



Hélder Pereira & Faustine Gendron - Part I

THE FLOOR OF THE OCEANS



Based on bathymetric charts by
Robert C. Dyer and Marie Tharp
of the Lamont-Doherty Geological Observatory
Columbia University Palisades, New York, 1953
IMPROVED BY THE UNITED STATES NAVY
OFFICE OF NAVAL RESEARCH





LE POURQUOI PAS ?



Discover Ifremer's missions



LE POURQUOI PAS ?

Le «Pourquoi pas ?» labo de rêve pour océanographes

«Nautille» :
engin sous-marin habité
(3 personnes)
qui peut atteindre 6.000 m
de profondeur. Mis en œuvre
par le portique arrière.

Newtsuit :
système d'assistance
à sous-marins
en difficulté

Bossoir
permettant la mise
à l'eau de vedettes
hydrographiques

Cale à treuils

PC scientifique
relié à un réseau informatique
connecté à 10 gigabits.

Salle de traitement :
local destiné à la
préparation des opérations
et post-traitement
des données.

Laboratoire
Hangar à 2 places
permettant d'embarquer
«Nautille» et «Victor 6.000»

Local, atelier
et magasin
informatique
et électronique

Cabines équipage /
Cabines scientifiques

Tirant d'eau : 6,9 mètres

Longueur : 107,6 mètres

Largeur : 20 mètres

Propulsion diesel électrique
associée à un positionnement
dynamique de classe II

Autonomie : 64 jours à 11 nœuds

Déplacement maximal :
6.600 tonnes

Capable tous océans trois zones
polaires

Possibilité d'embarquer
une quarantaine de scientifiques

6 laboratoires soit environ
1.000 m² de surfaces d'analyses
classées selon les degrés de
propreté (humide ou sec pour le
traitement de certains échantillons,
salle de traitement par ordinateurs)

Cabines équipage

Ifremer

Vitesse
maximale
14,5 nœuds

Salle de conférence
Cabines équipages
et scientifiques

Salon officiers
et scientifiques

Laboratoires
d'analyse des
prélèvements

Local
plongeurs

Local
capteurs
sensibles

Carottier permettant le prélèvement
de sédiments. Mis en œuvre par
une poutre latérale d'une capacité
de 15 tonnes.

«Victor 6000» :
engin sous-marin robotisé et télé-
commandé qui peut atteindre 6.000 m
de profondeur et rester plus de 3 jours
en plongée. Mis en œuvre par une grue
océanographique ou par le portique arrière

Équipements acoustiques (sous l'avant du bateau) :
Deux sondeurs multifaisceaux permettant de dresser une cartographie fine
des fonds sous-marins par 6.000 m sur une largeur pouvant atteindre
20 km à une vitesse comprise entre 4 et 10 nœuds selon la résolution
recherchée. 2 courantomètres à effet Doppler pour dresser des cartes de
courants jusqu'à 1.000 m, un sondeur de sédiments pour caractériser la
nature des premières couches constituant les fonds sous-marins et un
sondeur monofaisceau pour la détection de fond jusqu'à 6.000 m.



A teacher aboard the ship Pourquoi pas ?

SUPER-MOUV in Ecuador :

SUB-seafloor effects of the *Pedernales Earthquake* Rupture, Ecuador and associated vertical MOUVements



8 January 2024 – 21 February 2024





SUPER-MOUV :

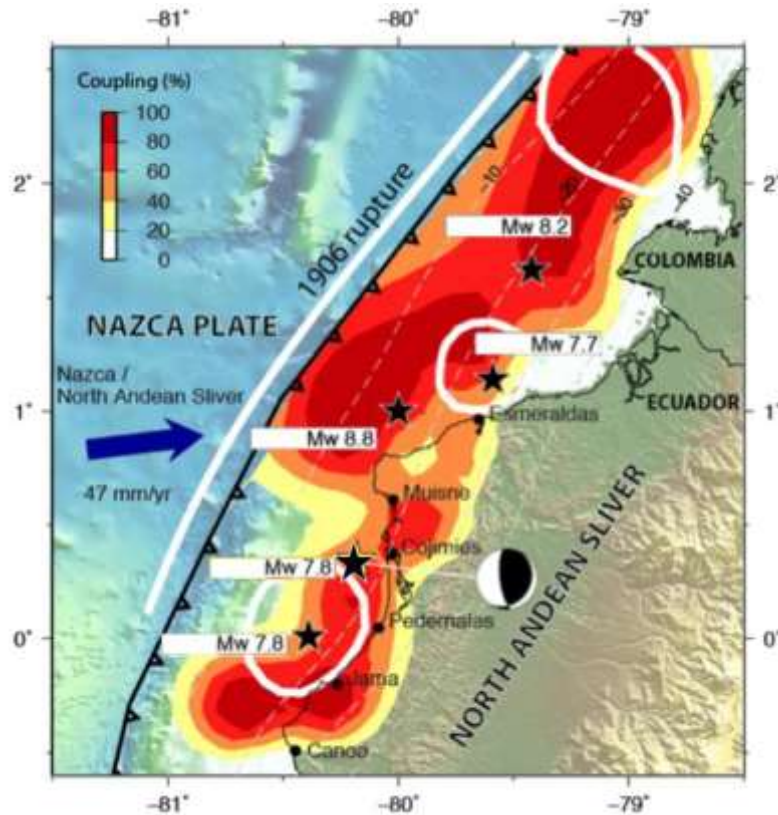
8 January 2024 – 21 February 2024



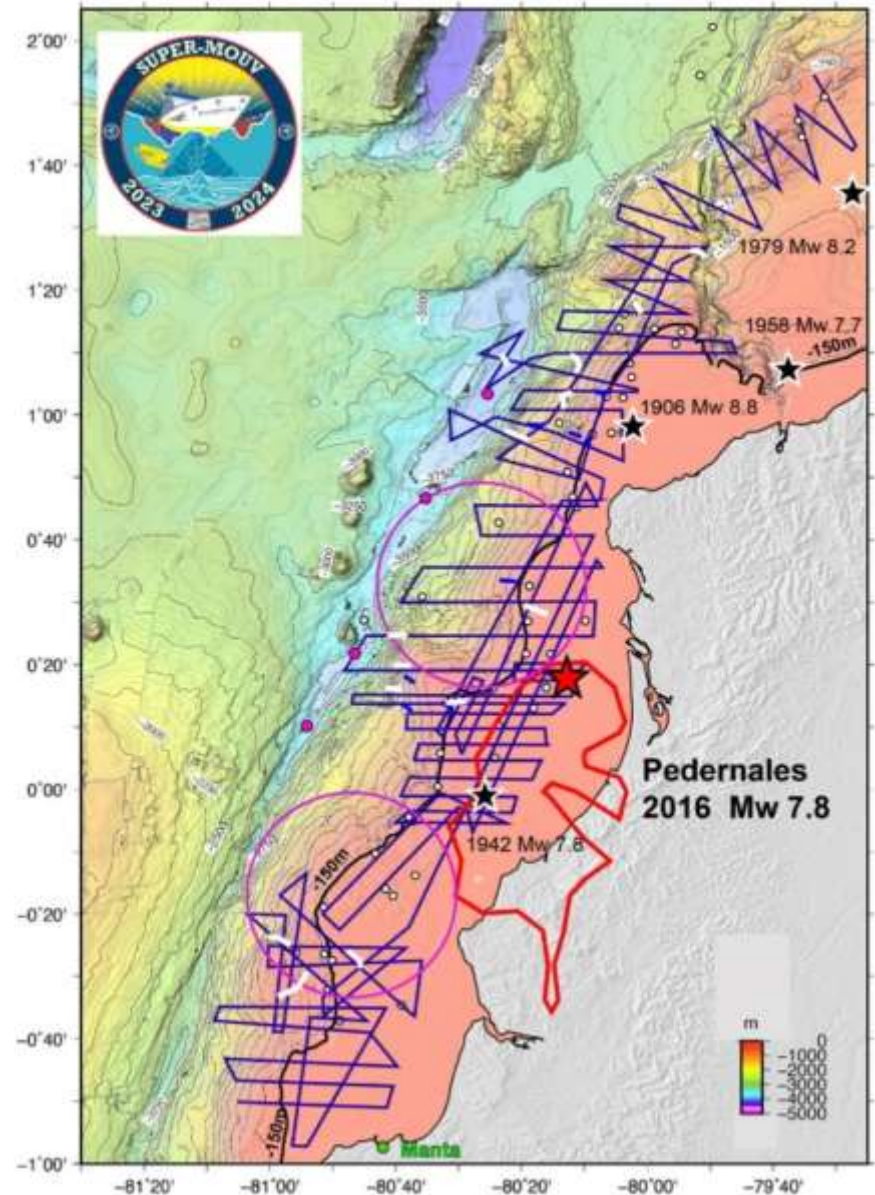


SUPER-MOUV :

8 January 2024 – 21 February 2024



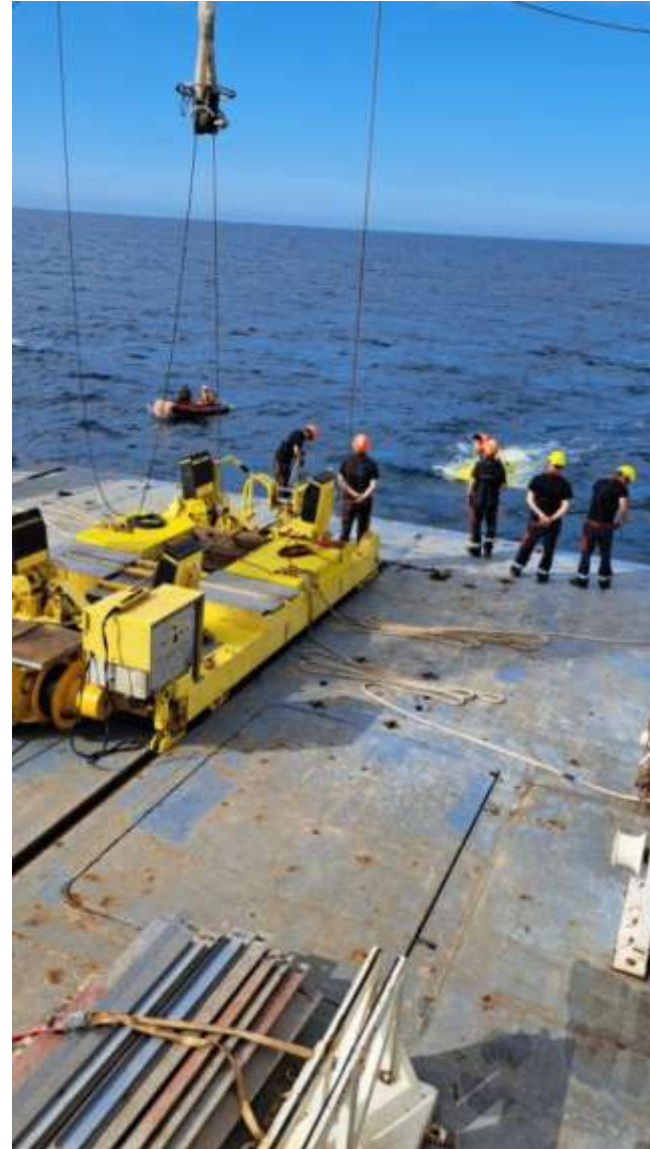
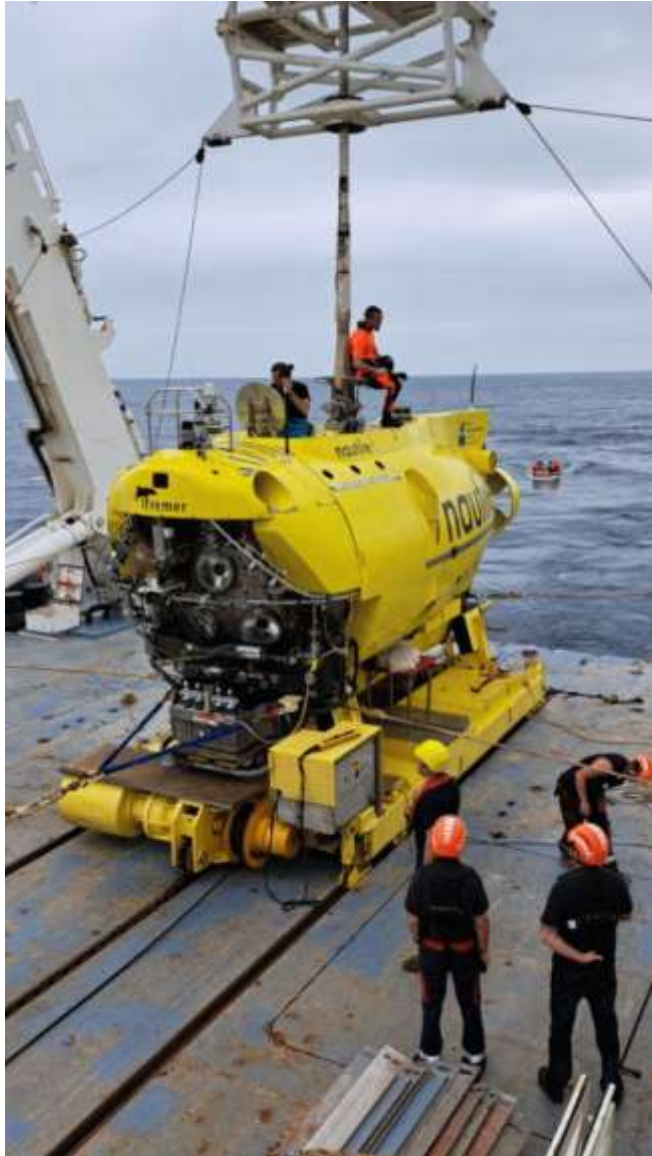
★ very big earthquakes since 1906





SUPER-MOUV :

8 January 2024 – 21 February 2024



***Nautille
lauching
daytime***



SUPER-MOUV :

8 January 2024 – 21 February 2024



***Dredging
rocks
by night***



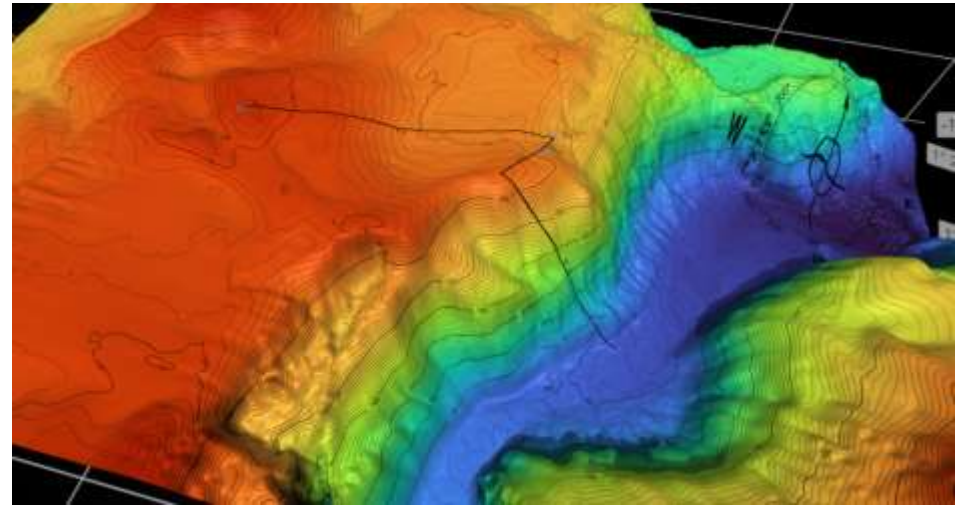
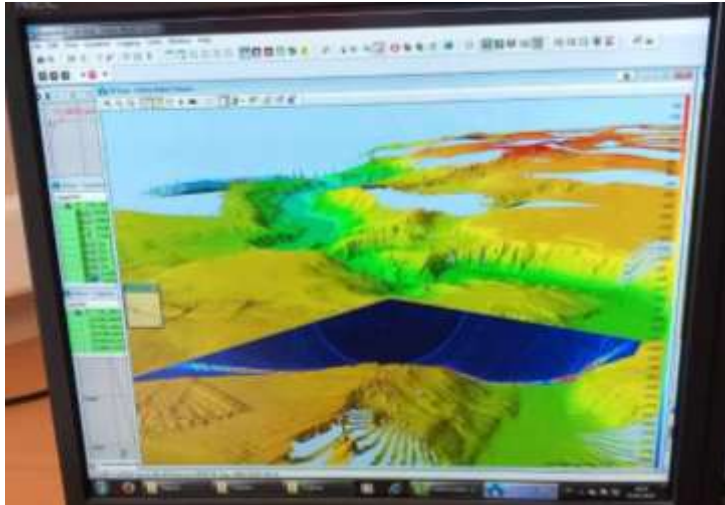
***CTD :
Conductivity,
Température,
Depth profiler***



