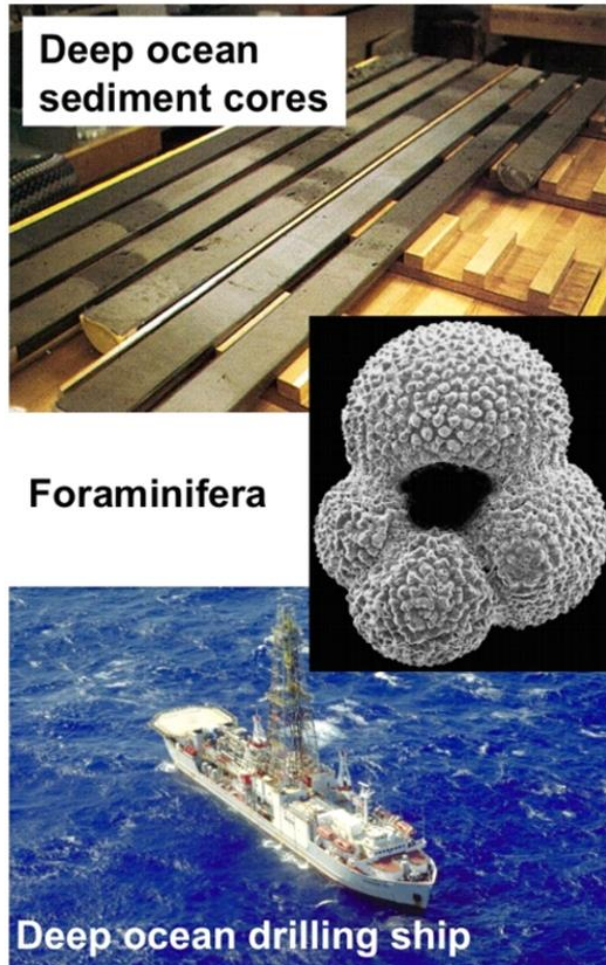
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Plate Tectonic hypothesis proven by ocean floor drilling

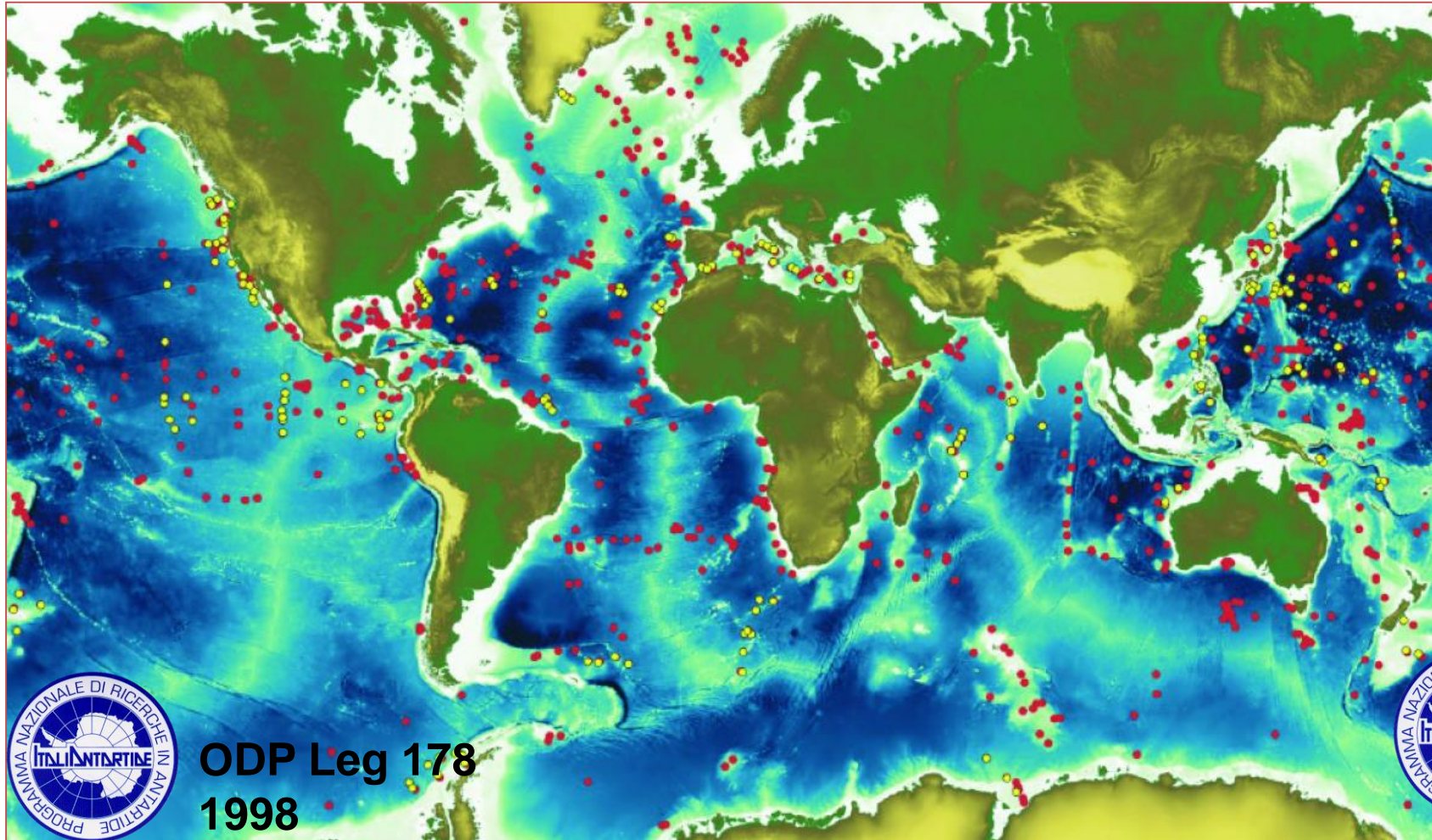


(figure di A. Camerlenghi OGS)

Milankovitch theory of climate proven by ocean floor drilling



ODP Leg 178: A. Camerlenghi (OGS) co-chief and PNRA collected site survey data
IODP Exp. 374 (2018): L. De Santis (OGS) co-chief and PNRA collected site survey data



ODP-IODP sites



ODP-IODP sites with
Italian participation



CORE REPOSITORIES

- Univ. of Bremen (Germany)
- Texas A&M Univ. (USA)
- Kochi Univ. (Japan)



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

CO₂, Climate variability, Sea-level change, Ocean chemistry, Ocean acidification

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

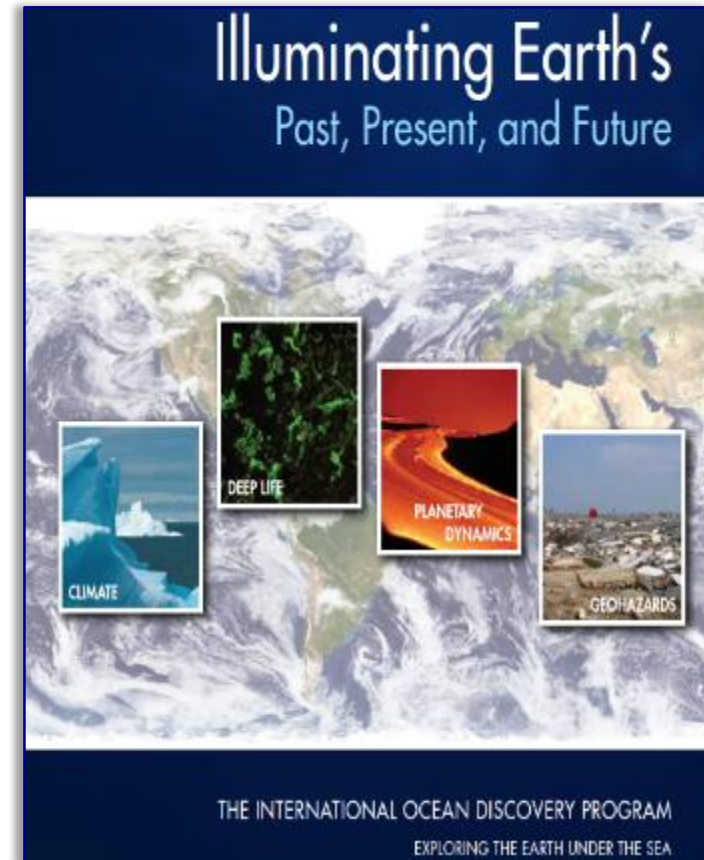
Limits of Life, Deep Biosphere, Impact of Environmental and Chemical Changes on Ecosystems

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



Nicole Kurtz IODP outreach coordinator nkurtz@LDEO.columbia.edu

<http://joidesresolution.org/node/453>
[@theJR/twitter](http://www.joidesresolution.org)
[@joidesresolution/facebook](https://www.facebook.com/joidesresolution/)

MSP Expedition 377 Arctic Ocean
Paleaoceanography call open end of April 2017
<http://www.ecord.org/expedition377/>

@ECORD_outreach (twitter)
ESSAC ECORD (Facebook)
Patricia Maruejol
maruejol@crpg.cnrs-nancy.fr

Classroom teachers
Informalscience
educators
Artists
Videographers
Writers
Social media experts



Time left before launch: 1 day 21 hours from now Current time on ship: Wednesday, April 12, 2017 - 01:06

JOIDES RESOLUTION

Science in search of Earth's secrets

HOME MEET THE JR EXPEDITIONS RESOURCES BLOG

Home > Get Involved > Onboard Education Outreach Officer/Teacher at Sea

Onboard Education Outreach Officer/Teacher at Sea

Want to sail on the JR as an educator/outreach officer?
We are now currently accepting applications to sail on one of 2 expeditions until April 17th!

JOIDES Resolution Onboard Education/Outreach Officers sail on board the ship to share the science story with students, families, and the general public. We welcome applications from K-12 classroom teachers, informal science educators, artists, videographers, writers, social media experts and anyone who can make a good case for themselves! Selected applicants will have the opportunity to learn shipboard science alongside the expedition's science party and translate the exciting science happening on board through creation of blogs, videos, social networking sites, [live ship-to-shore video events](#) and development of educational resources. Successful applicants will be creative, flexible, friendly and hardworking. Some geoscience background is helpful. All expenses for U.S. Onboard Education/Outreach Officers for travel to and from the ports of call, and a \$10,000 stipend are paid by the [U.S. Science Support Program](#) for IODP. Onboard Education/Outreach Officers are selected through a competitive application and interview process. The selected also be flown to a 3-day training session prior to their expedition. Non-U.S. applicants will be directed to their country but are still encouraged to apply.

Upcoming expeditions are at their links below:

[Expedition 375: Hikurangi Subduction Margin](#), March 8, 2018 - May 5, 2018

[Expedition 376: Brothers Arc Flux](#), May 5, 2018 - July 5, 2018

To apply, you will need to complete the application through our [new on-line application portal](#). During the application be asked to rank the expeditions in which you are interested. Our application has the following components:

- a completed application form
- an up-to-date C.V.
- a recommendation letter
- contact information for two additional references
- a one-page proposal for what projects you would like to do while on-board
- answers to several short essay questions
- a letter of support from your administrator if needed

[Want to read our three-year evaluation report about the Education Officer experience? Download it below!](#)

OTHER COOL STUFF

[Drilling into the Seafloor -- Just for Kids](#)
[Teacher Resources](#)

GET INVOLVED
Sign up for JR email news:

Name:

Organization:

Arctic 302 (2004) Swedish teacher Erik Zetterberg and photographer Hannes Von der Fecht <http://www.hannesvonderfecht.de/reportage/arctic-coring-expedition> and also on <http://www.ecord.org/resources/gallery/photos/msp/arctic/>.