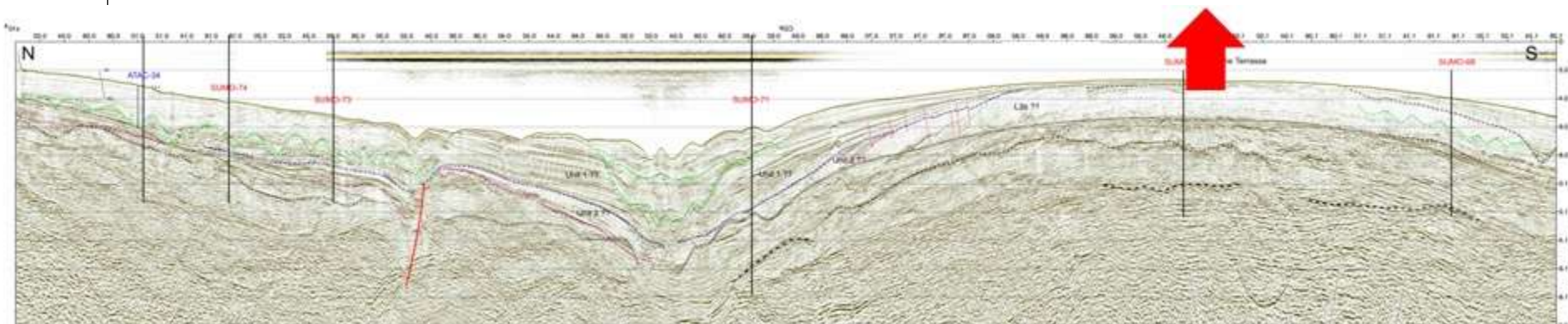


SUPER-MOUV :

8 January 2024 – 21 February 2024



Bathymetry and seismic





SUPER-MOUV :

8 January 2024 – 21 February 2024



Videoconferencing on board with schools all over the world





SUPER-MOUV :

8 January 2024 – 21 February 2024



*Coring
by night...*

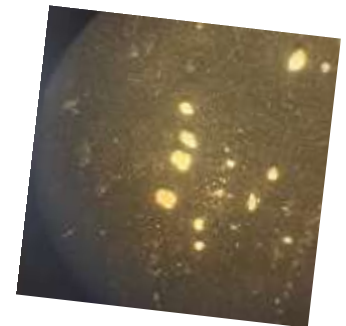


SUPER-MOUV :

8 January 2024 – 21 February 2024



*... to collect sediment cores
and study microfossils*



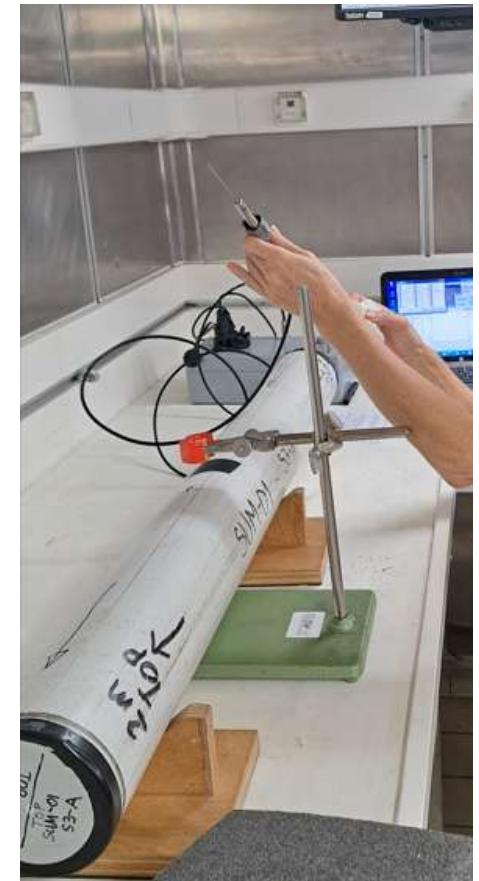
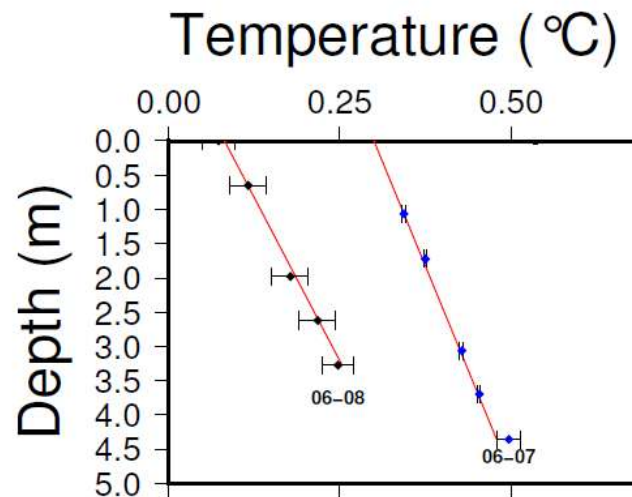
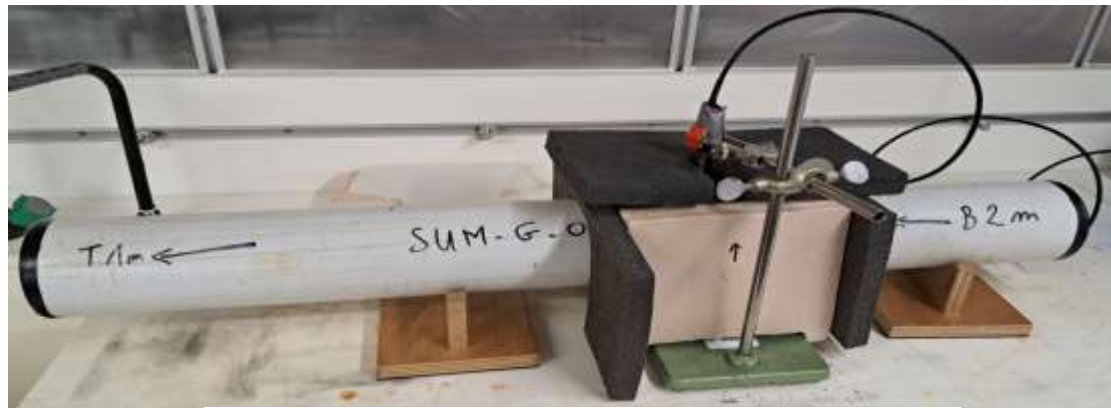


SUPER-MOUV :

8 January 2024 – 21 February 2024



... to study heat flow near the trench by measuring thermal gradient and thermal conductivity of sediments





SUPER-MOUV Website :

<https://edumed.unice.fr/data-center/oceano/supermouv.php>



La vie à bord

Les scientifiques au travail



Le Nautilie



Carottes sédimentaires



Fonctionnement du Pourquoi Pas ?



Analyses de l'eau de mer



Localiser le Pourquoi Pas ?

Envie de savoir où se trouve le navire en ce moment même ? Il suffit de consulter le lien suivant : [Localisation du Pourquoi Pas ?](#)



Using Ready-to-use Classroom Activities



Heat flow on Earth's surface

How to get heat flow beneath the ocean surface, how does it vary from different areas? Try to give answers by studying documents available below.

For this 6th meeting, we suggest you work on the variability of this flow, and on the notion of back-and-forth between data and modeling.

The new riddles are ready and available for download in the .PDF file below :



Heat flow on Earth's surface

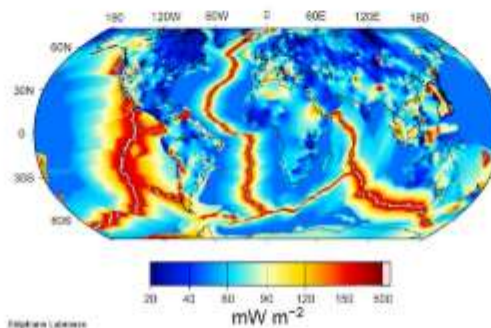
As part of the SUPER-MOUV campaign in February 2024, scientists on board the vessel *Pourquoi pas ?* searched to measure the heat flow at the bottom of the ocean off the coast of Ecuador.

Heat flow (or thermal flux) is the thermal energy dissipated by the Earth's surface (in a given time). The unit used is $W.m^{-2}$ and depends, according to Fourier's law, on

- the thermal conductivity of rocks, which is the capacity of a material, in this case a rock, to propagate heat without any movement of matter,
- the geothermal gradient, i.e., the rate of increase of temperature in the subsurface, from the surface to depth.

$$\text{Heat flow} \left(W.m^{-2} \right) = \text{thermal conductivity of a rock} \left(W.m^{-1}.^{\circ}C^{-1} \right) \times \text{geothermal gradient} \left(^{\circ}C.m^{-1} \right)$$

As shown on the map below, the heat flow on Earth's surface isn't homogeneous. The average is about $80 mW.m^{-2}$.





Using Ready-to-use Classroom Activities



Heat flow on Earth's surface

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Using Ready-to-use Classroom Activities



Questions for students about heat flow

First level :

Using <https://ihfc-iugg.org/viewer/> and a mid-oceanic ridge, a subduction trench and a volcanic arc of your choice, show that heat flow isn't homogeneous on Earth's surface (figures 1 & 2).

For help, use : <https://www.pedagogie.ac-nice.fr/svt/productions/tectoglob3d/>

Second level :

- Knowing that Iceland is mostly made of basaltic rocks, and that the average geothermal gradient in Earth's crust is around 30°K/km , use figure 4 to estimate the average heat flow in this part of the world.
- Using <https://ihfc-iugg.org/viewer/>, compare heat flow expected in Iceland to real heat flow measured in Iceland.
- Try to explain the difference between the expected results and the real heat flows in Iceland.

For help, use :

<https://www.pedagogie.ac-nice.fr/svt/productions/tectoglob3d/>

and/or

<https://www.pedagogie.ac-nice.fr/svt/productions/tomographie2/>





Using Ready-to-use Classroom Activities



Third level :

Heat flow studies were carried out in 2014 during the oceanographic campaign *Antithesis*. Two geothermal gradient measurements made during this campaign are shown in figure 3. The thermal conductivity measurements carried out in the sediments collected during these gradient measurements are shown in figure 5.

- Find the place where this campaign took place.
- Indicate, with justification, which of the points (06-07 or 06-08) should be the better one to calculate the geothermal gradient, then calculate the gradient for this point (in $^{\circ}\text{C}/\text{m}$).
- Knowing that the estimated gradient in $^{\circ}\text{C}/\text{m}$ is equivalent to the gradient in $^{\circ}\text{K}/\text{m}$, estimate the geothermal flow at the point chosen previously.
- Discuss your result compared with datas available on <https://ihfc-iugg.org/viewer/>

Exercice GEMDRON – ECH 2025





Using Ready-to-use Classroom Activities



Heat flow on Earth's surface

As part of the SUPER-MOUV campaign in February 2024, scientists on board the vessel *Forquival* per 7 searched to measure the heat flow at the bottom of the ocean off the coast of Ecuador.

Heat flow (or thermal flux) is the thermal energy dissipated by the Earth's surface (in a given time).

The unit used is $W \cdot m^{-2}$ and depends, according to Fourier's law, on :

- the thermal conductivity of rocks, which is the capacity of a material, in this case a rock, to propagate heat without any movement of matter,
- the geothermal gradient, i.e., the rate of increase of temperature in the subsurface, from the surface to depth.

$$\text{Heat flow} [W \cdot m^{-2}] = \text{thermal conductivity of a rock} [W \cdot m^{-1} \cdot K^{-1}] \times \text{geothermal gradient} [K \cdot m^{-1}]$$

As shown on the map below, the heat flow on Earth's surface isn't homogenous. The average is about $80 \text{ mW} \cdot m^{-2}$.

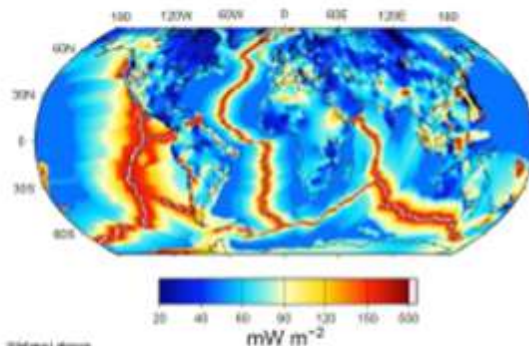


Figure 1: Heat flow map on the Earth's surface
<https://climate.geog.udel.edu/climateviz/heatflowmap/>

Forquival GENDRON - SOU 2025

The heat flow at plate boundaries follows most of the time the pattern shown below :

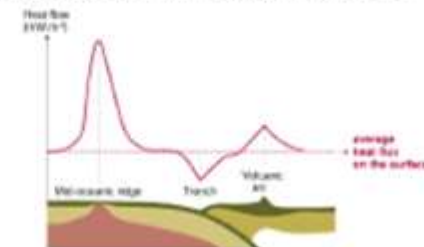


Figure 2: Model of heat flow at plate boundaries

In order to measure geothermal gradient, scientists deploy a gravity corer with several thermometers distributed along the length of the core, and measure the temperature at different depths in the oceanic sediments (<https://www.romesop.com/leaves/1/10/super-mouv/Outils-de-recherche/Prelevement-sediments/real/Carottiers-gravites/Carottiers-Calydon>)



Head of corer (in orange) by night
Forquival Gendron



Rope between the corer and the vessel
Forquival Gendron

Forquival GENDRON - SOU 2025



Using Ready-to-use Classroom Activities



Thermometer placed in the core
Routine Gendron



Thermometers for core
Routine Gendron

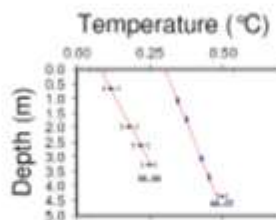


Figure 3: temperature measurements based on depth
(GPS coordinates for 06-07 and 06-08 available on figure 1)

Routine GENDRON - EDU 2023

In order to measure thermal conductivity, scientists have to collect sediment core samples (simultaneously with geothermal gradient measurements or not) using the corer on board the ship. Then, they use a heating thermometric probe, connected to a computer to find the thermal conductivity of the sediments present inside a core.



Crew taking a core out of water
Routine Gendron



Heating needle temperature probe
Routine Gendron



Thermal conductivity measurement in oceanic sediments in a core
Routine Gendron

Routine GENDRON - EDU 2023



Using Ready-to-use Classroom Activities



Material	Thermal conductivity (W/m ² /K)
Water	0,6
Urnastone	around 2,5
Basalt	around 2
Granite	around 3,2
Peridotite	around 5

Figure 4 : thermal conductivity in several materials

Sample	Longitude	Latitude	Thermal conductivity in sediments (W/m ² /K)
06-07	-90,3811	15,0073	1,348
06-08	-90,4072	14,8797	1,103

Figure 5 : thermal conductivity in sediments for samples 06-07 et 06-08 (Figure 3)



Questions for students about heat flow

First level :

Using <https://blh-geom.org/blower/> and a mid-oceanic ridge, a subduction trench and a volcanic arc of your choice, show that heat flow isn't homogeneous on Earth's surface (figures 1 & 2).

For help, use : <https://www.national Geographic.fr/en/productions/geomapsh3/>

Second level :

- Knowing that Iceland is mostly made of basaltic rocks, and that the average geothermal gradient in Earth's crust is around 30K/km, use figure 4 to estimate the average heat flow in this part of the world.

- Using <https://blh-geom.org/blower/>, compare heat flow expected in Iceland to real heat flow measured in Iceland.

- Try to explain the difference between the expected results and the real heat flow in Iceland.

For help, use :

<https://www.national Geographic.fr/en/productions/geomapsh3/> and/or

<https://www.national Geographic.fr/en/productions/geomapsh2/>

Third level :

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Two geothermal gradient measurements made during this campaign are shown in figure 3.

The thermal conductivity measurements carried out in the sediments collected during these gradient measurements are shown in figure 5.

- Find the place where this campaign took place.

- Indicate, with justification, which of the points (06-07 or 06-08) should be the better one to calculate the geothermal gradient, then calculate the gradient for this point (in °C/m).

- Knowing that the estimated gradient in °C/m is equivalent to the gradient in K/m, estimate the geothermal flow at the point chosen previously.

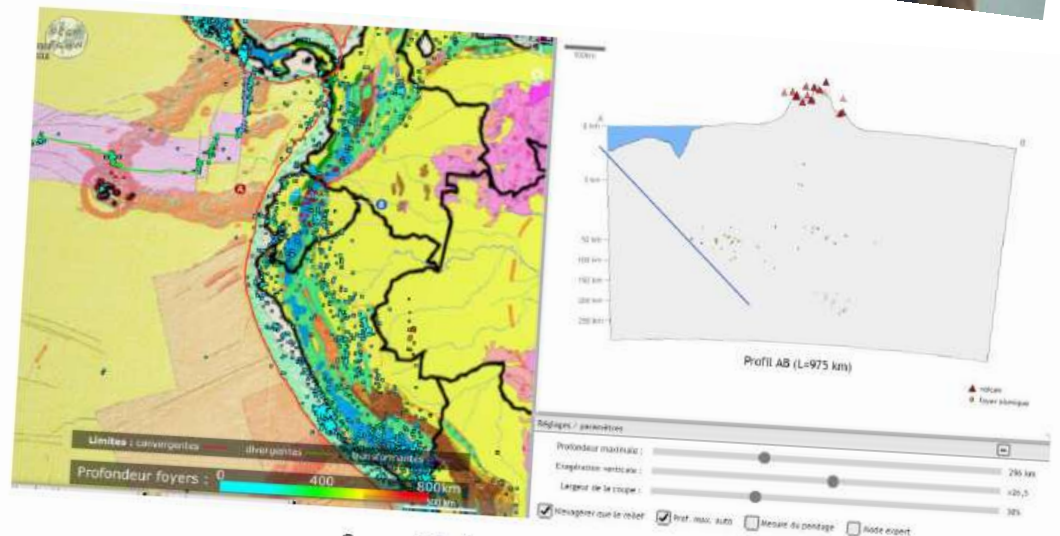
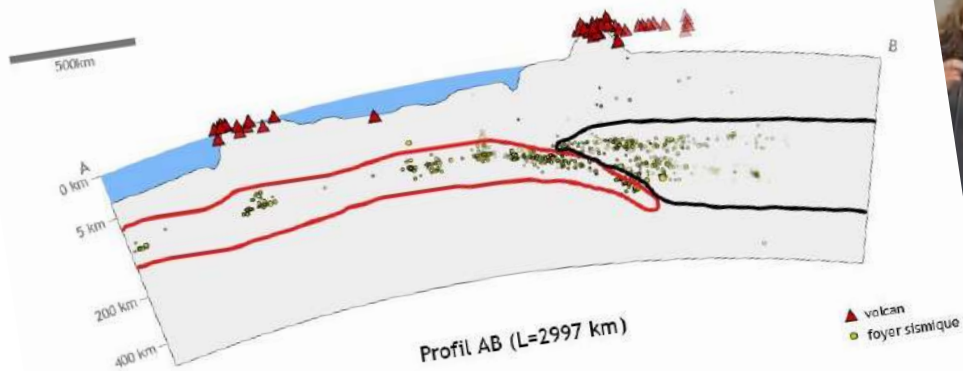
- Discuss your result compared with data available on <https://blh-geom.org/blower/>



Using Ready-to-use Classroom Activities



Part 1 (Victor and Matteo) : Tectonic context of Ecuador and the reasons of intense seismic and volcanic activity



Coupe géologique au niveau de l'Equateur



Hélder Pereira & Faustine Gendron - Part II



THE FLOOR OF THE OCEANS



Based on bathymetric charts by
Robert C. Sherris and Marie Tharp
of the Lamont-Doherty Geological Observatory
Columbia University Palisades, New York, 1958
IMPROVED BY THE UNITED STATES NAVY
OFFICE OF NAVAL RESEARCH



"When I think of the floor of the deep sea, the single, overwhelming fact that possesses my imagination is the accumulation of sediments. I see always the steady, unremitting, downward drift of materials from above, flake upon flake, layer upon layer — a drift that has continued for hundreds of millions of years, that will go on as long as there are seas and continents..... For the sediments are the materials of most stupendous 'snowfall' the Earth has ever seen..."



— Rachel Carson



Brief history of scientific ocean drilling programs

Deep Sea Drilling Project
(DSDP)
1966
Legs 1-96



Glomar Challenger

Ocean Drilling Program
(ODP)
1983
Legs 101-210



*JOIDES Resolution
(JR)*

Integrated Ocean Drilling Program
(IODP)
2003
Expeditions 301-346



JR



CHIKYU



*Mission specific
platforms*

International Ocean Discovery Program
(IODP)
2013
Expeditions 349-405



Brief history of scientific ocean drilling programs

International Ocean Drilling Program
(IODP³)
2025

Expeditions 501 onwards



JR



CHIKYU



*Mission specific
platforms*

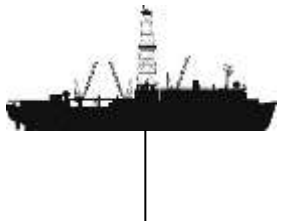


**INTERNATIONAL
OCEAN DRILLING
PROGRAMME**

The International Ocean Drilling Programme 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.

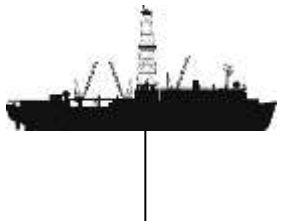
[Discover more >](#)

<https://iodp3.org/>



JOIDES RESOLUTION





JOIDES RESOLUTION



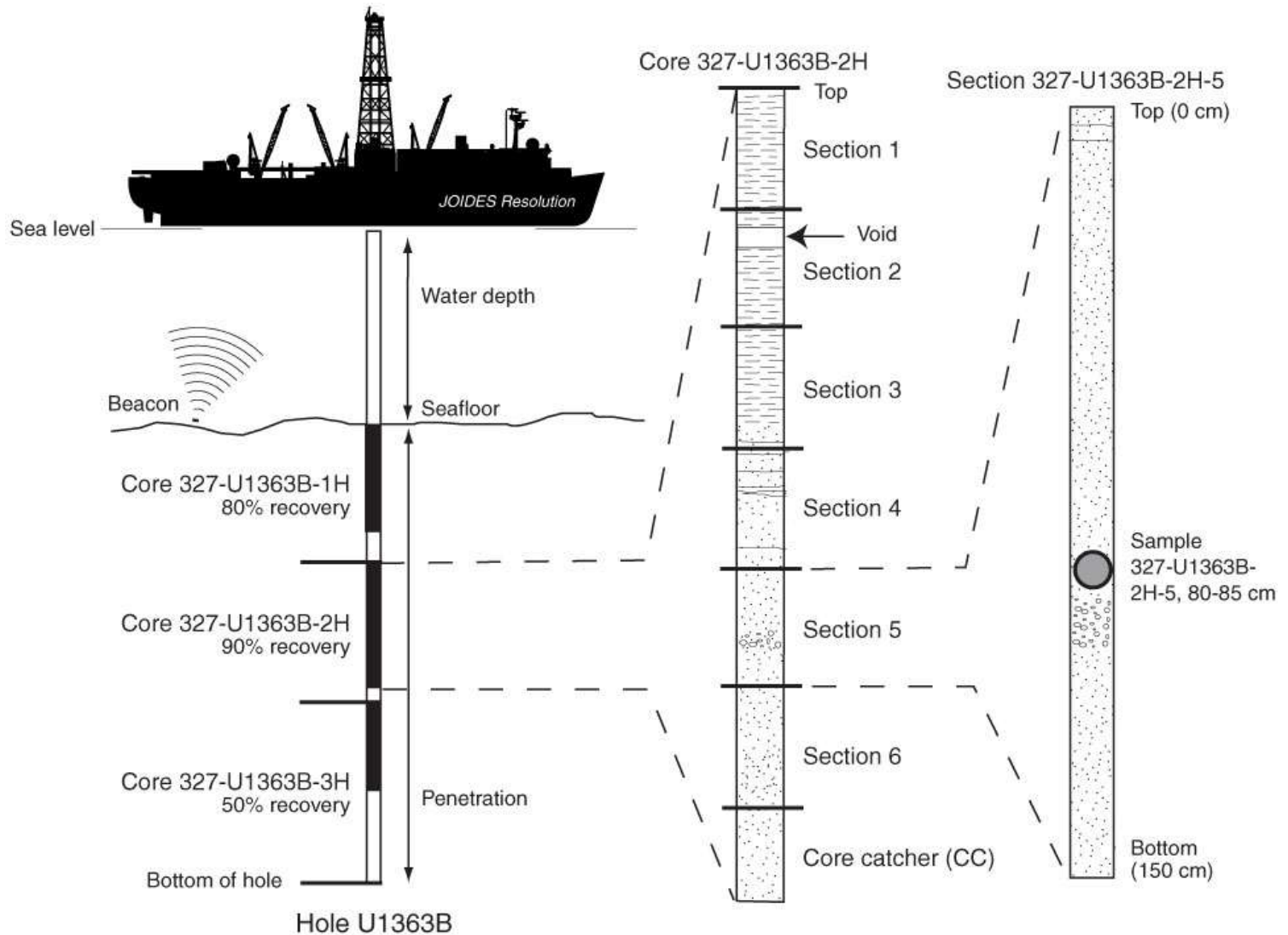


JOIDES RESOLUTION

IODP Expedition 327
Site U1363



Global Positioning System





An educator aboard the JOIDES Resolution

Juan de Fuca hydrogeology:

Cementing operations at the Hole U1301A and Hole U1301B
borehole observatories (CORKs)

22 June–5 July 2009





An E&O officer aboard the JOIDES Resolution

Mediterranean Outflow:

Environmental significance of the Mediterranean Outflow Water
and its global implications