The Antarctic Peninsula is disintegrating

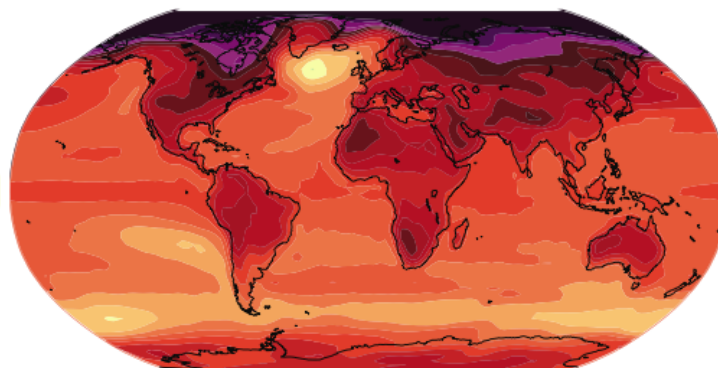
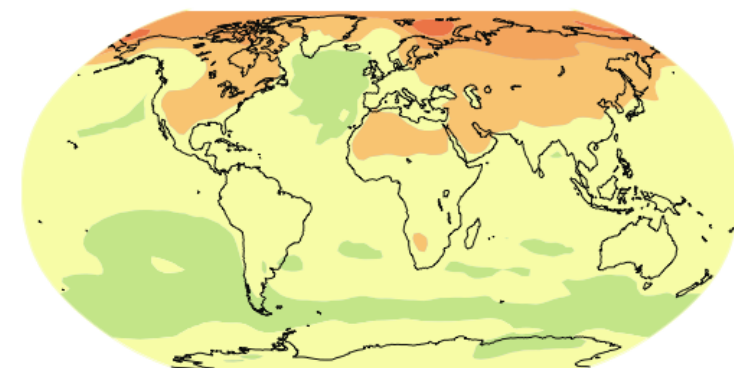
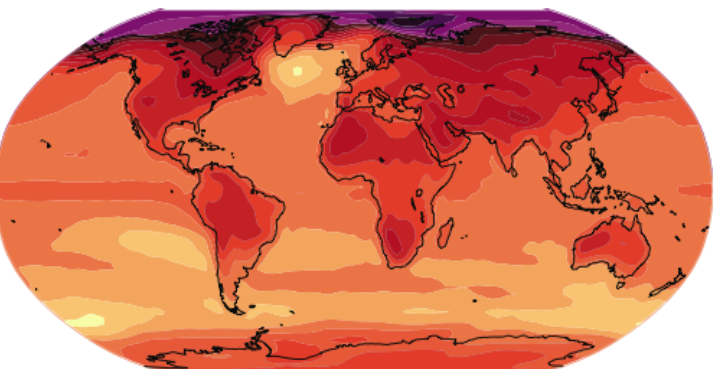
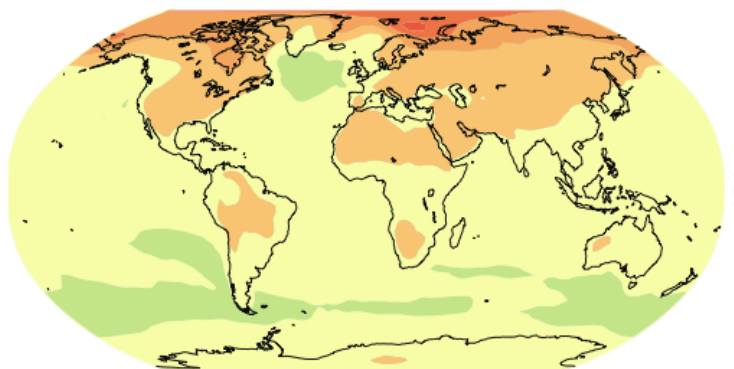
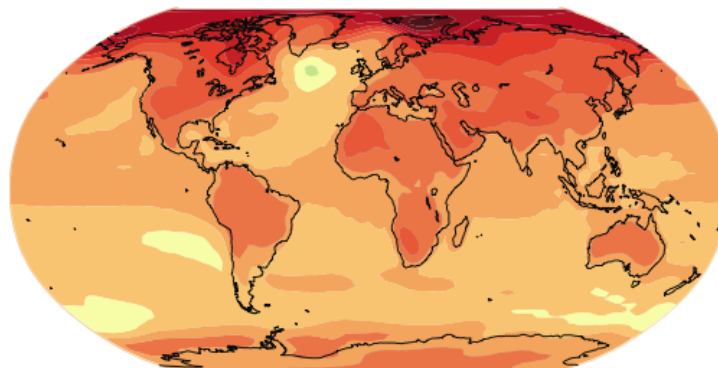
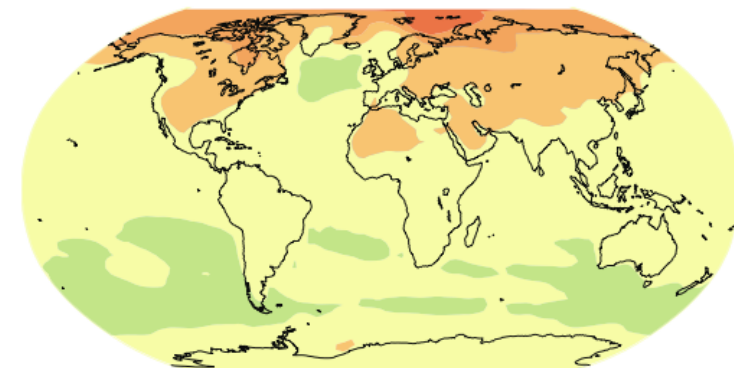


It takes
>10,000 years
to form and a
few years to
disintegrate

Circa 200 km

2020 - 2029

2090 - 2099



0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5

(°C)

Reconstruct ice proximal atmospheric and oceanic temperatures to identify past polar amplification and assess its forcings/feedbacks.

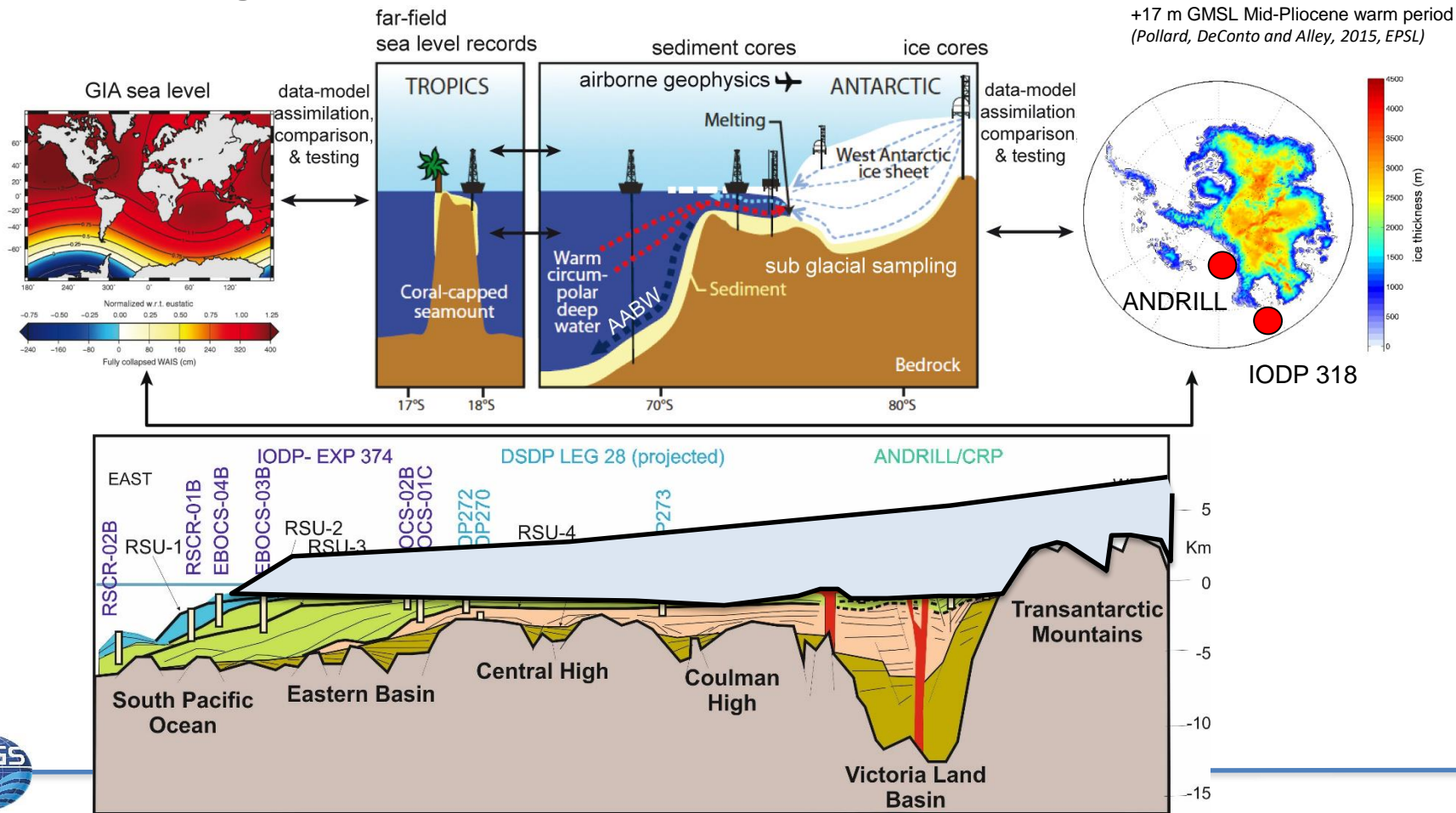
Assess the role of oceanic forcing (e.g. sea level and temperature) on marine ice sheet stability/instability

Evaluate the contribution of Antarctica to far-field sea level estimates.

Identify the sensitivity of Antarctica to Earth's orbital configuration



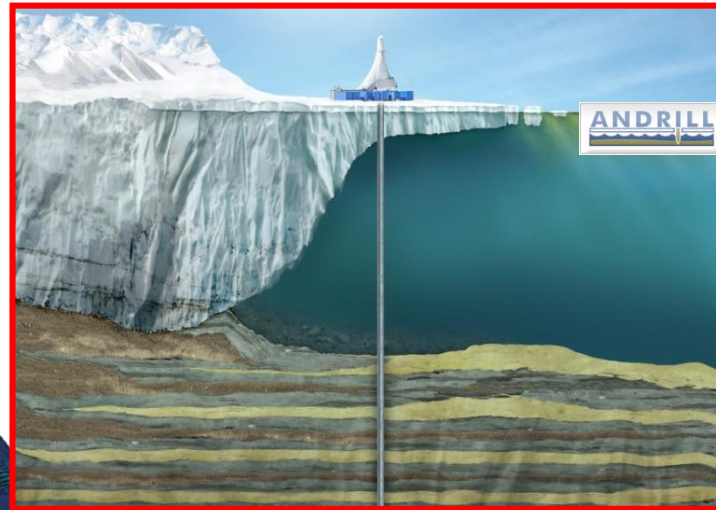
<http://www.scar.org/srp/pais>



Co-ordination of the Antarctic paleoclimate community in the frame of the the SCAR Geoscience program PAIS to secure scheduling of a US\$50 million transect of Antarctic IODP drilling expeditions (Wilkes Land, Ross Sea, Amundsen Sea) in 2017/2018 and 2018/2019.