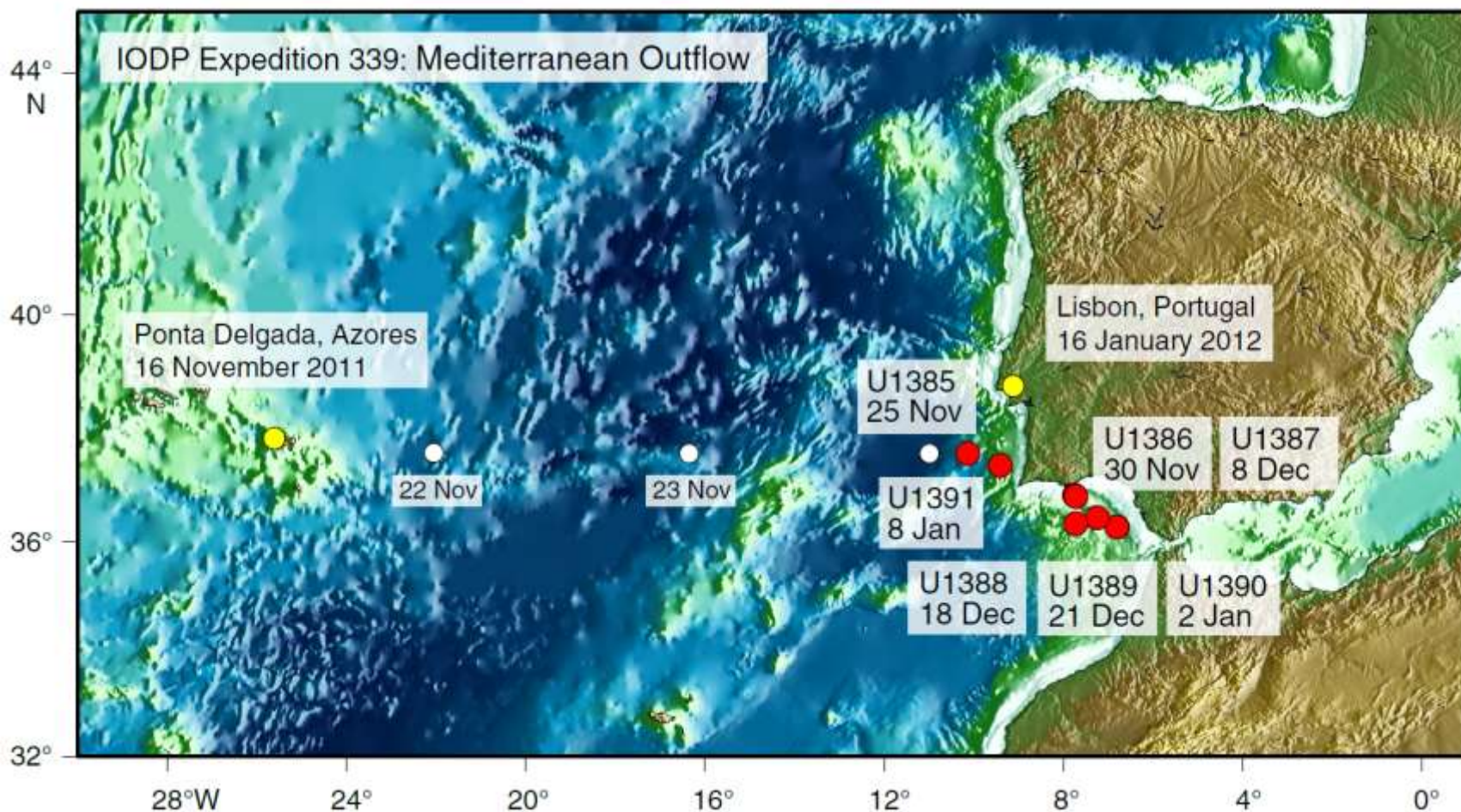
16 November 2011–16 January 2012





IODP Expedition 339

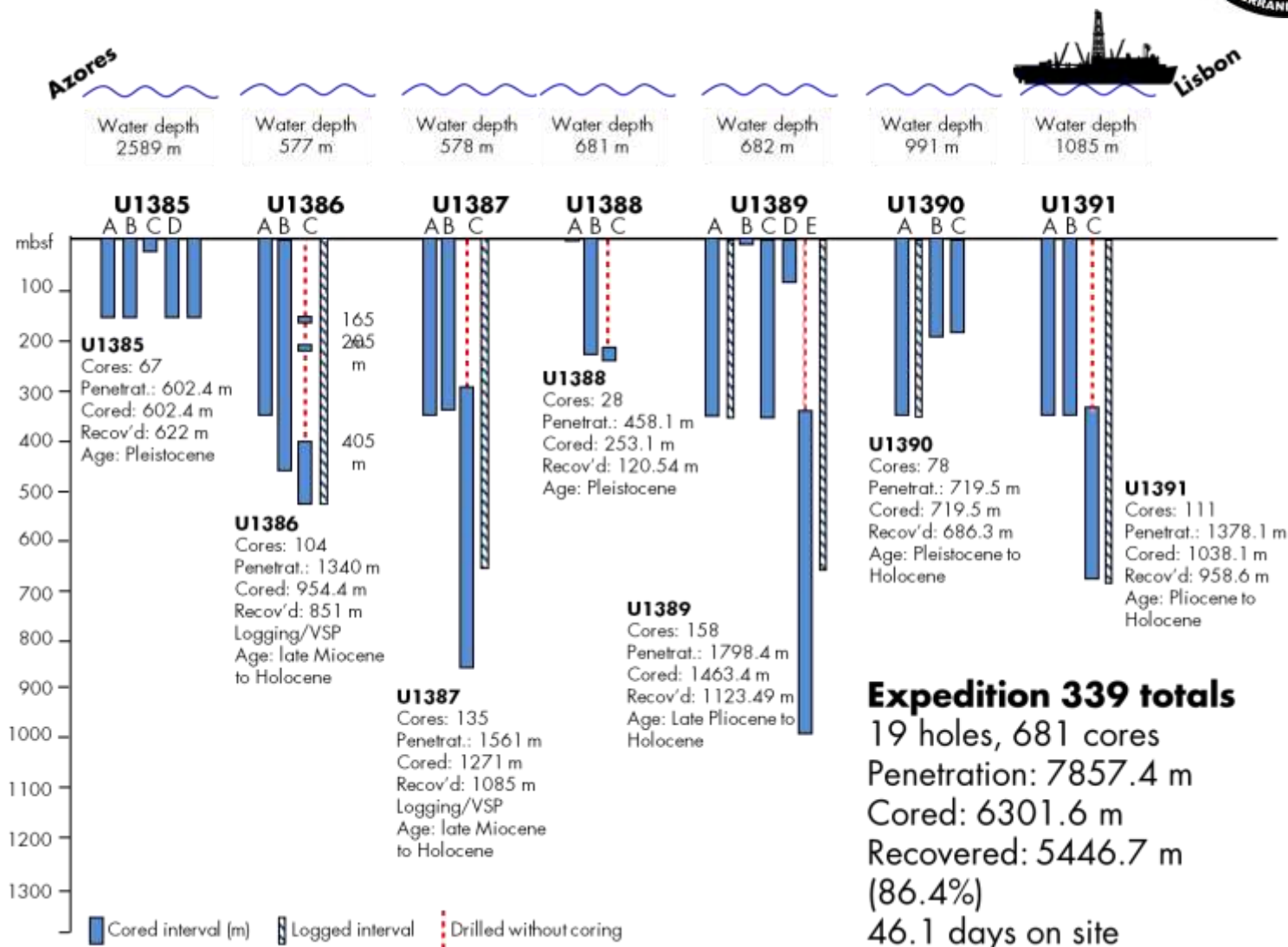
Mediterranean Outflow





IODP Expedition 339

Mediterranean Outflow





IODP Expedition 339



Mediterranean Outflow:

**Environmental significance of the Mediterranean Outflow Water
and its global implications**

16 November 2011–16 January 2012



Credit: John Beek, IODP/IFAU



IODP Expedition 339



Mediterranean Outflow:

Environmental significance of the Mediterranean Outflow Water
and its global implications

16 November 2011–16 January 2012



Credit: John Bick, IODP/TAMU



IODP Expedition 339

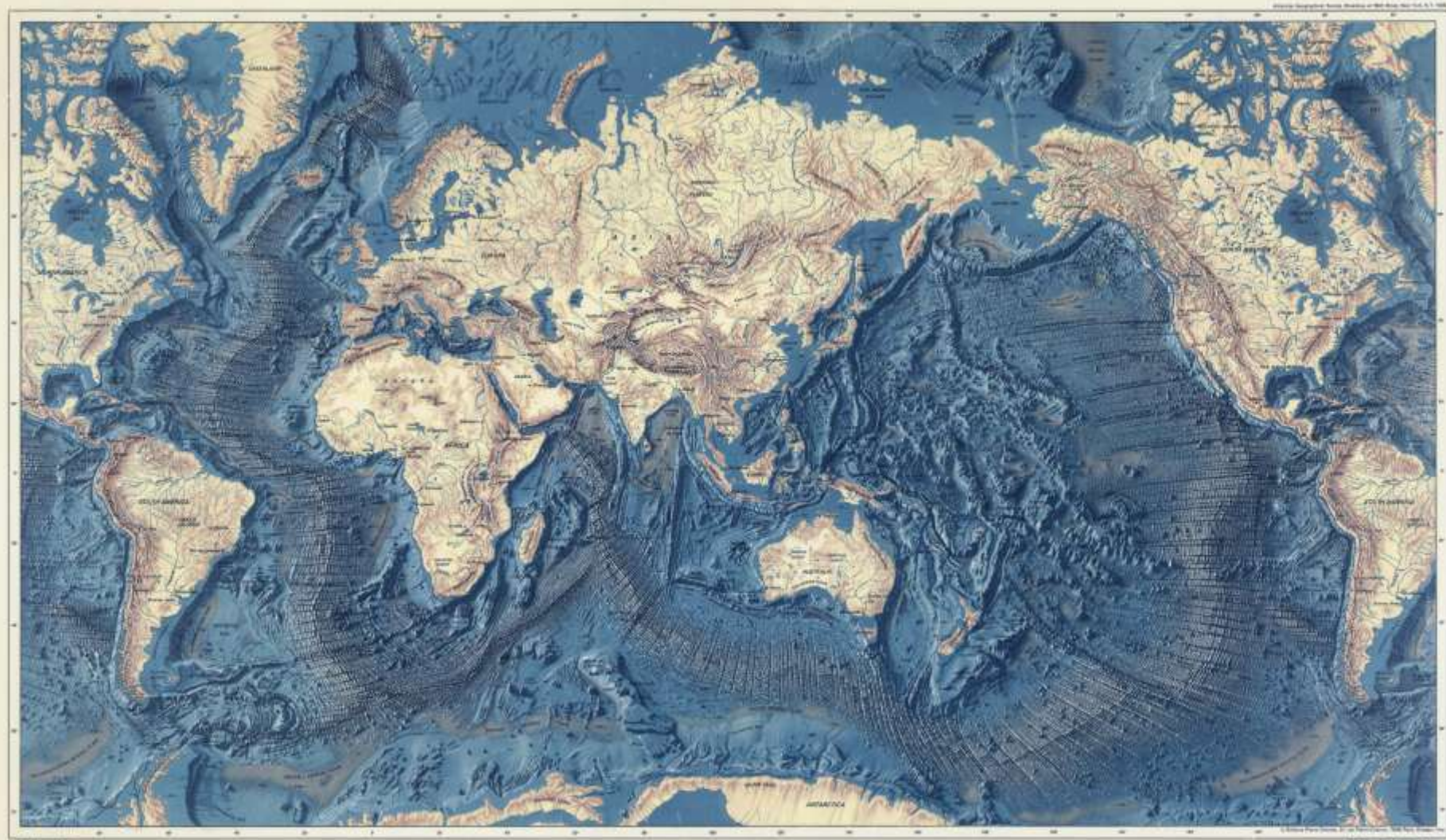


Mediterranean Outflow:

**Environmental significance of the Mediterranean Outflow Water
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16 November 2011–16 January 2012





THE FLOOR OF THE OCEANS

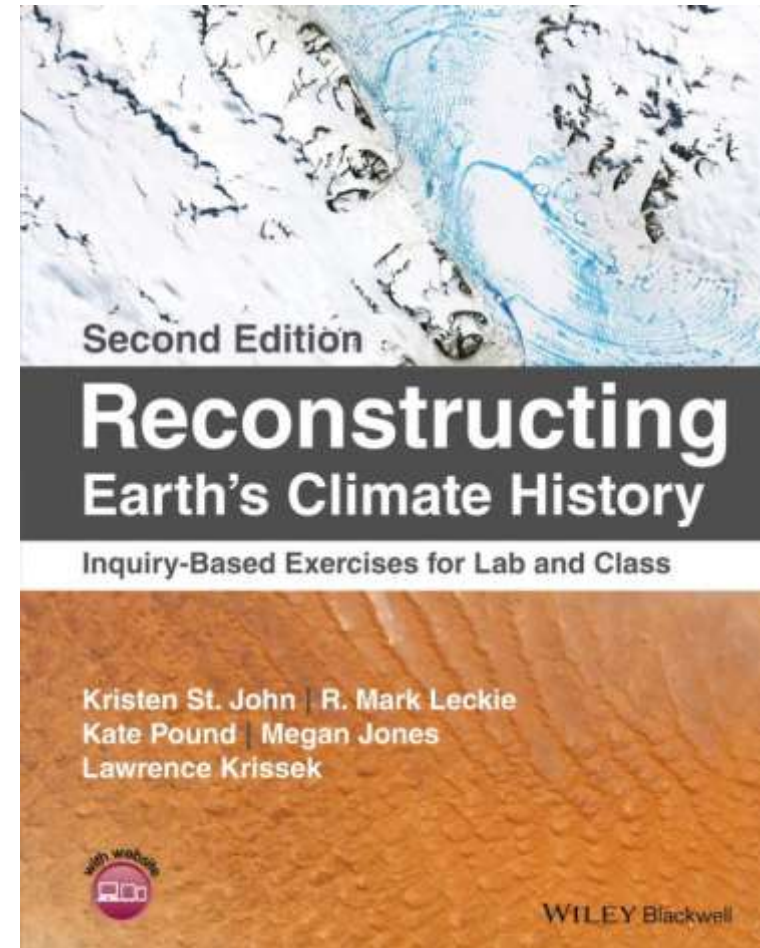
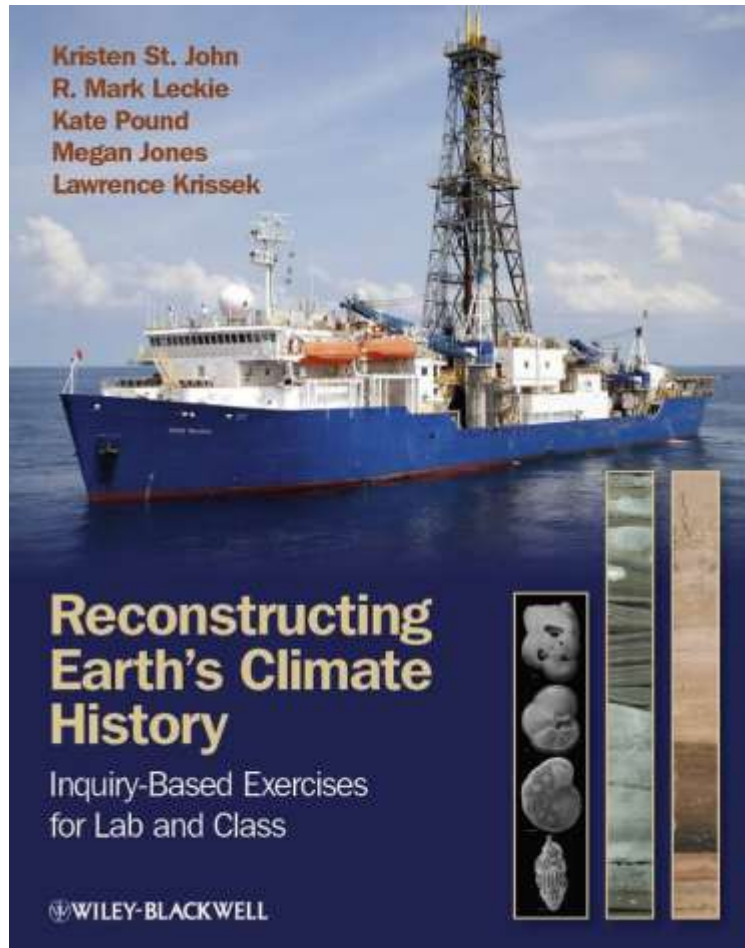


Based on bathymetric charts by
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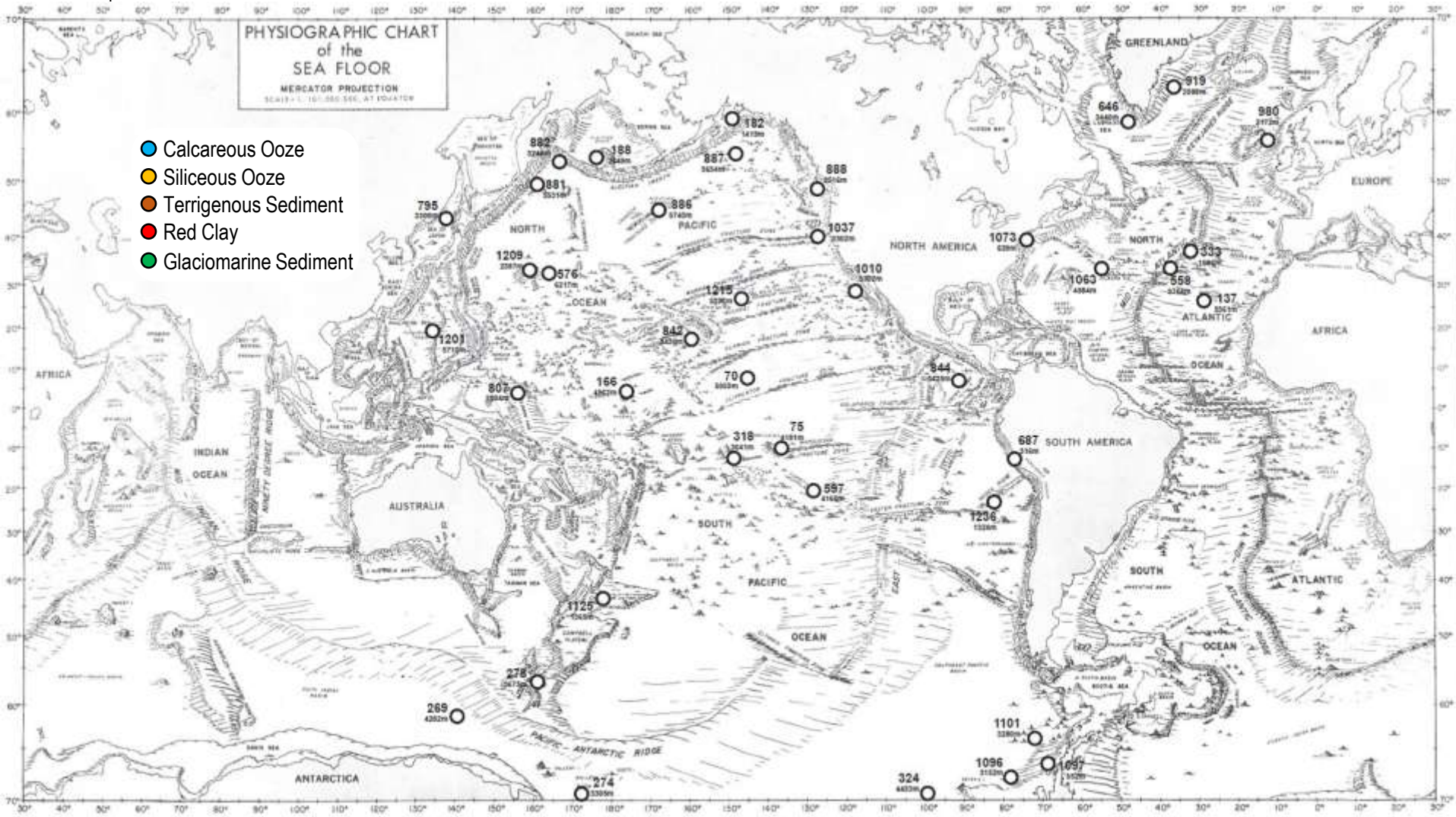
Doing Inquiry-Based Exercises for Lab and Class