ANDRILL (2006-08)

Direct evidence of West Antarctic Ice Sheet collapse in the warm Pliocene

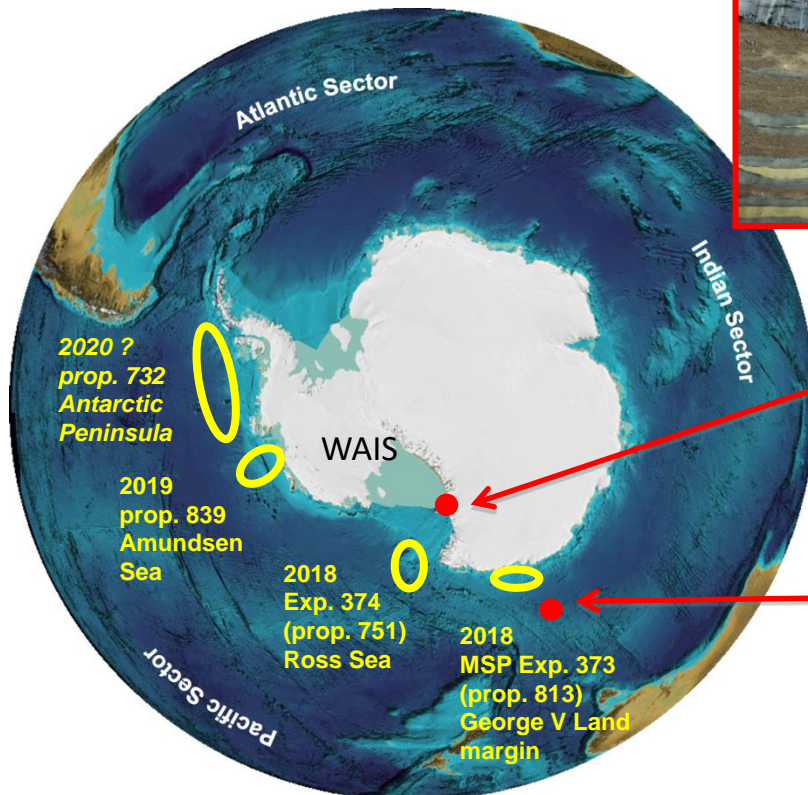


IODP – Leg 318 (2010)

Direct evidence of East Antarctic Ice Sheet retreat



Greenhouse Antarctic 50 million years ago. Cooling after Tasman gateways opening



GEOPHYSICAL METHODS: Sub Bottom Profiling

Recording data along a 2D profile: an example

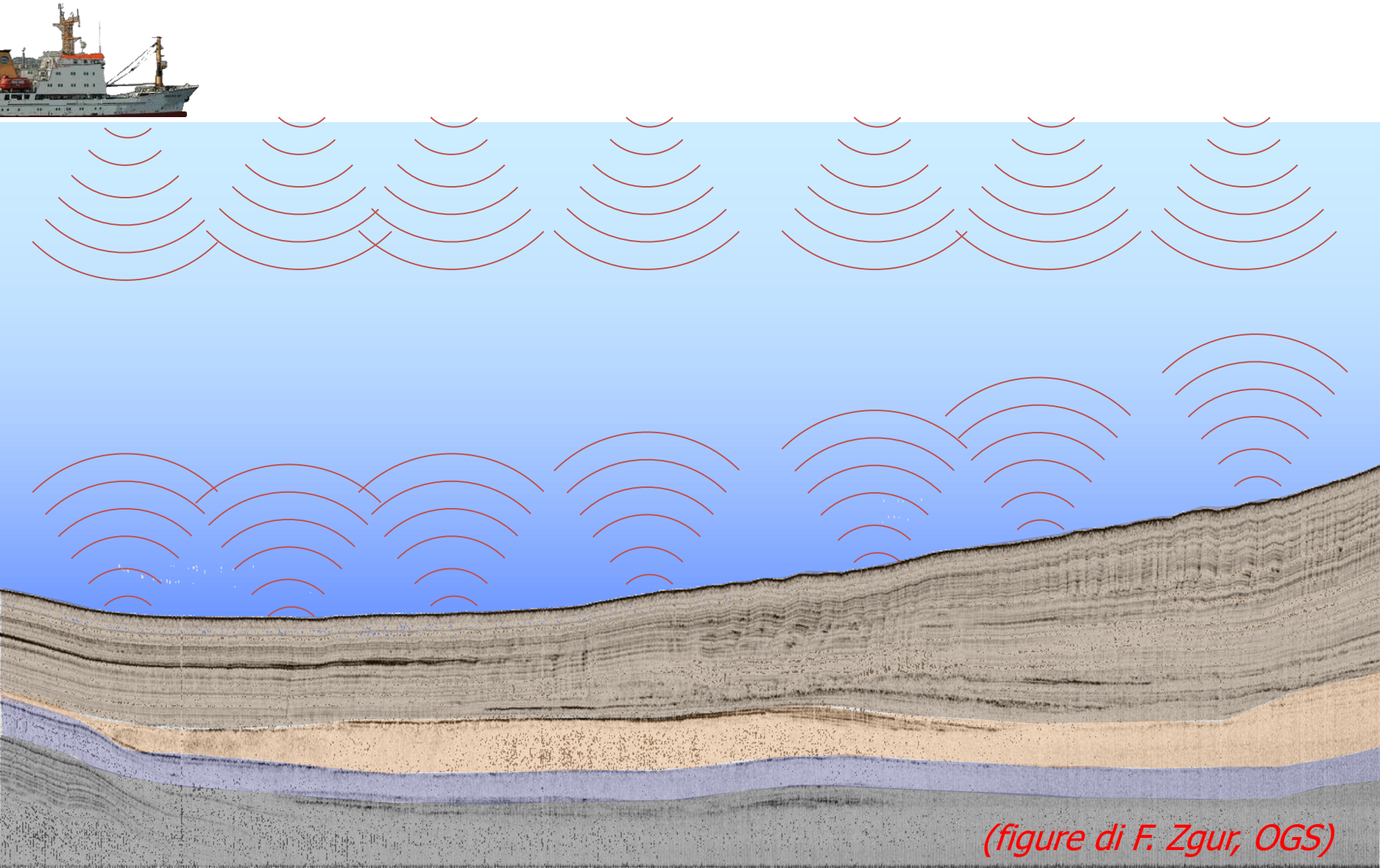
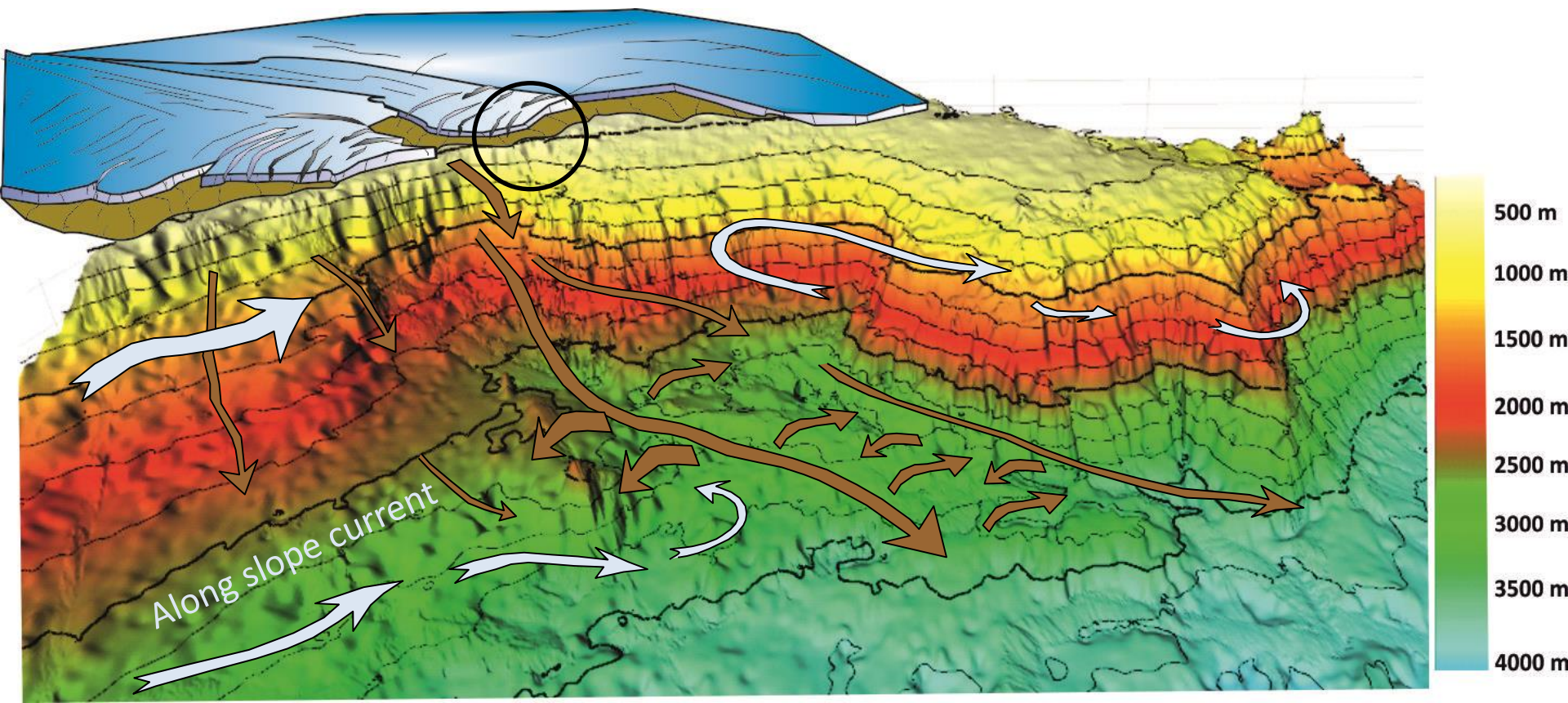
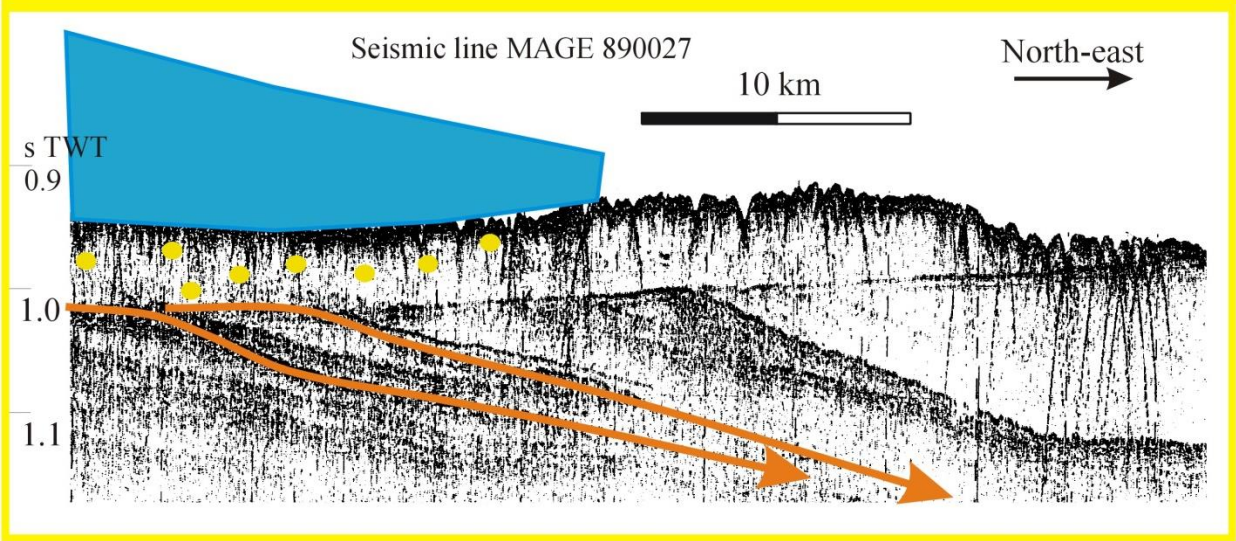


Figura is from De Santis, OGS



... who are you and how did you get here??



When I grow up I want to be...
(a Geologist)



PhD in Polar Science

Courses and Summer Schools

→ ECORD Summer School 2016

“Submarine Geohazards: Mapping,
Monitoring, and Modelling”

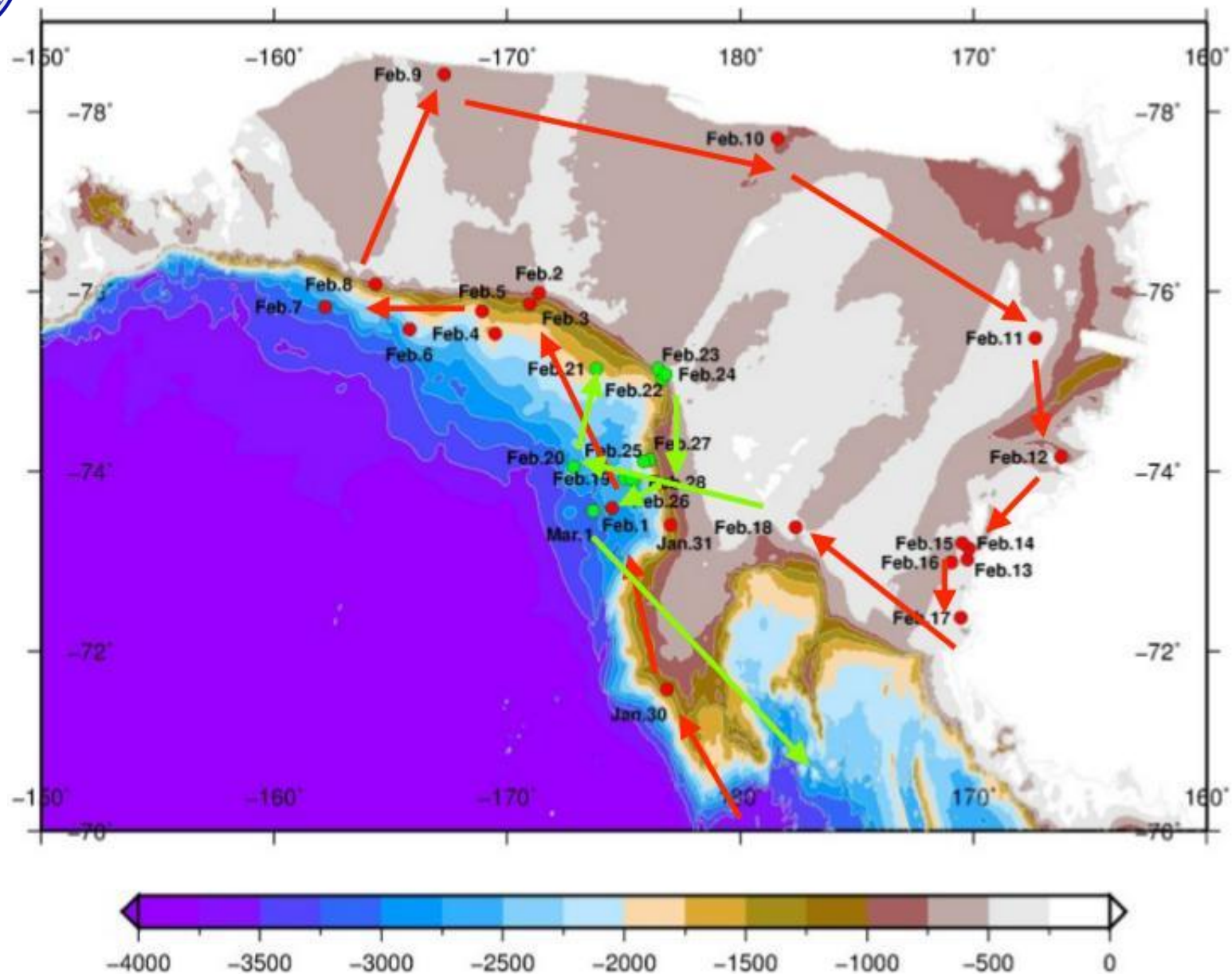
→ FLOWS Training School at IFREMER



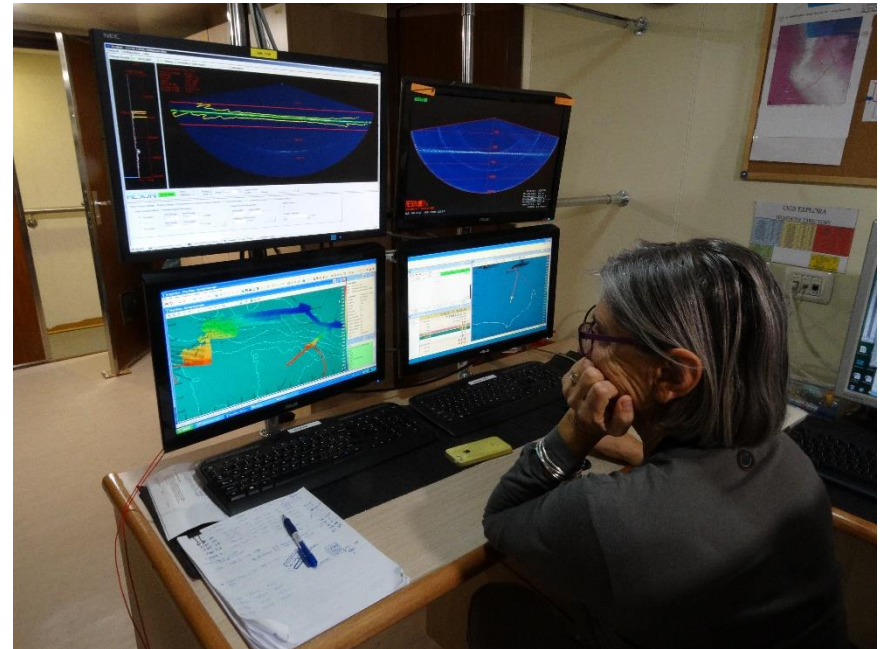
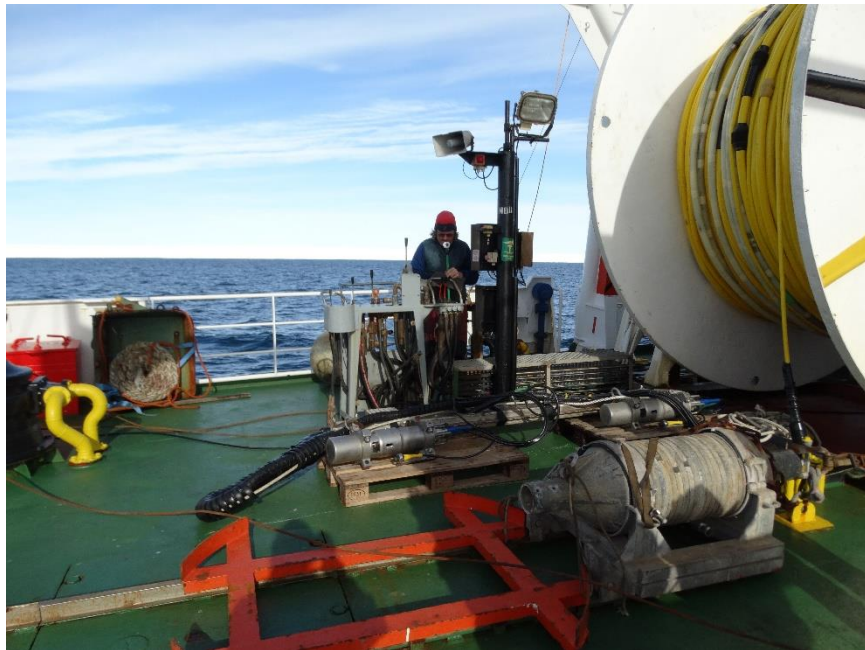
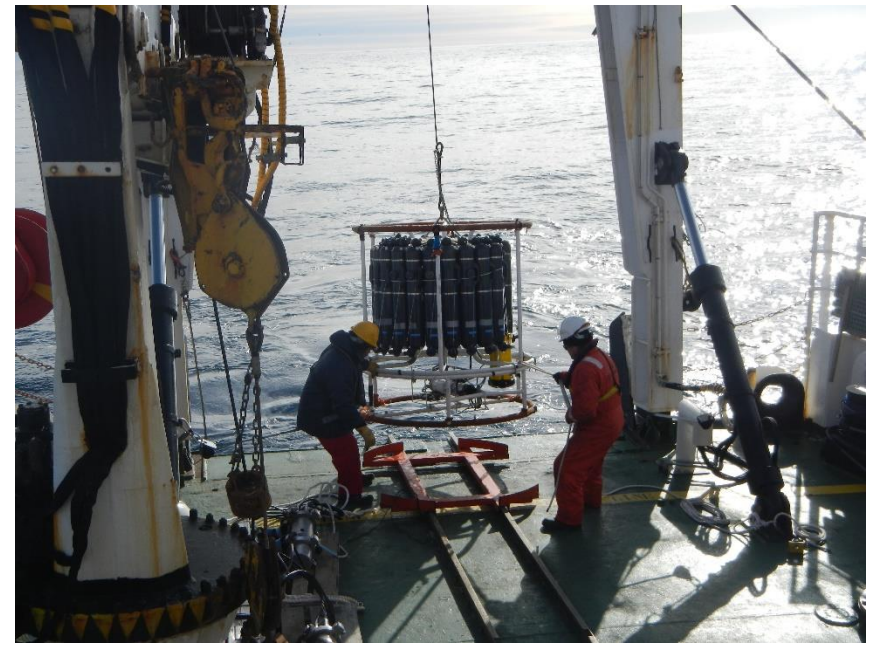




Circumnavigation of the Ross Sea!



Different kind of scientists and operations...



And a great international team!



...so sunny and warm!



13 feb

Nella Baia delle Balene

di [Laura De Santis](#)

11 febbraio

Da due giorni navighiamo a ridosso della piattaforma di ghiaccio di Ross, nel punto più a sud del pianeta raggiungibile con una nave: $-78^{\circ}34'$. E' un record per le spedizioni italiane. In pochi si sono spinti fino alla Baia delle Balene. Questo è il nome dell'ultima rientranza del Mare di Ross prima della Terra di Marie Byrd. Di Balene non ne abbiamo viste molte, qualcuno ha visto il loro spruzzo in lontananza. In compenso però il mare è calmo e non c'è vento. Siamo al riparo sotto un'enorme barriera di ghiaccio verticale alta una ventina di metri, sopra il livello del mare, ma spesso quasi 300 sotto la superficie. E sotto ancora, sul fondo del mare, che qui arriva a circa 800 metri, c'è una cavità che si spinge fino a quasi 85° Sud. La piattaforma ghiacciata di Ross è un "gigante buono", scintilla al sole e si mostra in tutta la sua imponenza per chilometri e chilometri (circa 800 km). Si vede una frattura fresca nella parete.