Doing Inquiry-Based Exercises for Lab and Class

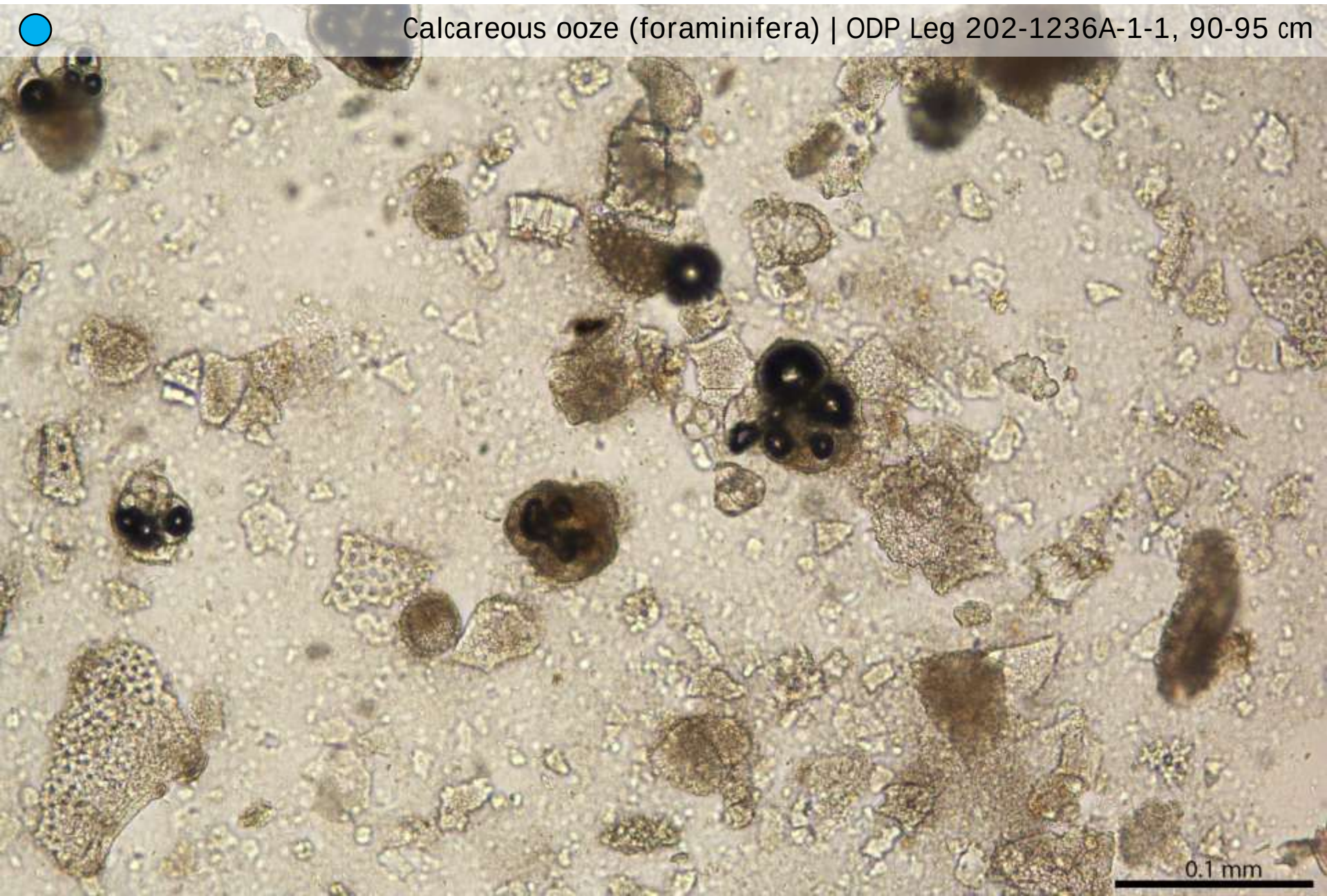
Seafloor Sediments | Geographic Distribution and Interpretation



For the sediments are the materials of most stupendous 'snowfall' the Earth has ever seen..."

— Rachel Carson

● Calcareous ooze (foraminifera) | ODP Leg 202-1236A-1-1, 90-95 cm

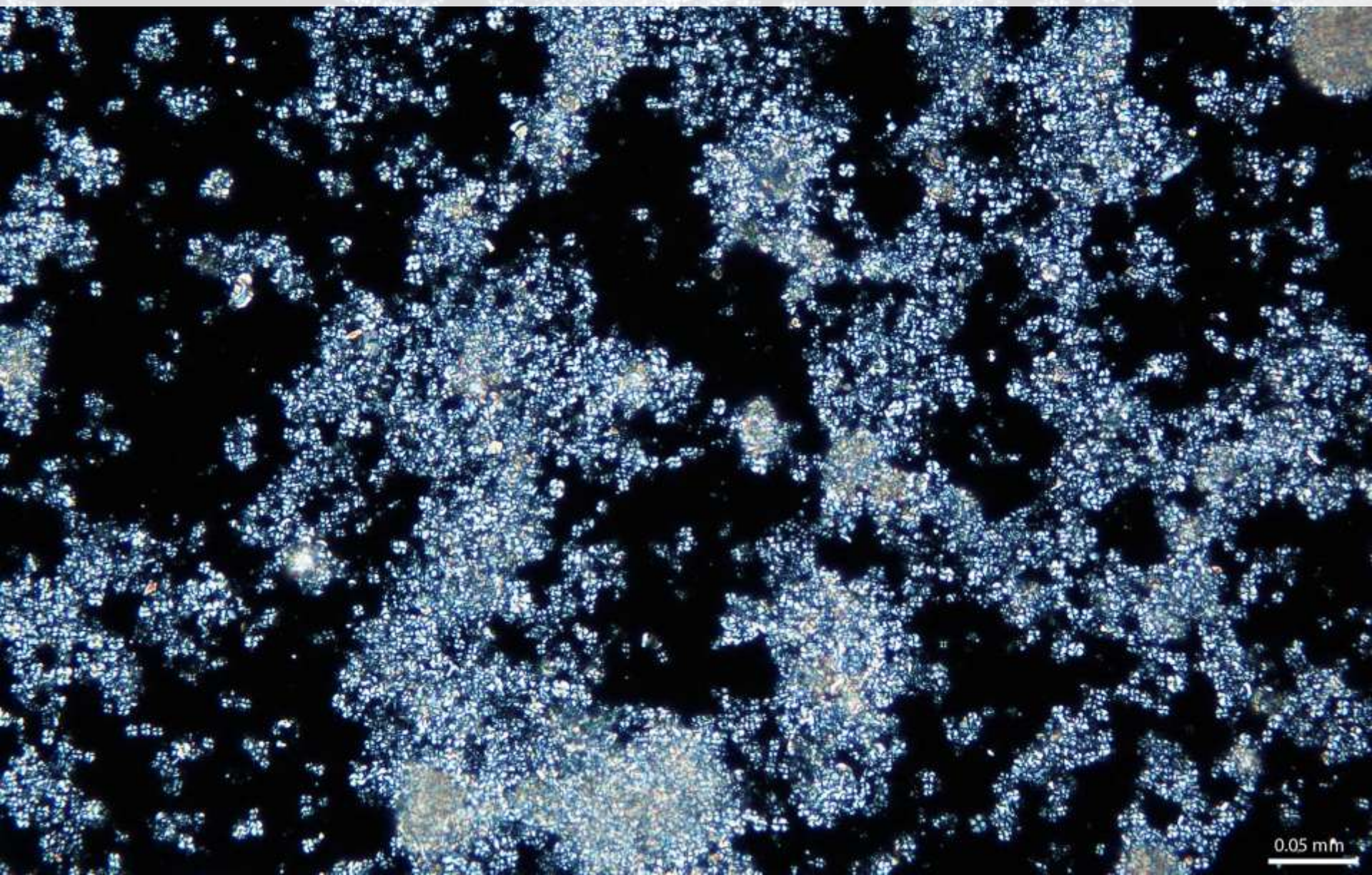


For the sediments are the materials of most stupendous 'snowfall' the Earth has ever seen..."

— Rachel Carson



Calcareous ooze (coccoliths) | DSDP Leg 82-558-3-6, 75 cm



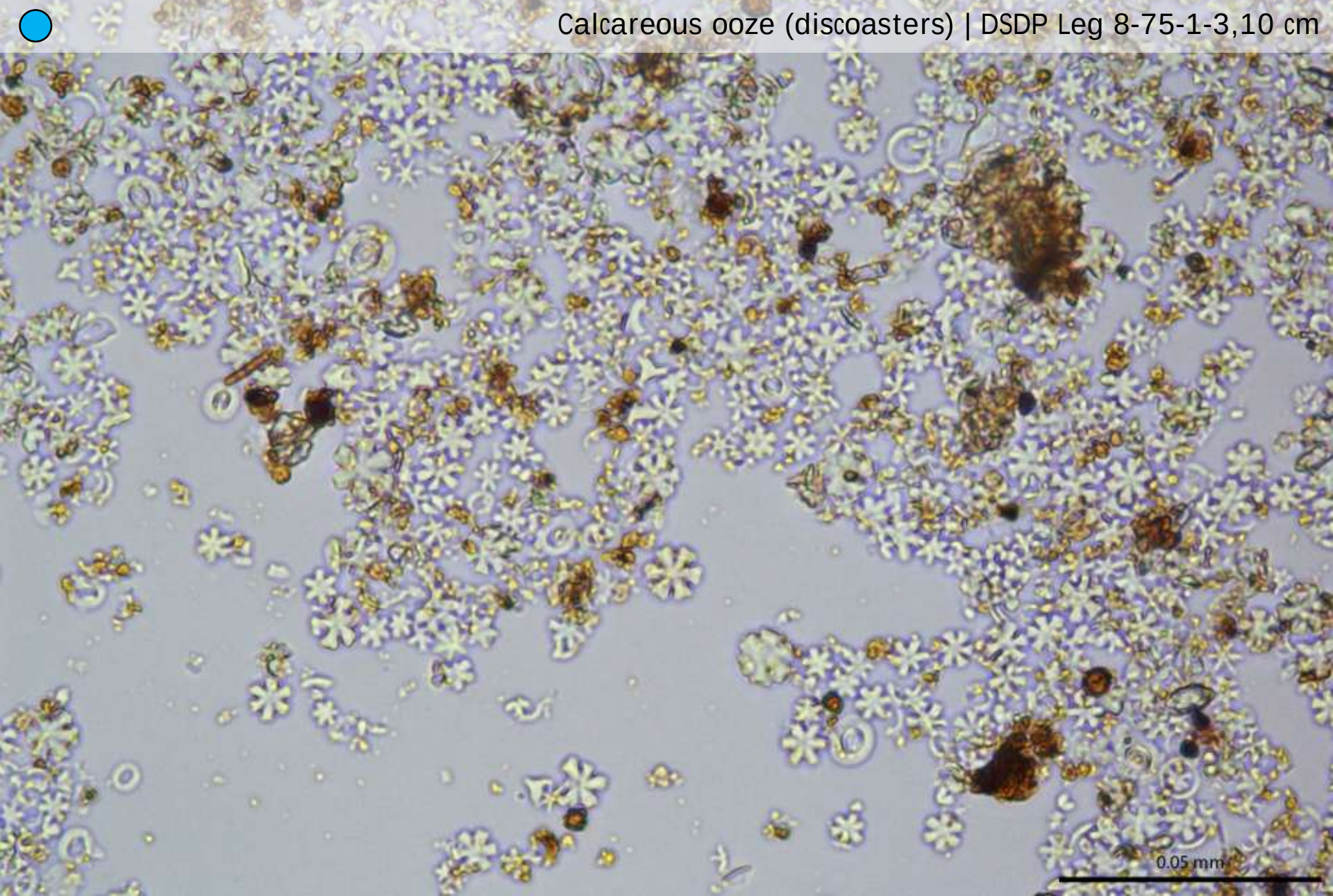
0.05 mm

For the sediments are the materials of most stupendous 'snowfall' the Earth has ever seen..."

— Rachel Carson



Calcareous ooze (discoasters) | DSDP Leg 8-75-1-3, 10 cm

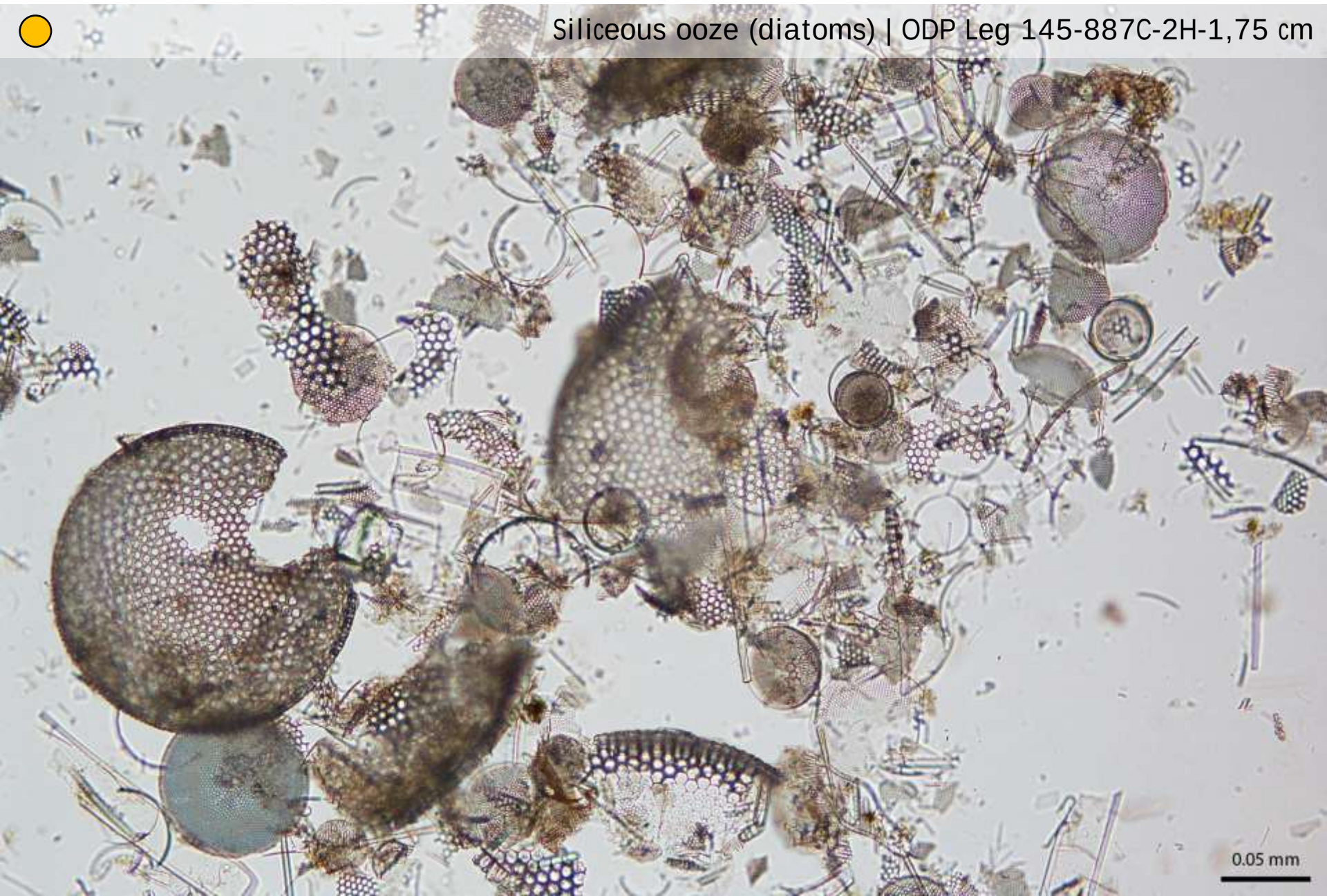


For the sediments are the materials of most stupendous 'snowfall' the Earth has ever seen..."