17 feb

L'incontro con la nave Italica

di [Elisabetta Olivo](#) (OGS) e Florence Colleoni (CMCC)

È mercoledì 12 febbraio quando scriviamo questo post.

Certo che dal diario scritto a mano al blog su un pc...come cambiano le cose in così poco tempo (pochissimo geologicamente parlando).

La versione di Elisabetta:

Svegliarsi per una mattina senza troppe onde. Trovarsi a fianco una nave ben più grande della nostra, l'Italica. Vedere dopo un mese facce nuove. Sembrerà strano, ma modificare anche di poco la routine qui in nave fa bene. Chissà cosa voleva dire partire per una spedizione più di 100 anni fa, come Shackleton, la solitudine e la lontananza da casa, senza comunicazioni e contatti col mondo "civilizzato" (e pensare a quanti di noi si lamentano ora per il poco internet!). Sicuramente loro erano "veri esploratori", ma anche noi nel nostro piccolo stiamo viaggiando tra terre viste da pochi fortunati, quindi poco conosciute, sicuramente per quanto riguarda i fondali marini.

Oggi **abbiamo fatto rifornimento di carburante dalla nave oceanografica Italica**, ora saremo autonomi per un altro mese circa. Loro dopo l'incontro hanno proseguito verso la base italiana Mario Zucchelli, dove in due giorni



OGS Istituto Nazionale di Oceanografia e di Geofisica Sperimentale

12 gen alle 12:29 • 🌐

I 60 giorni di missione di OGS Explora in Antartide saranno raccontati anche attraverso un blog su **Il Piccolo**. Qui potete trovare il primo post, di **Michele Rebesco**. Buona lettura!



Il Piccolo ha aggiunto 3 nuove foto.

10 gen alle 11:59 • 🌐

Da Trieste all'Antartide I ricercatori dell'Ogs in partenza per il Polo Sud terranno un diario - blog sul nostro sito durante tutta la loro missione. Qui <http://bit.ly/2ibMtIX> il loro primo post e la loro presentazione 😊 SEGUITELI!



OGS Istituto Nazionale di Oceanografia e di Geofisica

@INOGSit



INVIA UN MESSAGGIO



Pubblica



Foto



Promuovi



Modifica Pa...

4,7 ★★★★★ APRE DOMANI

Scienza, tecnologia e ingegneria

HOME

POST

RECENSIONI

FOTO

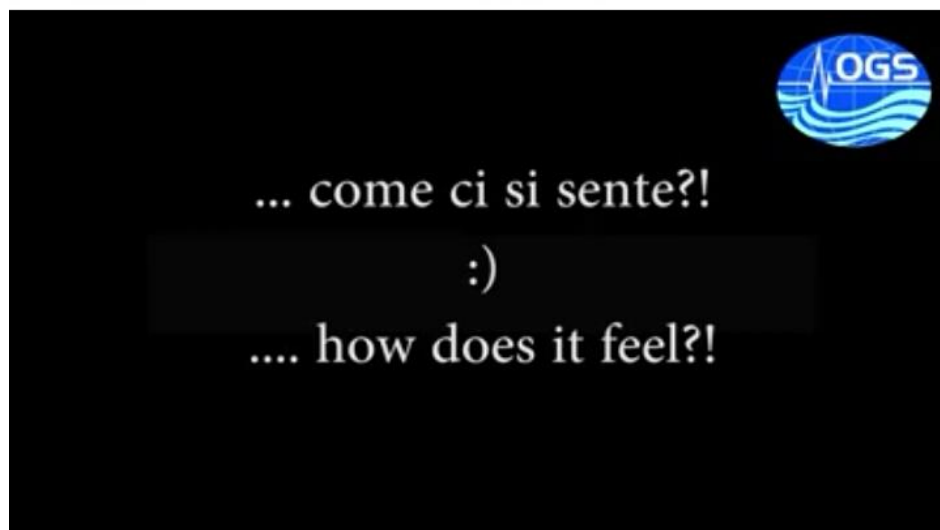
VETRINA



OGS Istituto Nazionale di Oceanografia e di Geofisica Sperimentale ha aggiunto un nuovo video: **Elisabetta Olivo - in partenza per l'Antartide su OGS Explora.**

12 gen alle 11:45 • 🌐

Domani i nostri ricercatori e tecnici partiranno per raggiungere la nave OGS Explora a Hobart, da dove si imbarcheranno per la **ItaliAntartide - 32.a Spedizione**, finanziata dal **PNRA - Programma Nazionale di Ricerche in Antartide**. Abbiamo raccolto delle brevi testimonianze video prima della loro partenza. Qui quella di **Elisabetta Olivo**, giovane dotto... [Continua a leggere](#)



OGS Istituto Nazionale di Oceanografia e di Geofisica Sperimentale

27 mar alle 10:03 • 🌐

"Dove di solito c'è la barriera di ghiaccio marino intorno alla polinia del Mare di Ross ora c'è solo acqua a perdita d'occhio. Sembra di essere in mezzo a un qualsiasi oceano, se non per qualche isolato iceberg". Su **la Repubblica** il racconto della spedizione di OGS Explora. Buona lettura!

ItaliAntartide - 32a Spedizione PNRA - Programma Nazional... [Continua a leggere](#)



"La nostra missione in un'Antartide senza più iceberg"

www.repubblica.it

👍 😊 Martina Polito e altre 13 persone

16 condivisioni

👍 Mi piace

💬 Commenta

➦ Condividi

4.235 persone hanno visto questo post >

Metti in evidenza il post

Science Communication Master – International School for Advanced Studies SISSA

 **MCS** Master in Comunicazione della Scienza "Franco Prattico"

HOME ▾ COS'È IL MASTER ▾ AMMISSIONE ▾ PERSONE ▾ NEWS FAQ CONTATTI

TORINO PADOVA MODENA ANCONA PERUGIA L'AQUILA NAPOLI CAGLIARI CATANIA

PARTECIPA A FAMELAB 2017!
La scienza è il tuo mestiere e raccontarla è la tua passione? Sei un giovane ricercatore, uno...
[Leggi tutto](#)

PARTECIPA ALLE SELEZIONI ITALIANE TRIESTE

ISCRIZIONE STAGE E COLLABORAZIONI DOPO IL MASTER COSTI E AGEVOLAZIONI



Past Antarctic Ice Sheet Dynamics conference Sept 10th - 15th 2017





**SCAR/PAIS - Past Antarctic Ice Sheet Dynamics
conference
Trieste, Italy
September 10th (Sunday) to 15th (Friday)
2017**



<http://www.scar.org/pais>
[PAIS-conference-2017.inogs.it](http://pais-conference-2017.inogs.it)

pais-conference2017@inogs.it

pais-conference2017@inogs.it

Promoting committee

- **L. De Santis (OGS, Trieste, Italy) – co-chair of PAIS and *organizing chairperson***
ldesantis@ogs.trieste.it
- **Tim Naish (Univ. of Victoria, NZ) – co-chair of PAIS and *scientific committee chairperson***
- Carlota Escutia (CSIC-Univ. Granada, Spain) former co-chair of PAIS
- Rob DeConto (University of Massachusetts, MA, USA), former co-chair of PAIS
- Anna Wåhlin (co-chair of SOOS www.soos.aq , univ. of Göteborg, Sweden)
- Valerie Masson-DeMotte (co-chair of IPCC-WG1, LSCE (CEA-CNRS-UVSQ/IPSL), Gif-sur-Yvette, France)





Past Antarctic Ice Sheet Dynamics conference

Sept 10th - 15th 2017



2-days field excursion pre-conference:

Saturday-Sunday (Sept. 9th -10th)

Plenary talks, posters, discussion:

Monday, Tuesday, Thurs., Friday (Sept. 11th -15^h)

Workshops:

Wednesday (Sept. 13rd)

Theme - 1: Advances in Antarctic ice-sheet reconstructions from geological and ice core archives. 1A: Deep time reconstructions. 1B: Recent reconstructions (LIG to present)

Theme - 2: Advances in understanding the drivers, processes, and rates of past and future Antarctic ice-sheet change from models and data.

Theme – 3: Teleconnections, far-field responses to Antarctic ice sheet change.

Theme – 4: Co-evolution of climate and life in the Antarctic & Southern Ocean.

Theme – 5: Emerging research priorities of societal relevance

**Thank you for your attention
and ...**

see you soon in Trieste!



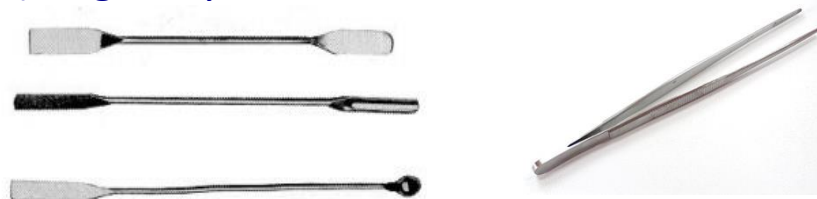
Deep Sea
Drilling tools

CORE DESCRIPTION





- *Definition of lithological units based on:*
 - Lithology including composition and texture
 - Color
 - Sedimentary structures (laminations, bioturbations, faults)
 - Boundaries (transitional, sharp not erosive, sharp erosive, irregular)
- *Definition of sediment disturbance*
 - Soupy sediments
 - Bended boundaries at the lateral ends
 - Flow-in (piston cores)
 - Core re-bouncing (repetition of stratigraphic sections) in gravity cores




Project:

CORE

SECTION

Date: _____

samples	SEDIM. STRUCT.	LITHOLOGY <small>(cm from top of section)</small>	texture <small>fine medium coarse bedding position</small>	LITHOLOGIC DESCRIPTION	COLOUR
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 </div> <div style="width: 5%;"> 10 20 30 40 50 60 70 80 90 100 </div> </div>					