— Rachel Carson



Siliceous ooze (diatoms) | ODP Leg 145-887C-2H-1,75 cm



0.05 mm

For the sediments are the materials of most stupendous 'snowfall' the Earth has ever seen..."

— Rachel Carson



Siliceous ooze (radiolarians, fraction > 63 μ m) | IODP Exp 320-U1334A-27X-6, 43–45 cm



Wade et al. (2020)

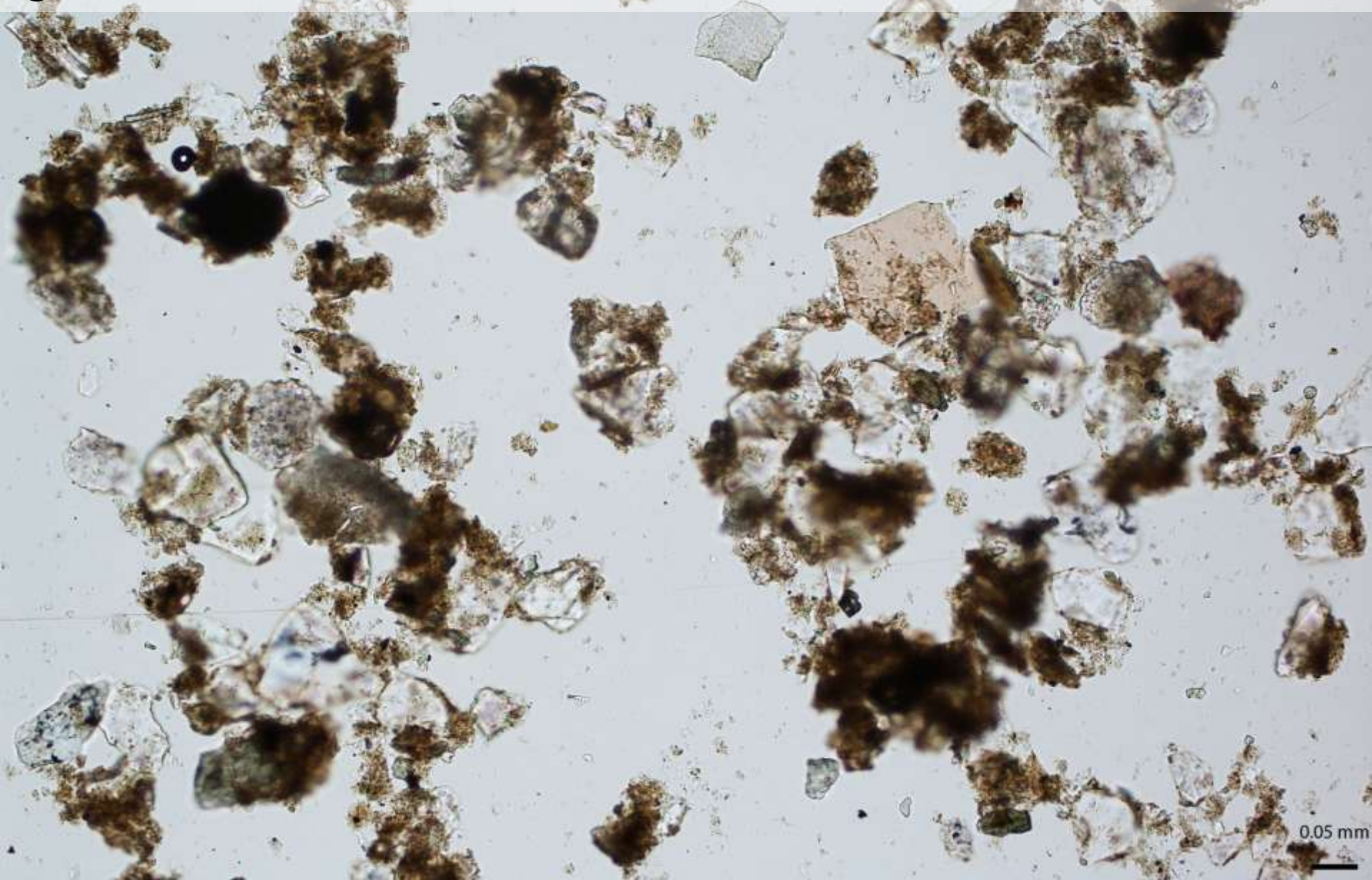
<https://doi.org/10.1016/j.earscirev.2020.103403>

200 μ m

For the sediments are the materials of most stupendous 'snowfall' the Earth has ever seen..."

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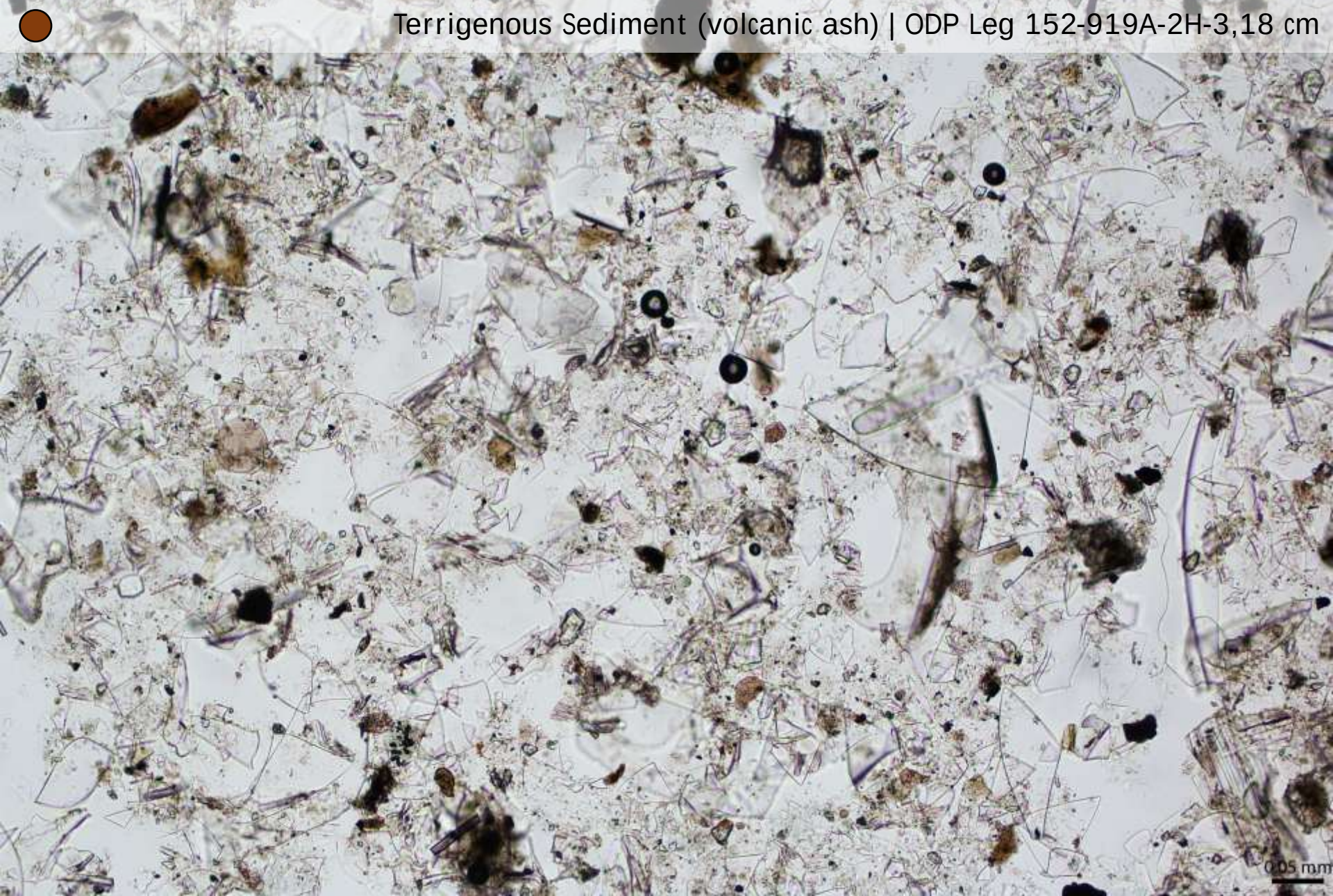
● Terrigenous Sediment (Continental shelf quartz grains) | ODP Leg 174-1073A-1H-1, 10 cm



For the sediments are the materials of most stupendous 'snowfall' the Earth has ever seen..."

— Rachel Carson

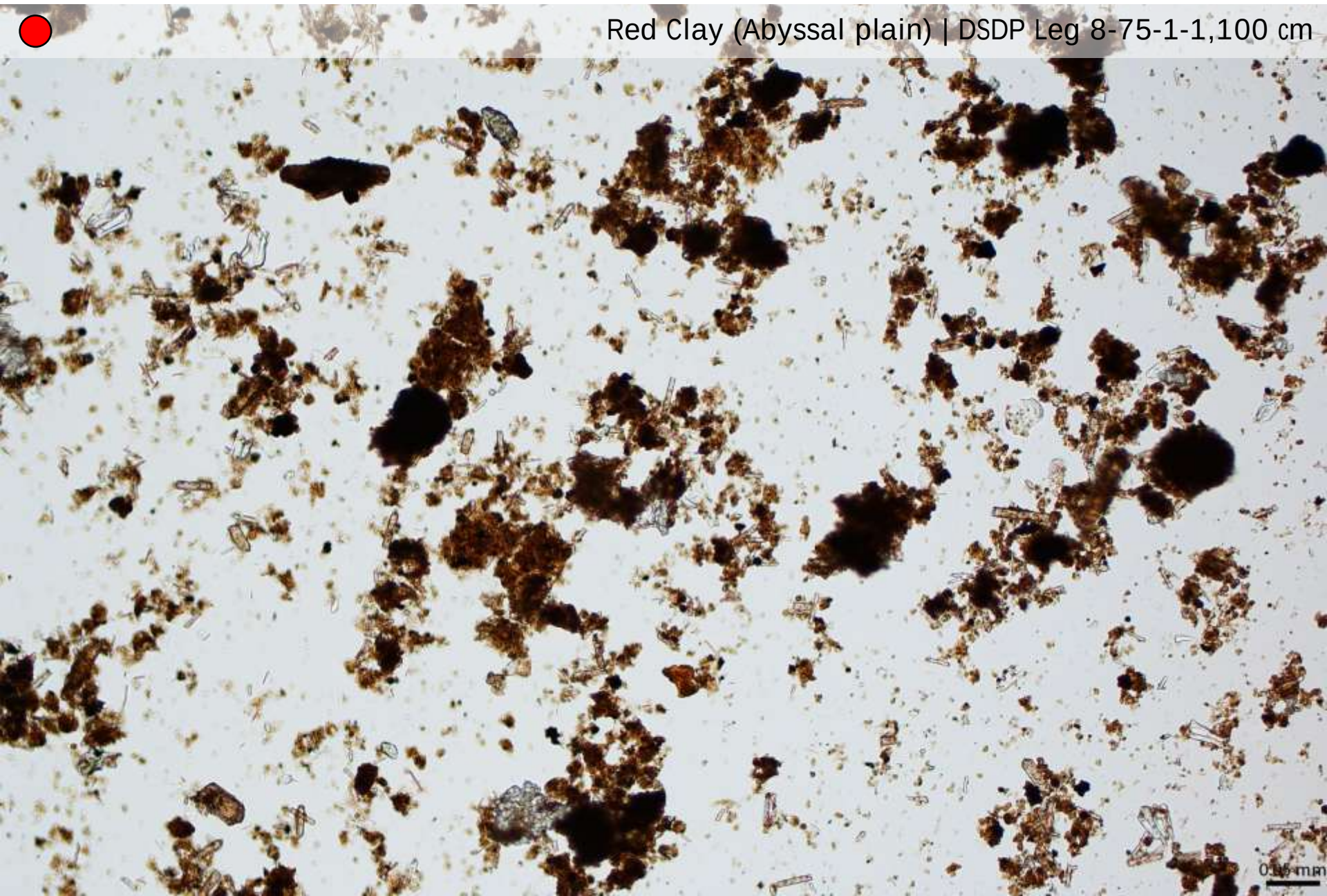
● Terrigenous Sediment (volcanic ash) | ODP Leg 152-919A-2H-3, 18 cm



For the sediments are the materials of most stupendous 'snowfall' the Earth has ever seen..."

— Rachel Carson

Red Clay (Abyssal plain) | DSDP Leg 8-75-1-1, 100 cm



For the sediments are the materials of most stupendous 'snowfall' the Earth has ever seen..."

— Rachel Carson



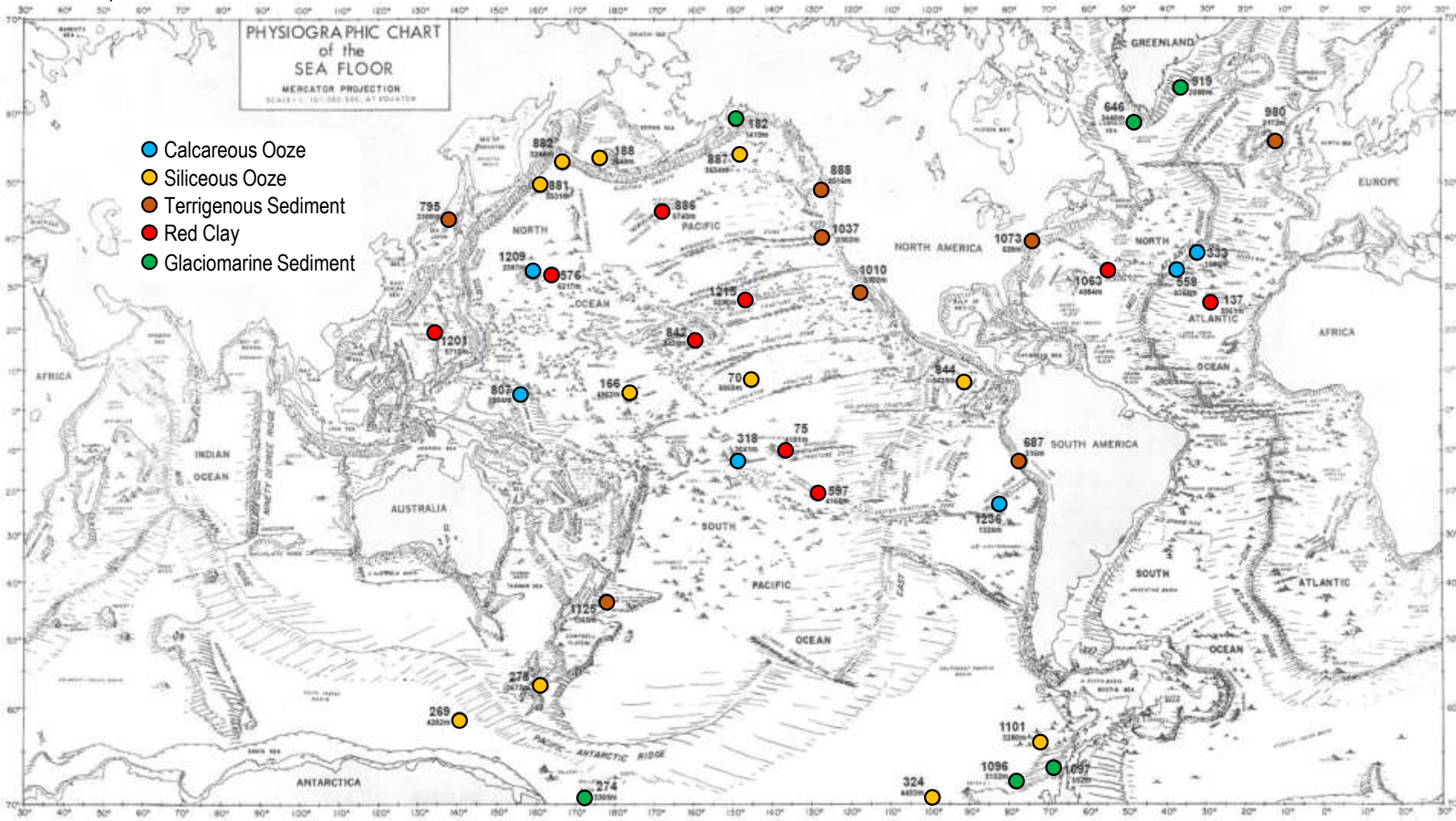
Glaciomarine Sediment (Antarctica) | ODP Leg 178-1101A-2H-2,106 cm





Doing Inquiry-Based Exercises for Lab and Class

Seafloor Sediments | Geographic Distribution and Interpretation





Requesting sediment samples...



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DATA & SAMPLES

[Home](#) / [IODP³ Resources](#) / [Data & Samples](#)

IODP³ provides open access to all expedition samples and data once the members of Expedition Science Teams have had a reasonable opportunity to complete their initial studies within a one-year moratorium period. Samples and data from all other scientific ocean drilling programmes (past and present) are also freely available.

Data are available from each expedition's Science Operator, whereas samples may be requested from the three Core Repositories, using the links below.

[Sample, Data & Obligations Policy](#)

DATA ACCESS

[JRSO](#)[MARE3](#)[ESO](#)[DOWNHOLE LOGGING DATA](#)

IODP³ RESOURCES

- Core Repositories
- Data & Samples**
- Frequently Used Acronyms
- KML Tools
- Branding and Logos

IODP³ EXPEDITIONS

EXPEDITION 503

| [SEND AI](#)

HADAL TRENCH TSUNAMIGENIC SLIP HISTORY

[Dates: Nov. 24 - Dec. 12, 2025](#)



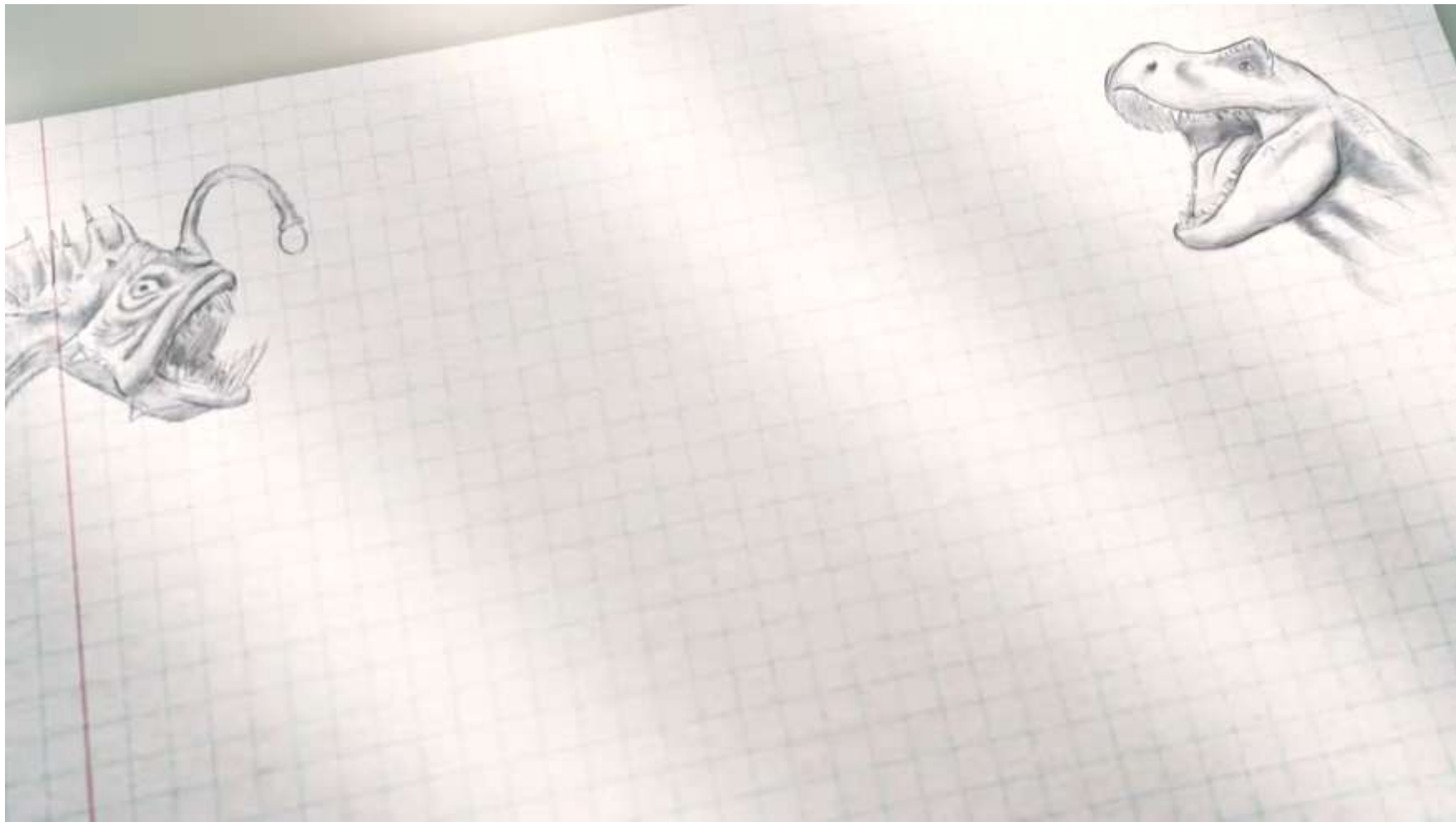


...and extracting microfossils





...and extracting microfossils





...and extracting microfossils





...and extracting microfossils

5

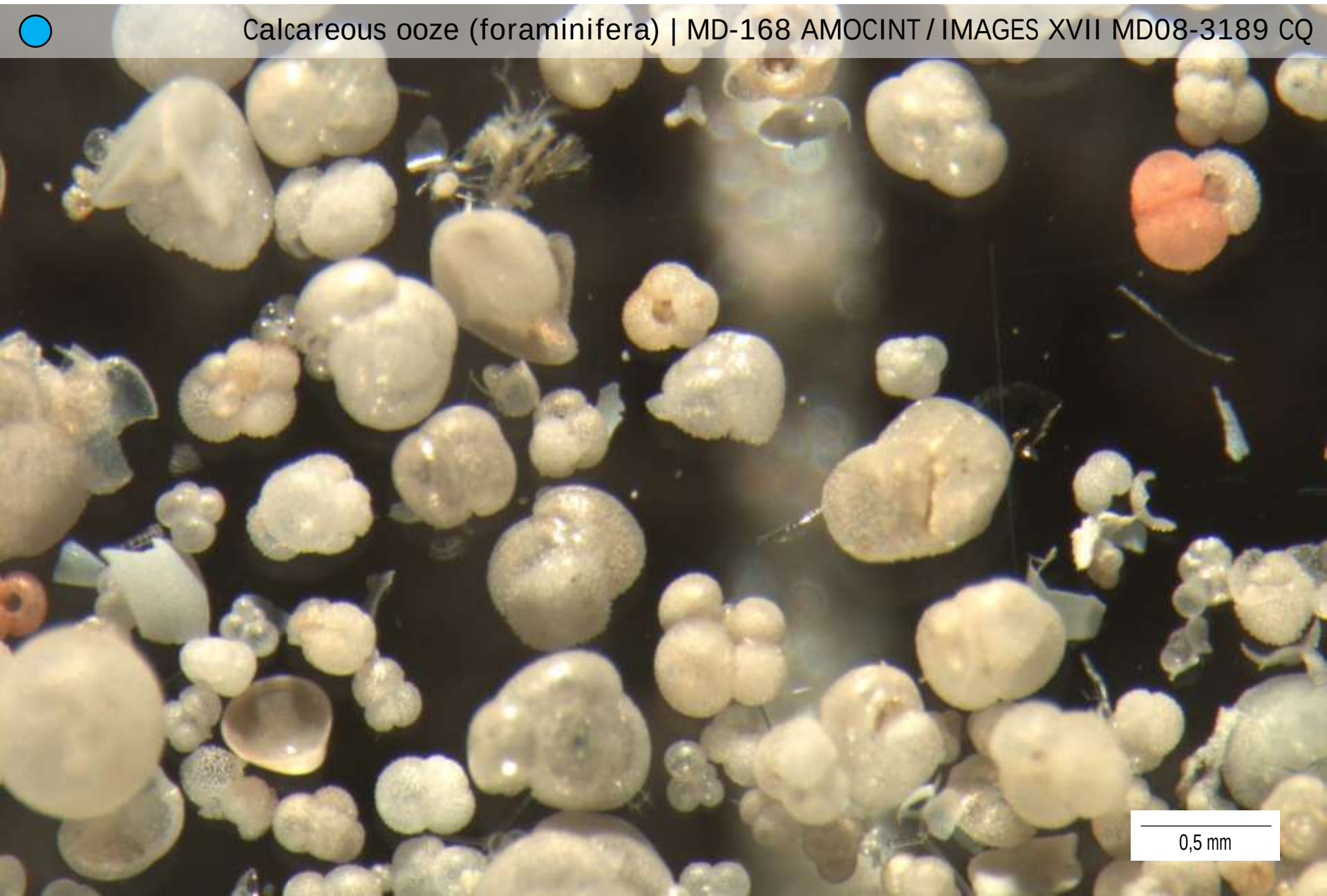


Cortesía da foto: H. Pereira

For the sediments are the materials of most stupendous 'snowfall' the Earth has ever seen..."

— Rachel Carson

● Calcareous ooze (foraminifera) | MD-168 AMOCINT / IMAGES XVII MD08-3189 CQ



0,5 mm



Using Core Photographs and Digital Images

International Ocean Discovery Program JOIDES Resolution Science Operator

Home Expeditions ▾ Participants ▾ Travel & Meetings ▾ Technology ▾ Data ▾ Samples ▾ Publications ▾ Outreach ▾ Related Sites ▾ About ▾ Search

Samples / [Sample/Data Request](#) / Core Photographs and Digital Images

Core Samples

[Information](#) [Requests](#) [Sample Types](#) [Policies](#) **[Images](#)** [Repositories](#) [Archives](#) [Moratorium](#)

Core Photographs and Digital Images

Whole-Core Photographs

[Whole-core photos](#) are available in black-and-white 8 × 10 inch prints, 35-mm color slides, or scanned images (high-resolution TIFF files). Requests can be made to the [Data Librarian](#). Please include the DSDP/ODP/IODP core-naming convention when placing requests (i.e., Leg-Site-Hole-Core). IODP whole-core photos are available only through Expedition 312.

Low-resolution whole-core images (300 dpi; PDF files) can be obtained from the [Janus database Core Photo query](#).

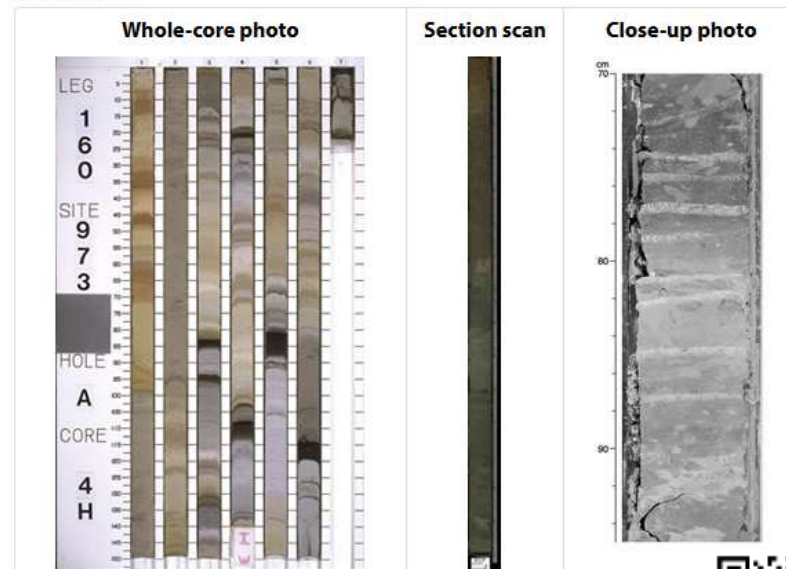
Digital Images of Core Sections

[Line-scan digital images](#) of the archive-half core sections captured with the Digital Imaging System can be obtained starting with ODP Leg 198 from the [Janus database Core Photo query](#) or [LIMS](#).

Close-up Photographs

[Close-up photographs](#) are available in black-and-white 8 × 10 inch prints, 35-mm color slides, or scanned digital images (high-resolution TIF files). Requests can be made to the [Data Librarian](#). Please include the ODP/IODP core-naming convention when placing requests (i.e., Leg-Site-Hole-Core-Section-Top interval). Requests can only be made for close-up photos taken during a cruise. Close-up photos can be obtained starting with DSDP Leg 46 from the [Janus database Closeup Photo query](#) or [LIMS](#).