LEGEND

— sharp boundary

— gradational boundary

— irregular boundary

▲ normal and reverse grading

▲ planar laminations

— cross laminations

— slump

— fault

△ swamp rich

◉ brams rich

◉ shell's fragments

— sandy sediment

— stratification

□ clay

□ silt

□ sand

□ pebbles

□ boulders

□ lignite

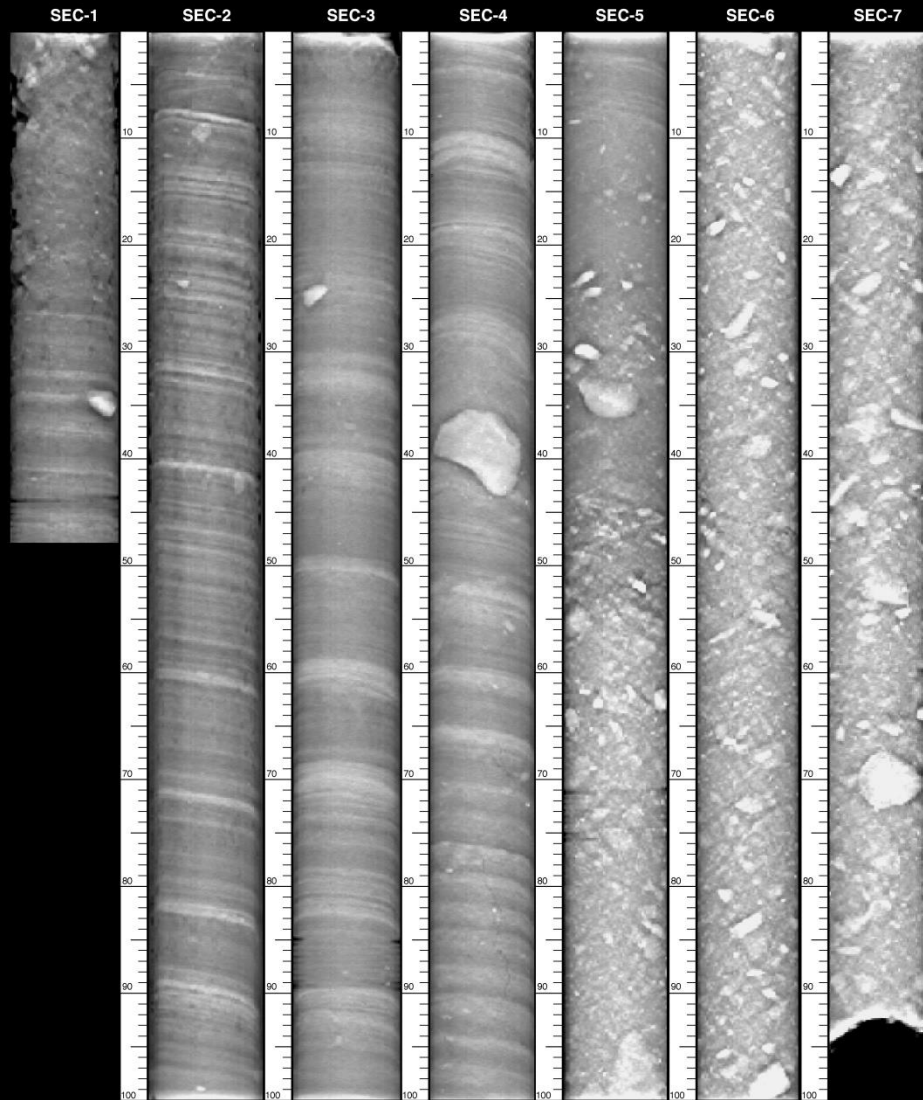
□ lignite, dark layer

length of section (cm)
 total length of core (cm)
 remarks:

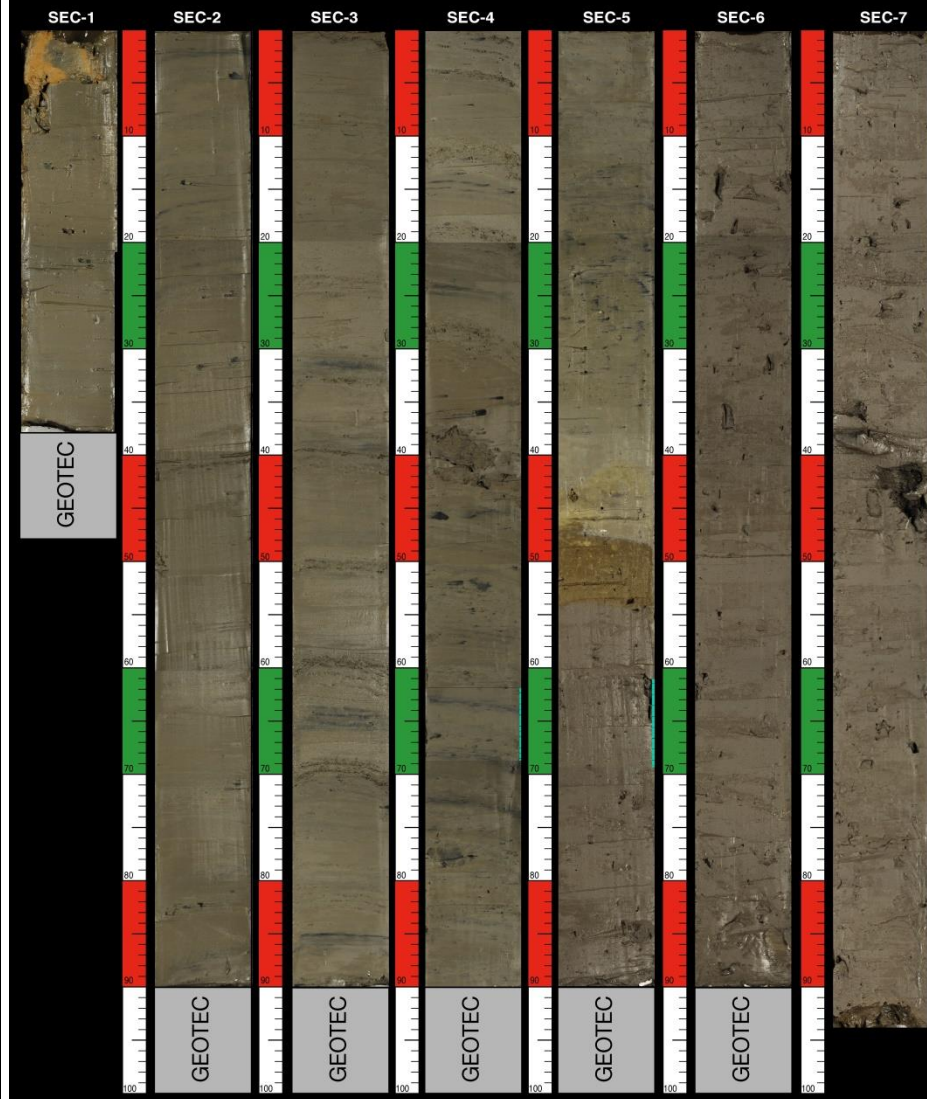


(figure di R. G. Lucchi, OGS)

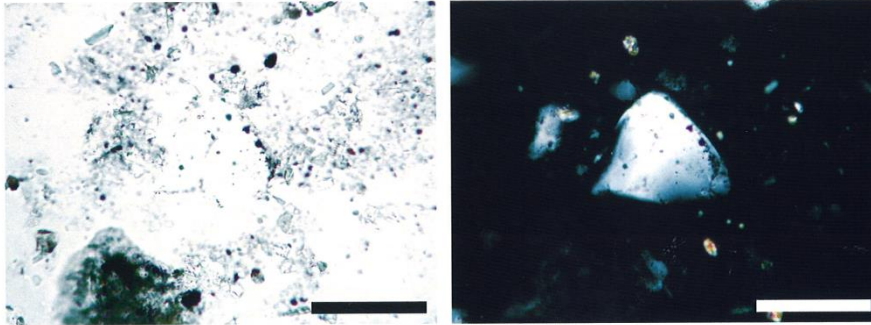
SVAIS CORE-02 vert.



SVAIS CORE-02

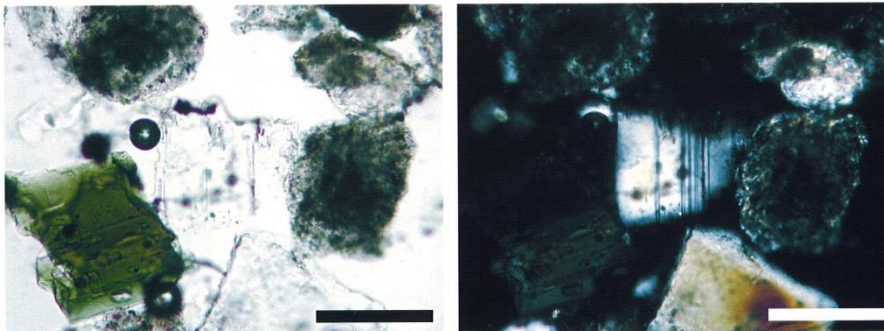


Quarz

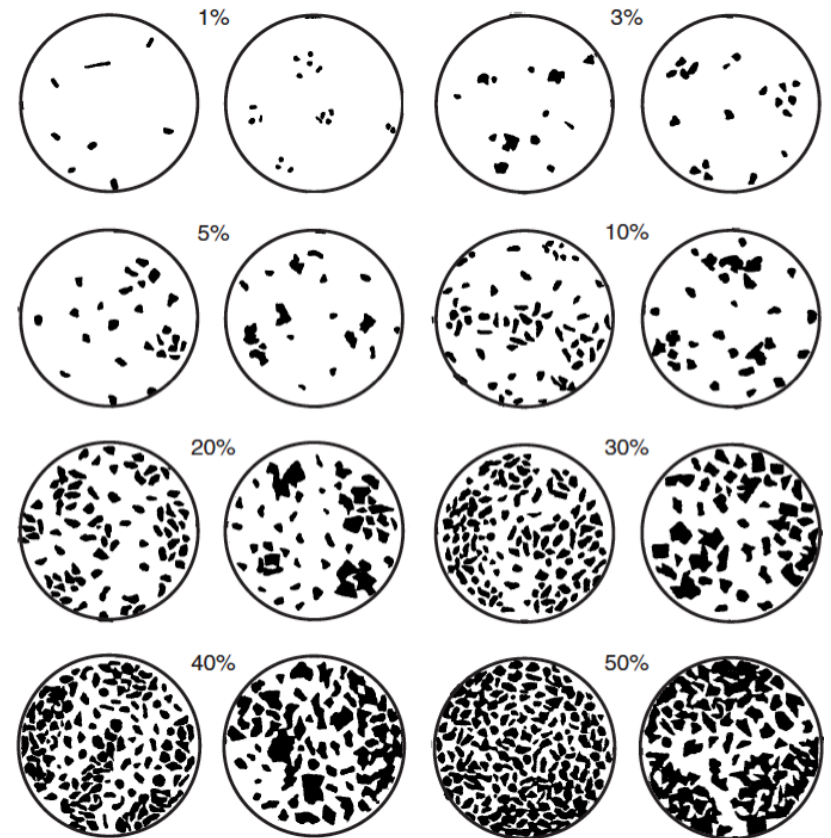


IODP Exp .320

Plagioclase

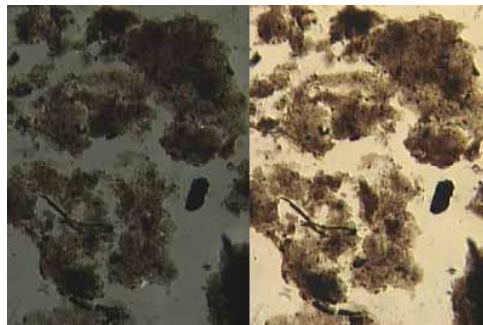


Composition/Quantification

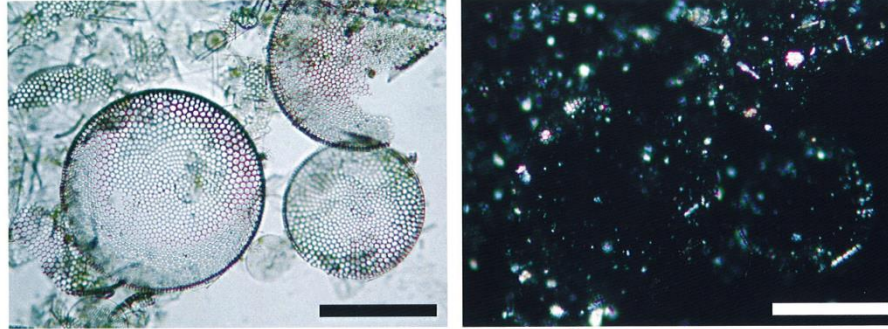


Rothwell 1989

Clay fraction

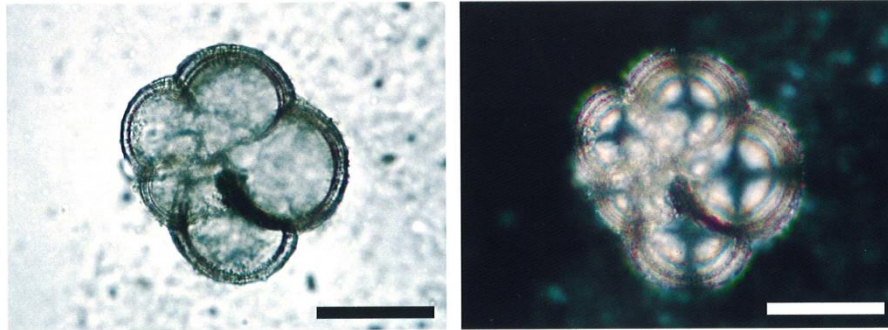


Diatoms



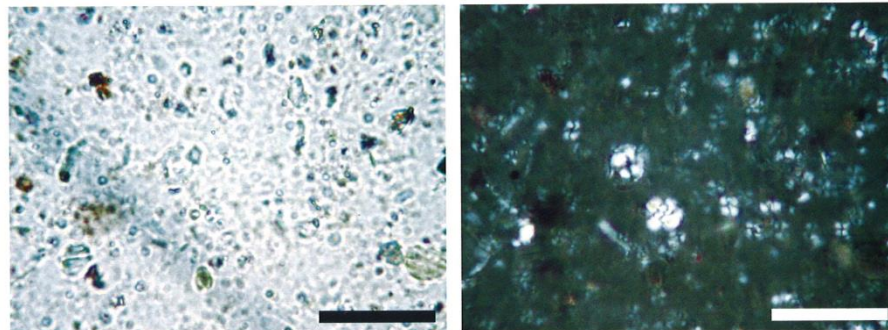
オホーツク海・中心部, 水深 1107m, XP98, PC1, Sec.1, 20cm
200 倍, スケールは横 100 μ m

Foraminifera



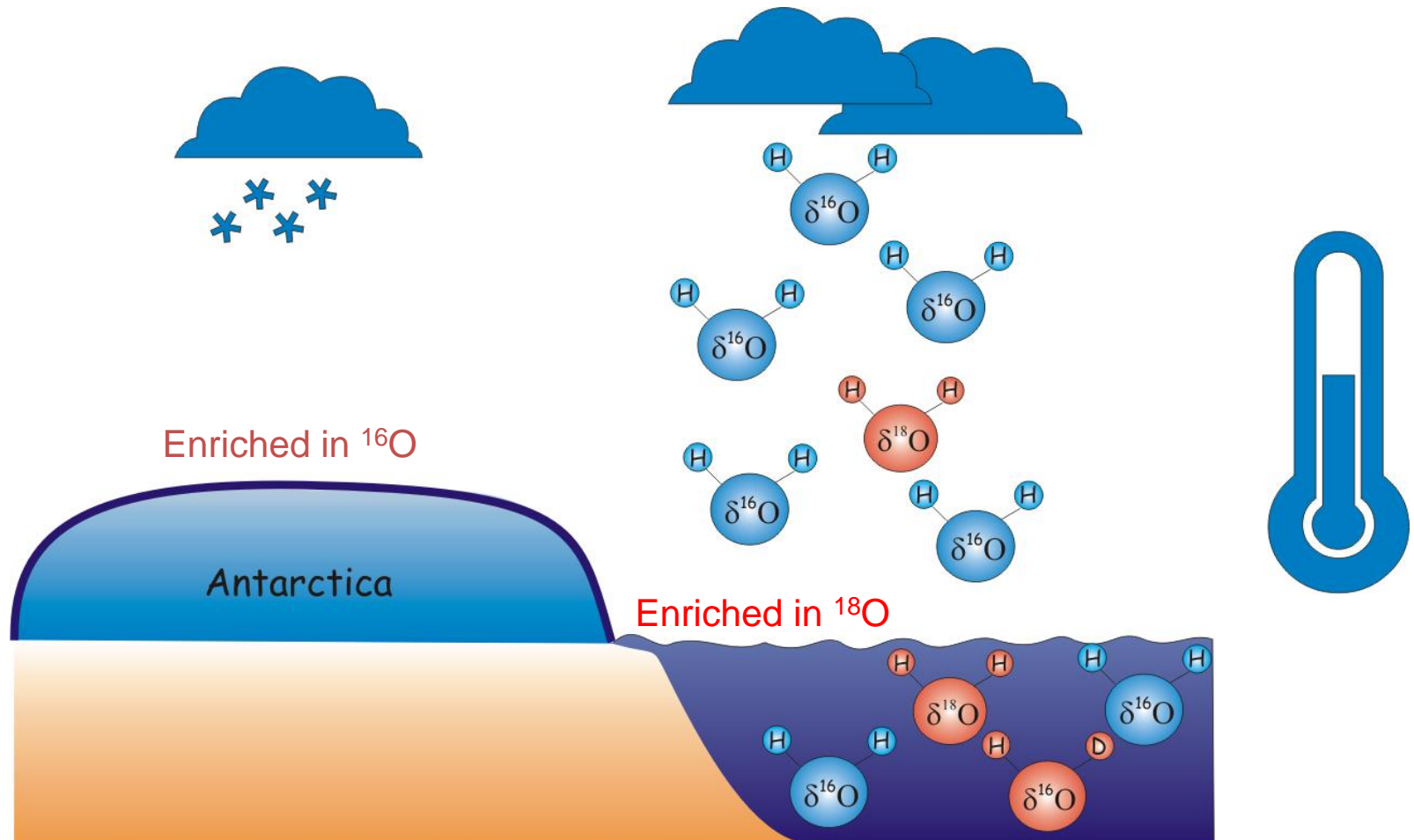
太平洋・熊野トラフ, 水深 2190m, KT02-1, KK2PC
400 倍, スケールは横 50 μ m

Calcareous nannoplankton

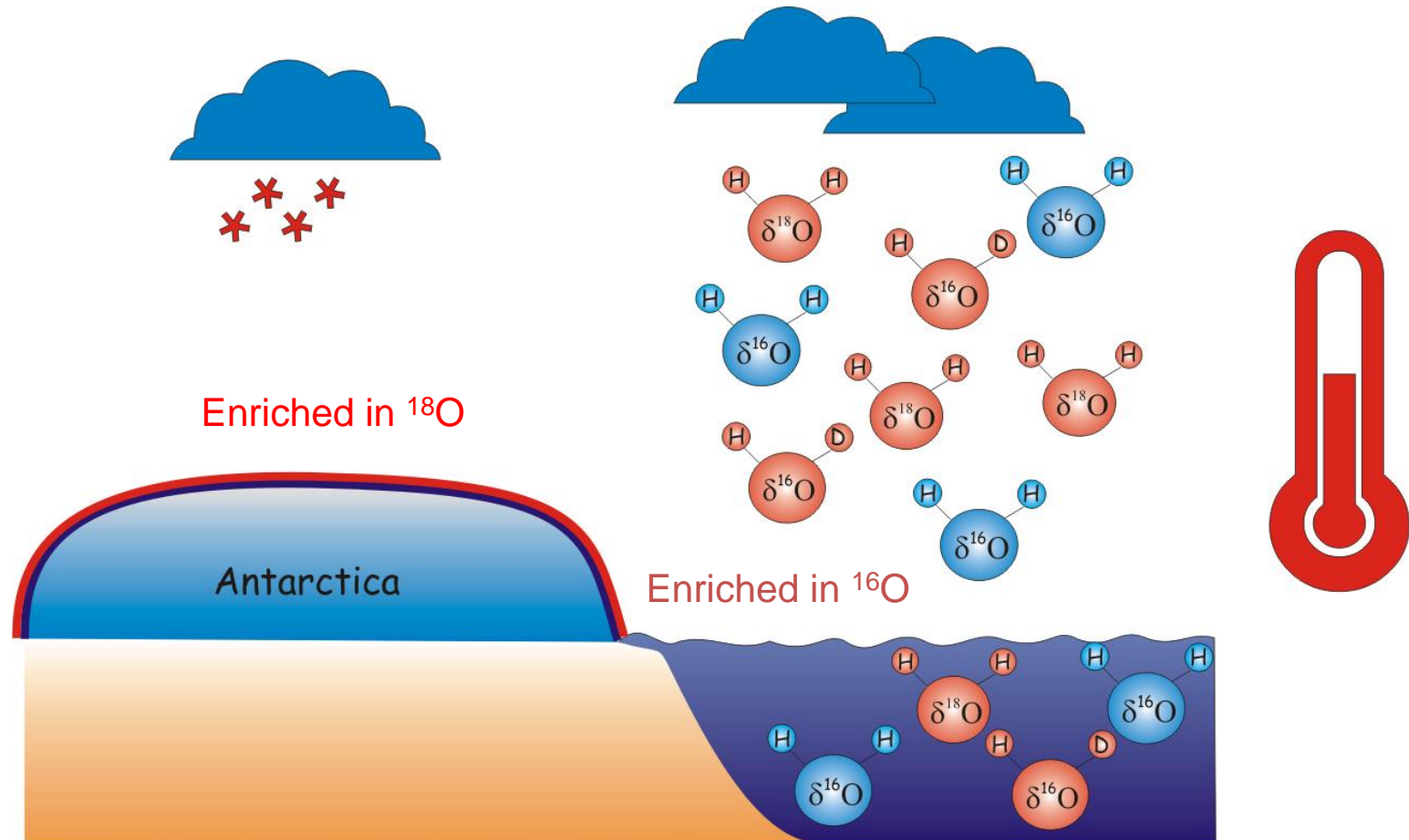


東地中海・キプロス沖, ODP Leg160, 967D, 1H, Sec.1, 0-5cm
1000 倍, スケールは横 20 μ m

Ice ages (glacials) – light oxygen is removed from the ocean through photosynthesis and evaporation



Warm periods (interglacials) – light oxygen is returned to the ocean, while photosynthesis and evaporation remove relatively more heavy oxygen



Sand composition

- wet sievings at 63 microns are used to investigate the composition of sediment coarse fraction, the grains form and roundness, in order to define the sediment provenance. The sand fraction is also used for biostratigraphic purposes.