Examples





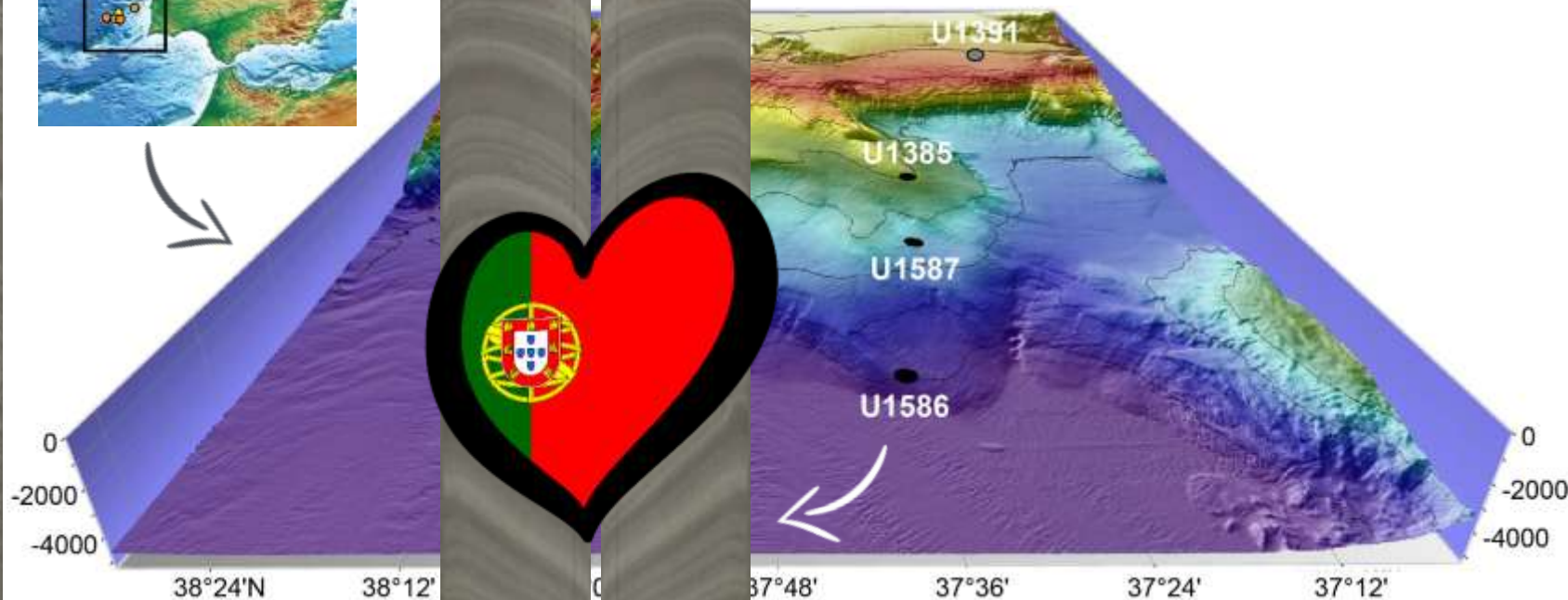
Using Core Photographs and Digital Images

IODP Expedition 397: Iberian Margin Paleoclimate



Working
half

Archive
half



397 U1586A-6H-5

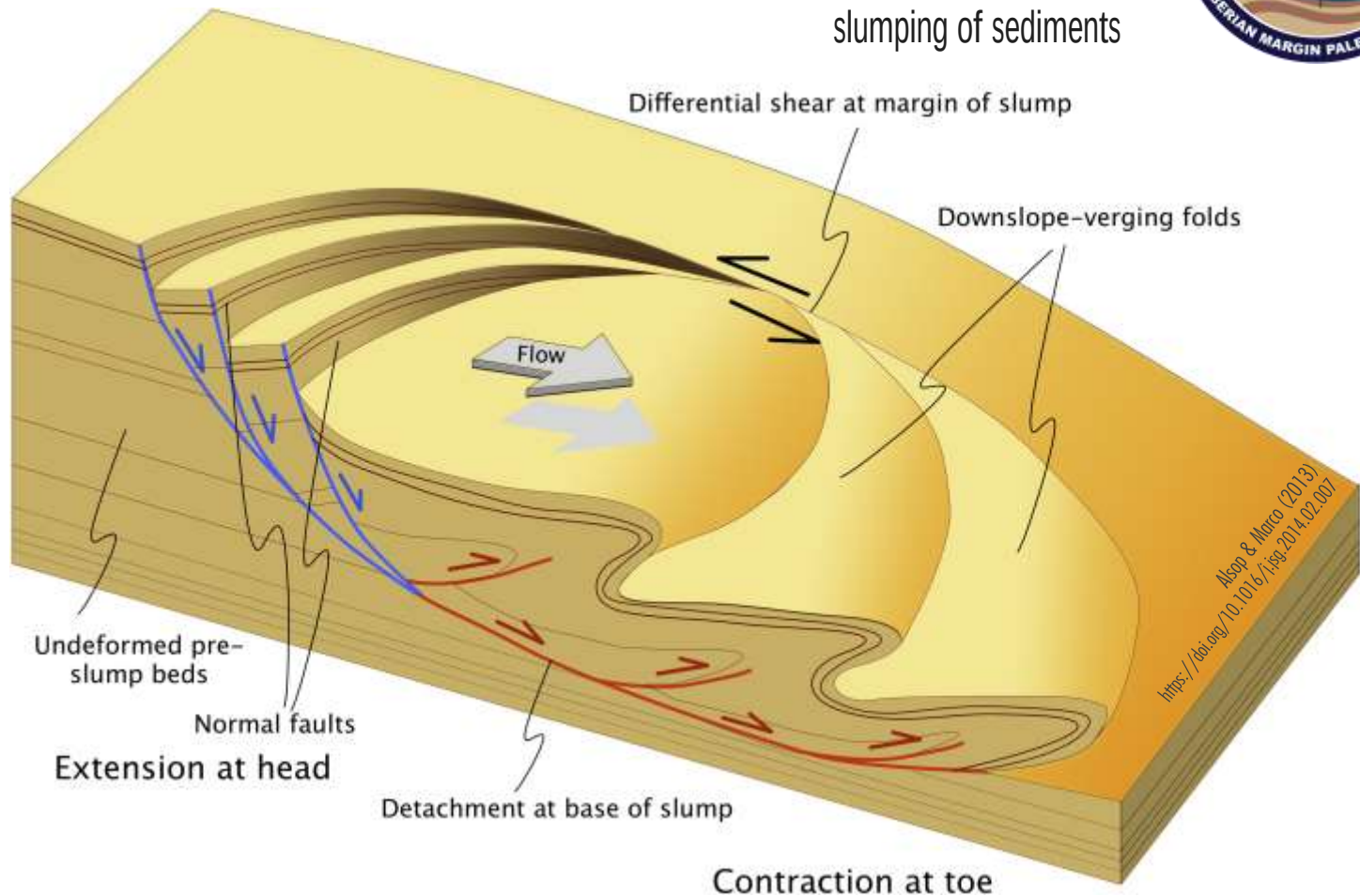


Using Core Photographs and Digital Images

IODP Expedition 397: Iberian Margin Paleoclimate



Schematic 3D cartoon illustrating gravity-driven downslope slumping of sediments





Requesting ODP/IODP core replicas



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Core replica: Chicxulub Impact Sequence I – IODP Expedition 364

Core replica

Chicxulub Impact Sequence I - IODP Expedition 364 Replica of core section: Hole M0077, Core 81R, Section 2IODP Expedition 364 Chicxulub K-Pg Impact Crater Replica of a core drilled in the in rocks from the peak ring of the Chicxulub impact crater in the Gulf of...



Core replica: Chicxulub Impact Sequence II – IODP Expedition 364

Core replica

Chicxulub Impact Sequence II - IODP Expedition 364 Replica of core section: Hole M0077, Core 40R, Section 1IODP Expedition 364 Chicxulub K-Pg Impact Crater Replica of a core drilled in the in rocks from the peak ring of the Chicxulub impact crater in the Gulf of...



Cretaceous-Paleogene (K/Pg) Blake Nose Paleooceanographic Transect

Core replica

Cretaceous-Paleogene (K/Pg) mass extinction boundary Replica of core section: ODP Leg 171B, Hole 1049A, Core 17X, Section 2Expedition: ODP Leg 171B Black Nose Paleooceanographic Transect The core contains evidence (tektites) of a huge meteorite impact at 66Ma ago, the...



Core replica: Paleocene Eocene Thermal Maximum (PETM)

Core replica

Paleocene-Eocene Thermal Maximum (56 Ma) Replica of core section: ODP Leg 208, Hole 1262C - Core 5H, Section 4Expedition: Leg 208 Cenozoic Climate Cycles: Walvis Ridge Transect Replica of a core drilled in the early Cenozoic sediments of the Walvis Ridge, Southern...



Core replica: Tahiti Sea-Level – IODP Expedition 310

Core replica

Coral Reefs off Tahiti Replica of core section: 310-M0024A-10R-01IODP Expedition 310 Tahiti Sea-Level Change Replica of a core drilled in Pleistocene fossil coral reefs off the coast of Tahiti by the ECORD Science Operator, Hole 24A, Core 10R, Section 1.Coral...



Core replica: Arctic Coring – IODP Expedition 302 (ACEX)

Core replica

Arctic Coring - ACEX - IODP Expedition 302 Replica of core section: 302-M0004A-11X-03IODP Expedition 302 Arctic Coring (ACEX) Replica of a core drilled in Eocene sediments of the central Arctic Ocean by the ECORD Science Operator, including the Azolla event, Hole 4A,...





Using Ready-to-use Classroom Activities

CLASSROOM ACTIVITIES

Search the database of more than 60 downloadable activities, posters, and resources for educators. All activities shown by default. To search our database of lessons, hover your mouse over the Activity Type, Topics Covered, or Grade Level and then click the options. Multiple selections are possible by checking multiple fields. To reset your filters and view all activities again, press the top button in each drop down or simply refresh the page.

Don't have time to search through the site to find what you need? The links below house a collection of resources on a specific topic.

[Climate Change](#)

[Plate Tectonics](#)

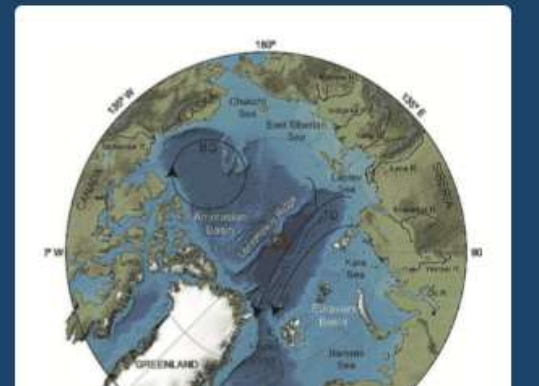
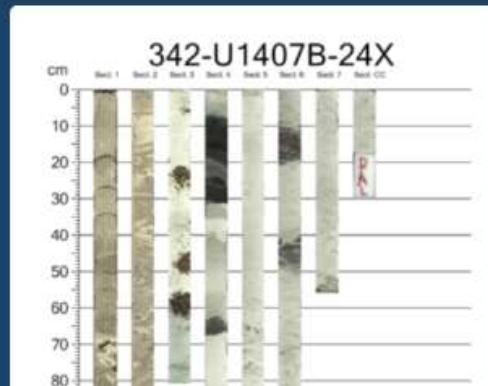
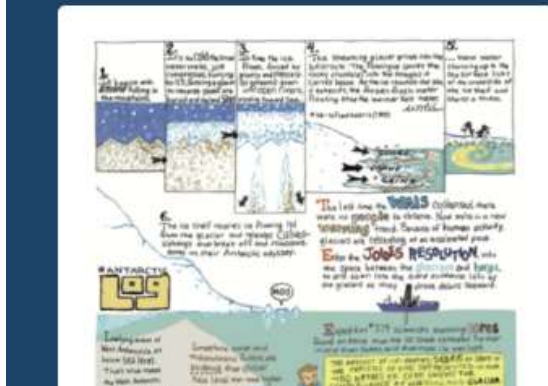
[Microbiology](#)

[Careers at Sea](#)

ACTIVITY TYPE ▾

TOPICS COVERED ▾

GRADE LEVEL ▾





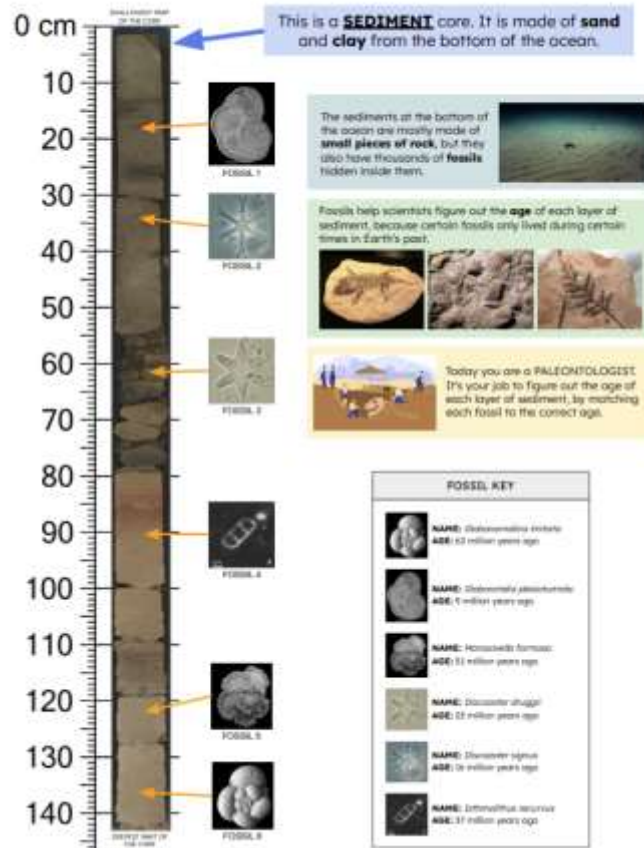
Using Ready-to-use Classroom Activities



CORES FOR KIDS

Education Just for Kids: Microfossils
Sedimentology

STATION 1: HOW OLD IS OLD?



Scientist (your name): _____

JOIDES RESOLUTION AT YOUR SCHOOL



Station 1: How old is old?

SHALLOW PART OF THE CORE		Fossil 1		Age: _____
DEEP PART OF THE CORE			Fossil 2	Age: _____
			Fossil 3	Age: _____
			Fossil 4	Age: _____
			Fossil 5	Age: _____
			Fossil 6	Age: _____
			Fossil 7	Age: _____

Station 1 INSTRUCTIONS

1. View the fossils on the Station 1 poster.
2. Use the **FOSSIL KEY** to find the age of each fossil.
3. Write the age of each fossil on your worksheet.
4. Answer the **STATION 1 QUESTION**.

• STATION 1 QUESTION: How do the ages of fossils change with increasing depth?





Using Ready-to-use Classroom Activities



CORES FOR KIDS

Education just for kids! Microfossils
Sedimentology

STATION 2: CREATE A CORE!

How can we find different things in just one core?

Cores are like **time machines**! First a layer forms, then over time **new layers form on top**. If you find different things on a core, it means the **ocean changed over time**. A single core can tell the story of what happened in the ocean over **millions of years**!

What do different colors mean?

White	Red	Green	Black
Filled with tiny shells of dead sea creatures.	Contains rusty metals. A lot of oxygen in the environment.	Not much oxygen, and not many living things.	Made from lava from a volcanic eruption.

Shells
Shells are **fossils**, which means they are the **remains of creatures** that lived in the ocean long time ago. Scientists find shells in places where the ocean is **shallow** enough for many animals to live.

Sand
Sand is a **medium-grained sediment**, meaning it's made up of pieces of rock that are small, but still big enough to see. Scientists find sand in places where the ocean is **shallow**, like the beach.

Mud
Mud is a **fine-grained sediment**, which means it's made up of **very, very small pieces of rock**. Scientists find mud in places where the ocean is **very deep** and **very calm**.

Basalt
Basalt forms when **lava** from a volcano hardens into rock. Scientists find basalt in places where there is (or was) a **volcano**!

Station 2: Create a "core"!

YOUR CORE

NEAREST RECENT

Section 1 Material: _____

Description: _____

Section 2 Material: _____

Description: _____

Section 3 Material: _____

Description: _____

Section 4 Material: _____

Description: _____

OLDEST

Station 2 INSTRUCTIONS

1. Read about the different things you can find in a core in the Station 2 poster.
2. Decide what you want each section of your core to be made of.
3. **DRAW** the material on each section of the core in the rectangle on the left of this worksheet.
4. **DESCRIBE** each section of your core.

- **CONCLUSION:** What is your favorite thing you learned today?





Assembling a paper model of a drillship

ECORD School of Rock 2015

From left to right: Helder Pereira (Portugal), Susan Gebbels (United Kingdom), Markus Fingerle (Germany), Jean-Luc Béranguer (France) and Norihito Kawamura (Japan)





"That's all Folks!"