Beach sands



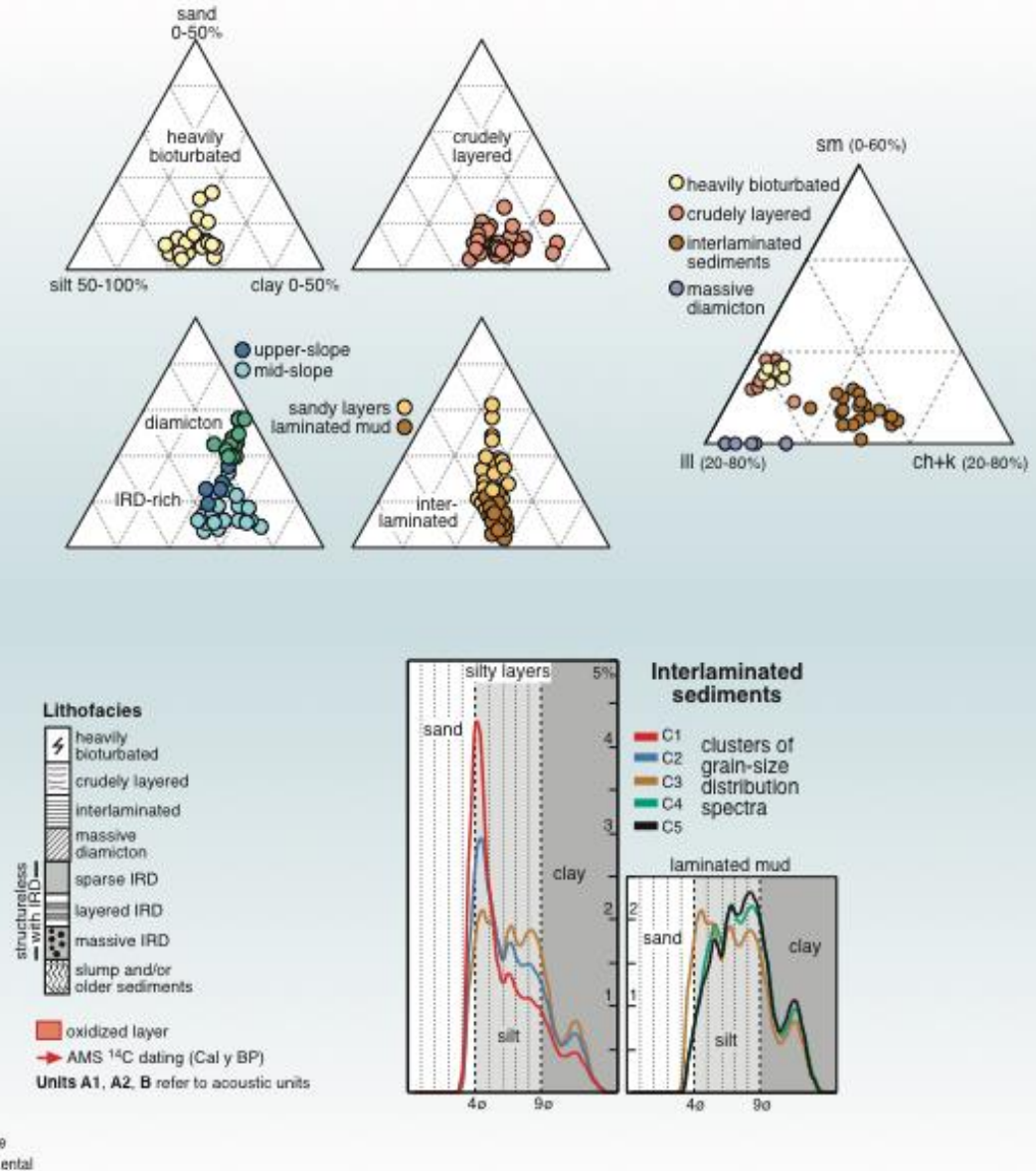
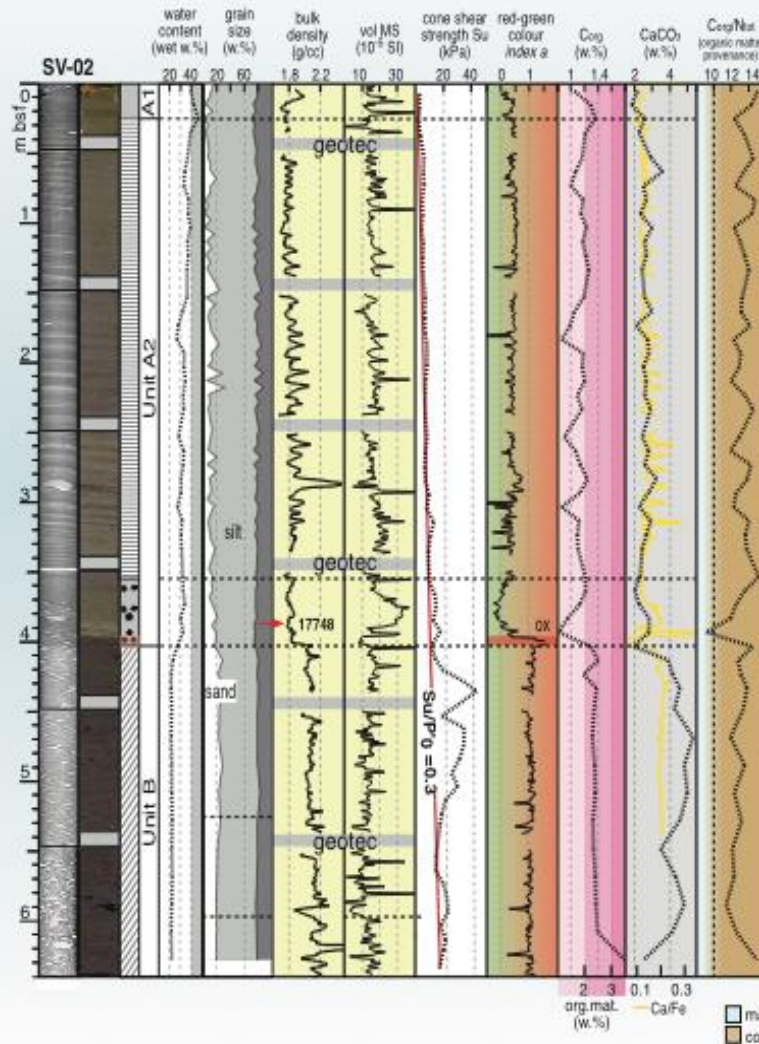
Glacigenic
sediments



Tephra
(volcanic glass)

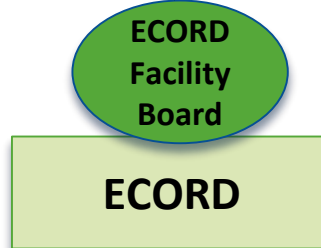
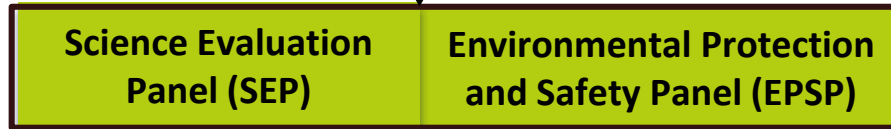
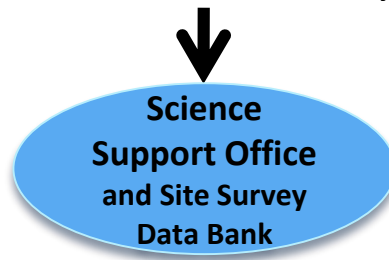


Plot of results



- ✓ Streamlined structure
- ✓ Cost efficiency

- ✓ Operational flexibility
- ✓ Funding flexibility



IODP members and non IODP countries



NSF

JAMSTEC



ECORD Council
(Funding agencies)

EMA
(Managing Agency)

ECORD FB
(MSP scheduling
committee)

ESO
(Implementing
Organisation)

**Education
/ Outreach
Task Force**

**MagellanPlus
Workshop Series
(ECORD – ICDP)**

ESSAC
(Scientific
Committee)

**Vision
Task Force**

ECORD ILP
(Industry Liaison)

Science community,
Public, Medias,
Teachers

Industry

Science
community

Other science
programs,
EC

Funding

*Exploring the Earth Under the Sea*

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Submitting Proposals

Next Proposal Submission Deadline: October 2, 2017, 23:59 GMT

The **Proposal Database System (PDB)** is the web-based interface for completing and submitting IODP proposals. PDB offers specific guidance and many proposal components are now created interactively; proponents are advised to begin working with PDB as soon as a proposal is planned. Complete proposal preparation guidance, format requirements, and review policies are explained in the [IODP Proposal Submission Guidelines](#).

A **Call for Scientific Ocean Drilling Proposals** is usually published at least two months in advance of the deadline with specifics about what types of proposals are being sought.

Proponents are strongly encouraged to contact the [Science Operators](#) to discuss platform-specific operational and fiscal constraints before developing proposals. The **IODP Proposal Manager** has sole authority to accept proposals or grant exceptions to deadlines and policies.

To submit a drilling proposal:

[Login to PDB to create a new proposal or manage existing proposals](#)[Download the IODP Proposal Submission Guidelines for detailed information on proposal contents](#)[Read the IODP Proposal Confidentiality Policy](#)

Most types of proposals also require the **submission of site characterization data** to the Site Survey Data Bank.

Proponents with questions about submitting proposals can contact the [IODP Science Support Office](#) for assistance.

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Exploring the Earth Under the Sea

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You are here: Home ▶ Expeditions ▶ (see all articles) ▶ Apply to Sail

Apply to Sail

Expedition 380: NanTroSEIZE Frontal Thrust Long-Term Borehole Monitoring System



- apply by April 28, 2017
- Center for Deep Earth Exploration (*Chikyu* operator)
- expedition dates: October 23 - December 5, 2017
- [Exp 380 Call for Applications](#)

Deadline has passed

Expedition 376: Brothers Arc Flux

- *JOIDES Resolution* Science Operator
- expedition dates: May 5 - July 5, 2018
- [Expedition summary and scientific objectives](#)

Deadline has passed

Expedition 381: Corinth Active Rift Development

- ECORD Science Operator
- offshore dates: October-November 2017 (estimated)
- onshore dates: February 2018 at MARUM, University of Bremen, Germany (estimated)
- [Exp 381 Call for Applications](#)

Note: Applications for IODP expeditions are made through the applicant's [Program Member Office](#), which may have different deadlines than those posted above.

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EUROPEAN CONSORTIUM FOR
OCEAN RESEARCH DRILLING

ABOUT ECORD

EXPEDITIONS

SCIENCE

OUTREACH

EDUCATION

RESOURCES

Unraveling Earth's history
beneath the ocean floor

The European Consortium for Ocean Research Drilling

unites 15 countries and provides mission-specific platforms for IODP expeditions



File Modifica Visualizza Cronologia Segnalibri Strumenti Aiuto

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f t r SEARCH

ECORD
EUROPEAN CONSORTIUM FOR
OCEAN RESEARCH DRILLING

ABOUT ECORD EXPEDITIONS SCIENCE OUTREACH EDUCATION RESOURCES

[Nessun titolo]

STUDENTS AND EARLY-CAREER SCIENTISTS	SCIENTISTS	EDUCATORS
ECORD COURSES AND SUMMER SCHOOLS	HOST AN ECORD SUMMER SCHOOL	TEACHERS AT SEA
GET A SCHOLARSHIP	HOST A DISTINGUISHED LECTURER	ECORD SCHOOL OF ROCK
GET A RESEARCH GRANT		LIVE VIDEO EVENTS WITH MSP EXPEDITIONS
ECORD COURSES		REQUEST ODP/IODP CORE REPLICAS

unites 15 countries and provides mission-specific platforms for IODP expeditions

www.ecord.org/education/

To apply, you will need to complete the application through our new on-line application portal. During the application process, you will be asked to rank the expeditions in which you are interested. Our application has the following components:

- a completed application form
- an up-to-date C.V.
- a recommendation letter
- contact information for two additional references
- a one-page proposal for what projects you would like to do while on-board
- answers to several short essay questions
- a letter of support from your administrator if needed

Want to read our three-year evaluation report about the Education Officer experience? Download it below!

Also, watch our video about being an Education/Outreach Officer [here](#).

Any questions can be sent to scooper@ldeo.columbia.edu or nkurtz@ldeo.columbia.edu

Science in IODP is driven by community-generated proposals targeting the research themes outlined in the program's overall science plan and utilizing multiple drilling platforms. IODP proposal submission is a process designed to transform exciting science into successful expeditions.

Proposal Submission Guidelines

IODP Science Evaluation Panel



The JOIDES Resolution Facility Board approved these guidelines on May 18, 2016

Links updated/fixed on August 30, 2016

