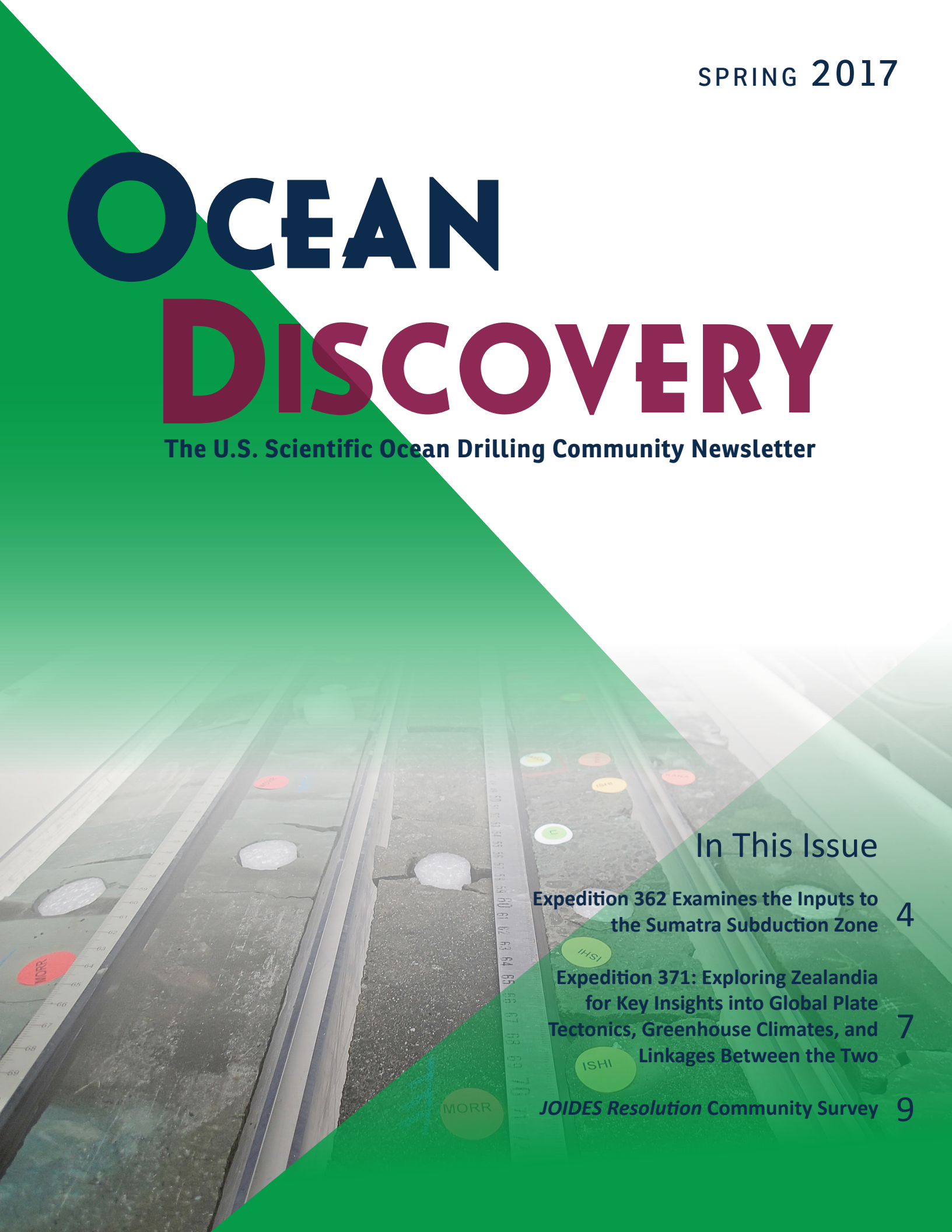
SPRING 2017

# OCEAN DISCOVERY

The U.S. Scientific Ocean Drilling Community Newsletter




## In This Issue

**The International Ocean Discovery Program (IODP)** is an international research collaboration among roughly two dozen countries to advance scientific understanding of the Earth through drilling, coring, and monitoring the subseafloor. The U.S. Science Support Program (USSSP) supports the involvement of the U.S. scientific community in IODP and is funded by the U.S. National Science Foundation (NSF). IODP utilizes multiple drilling platforms to carry out its missions: the riserless *JOIDES Resolution*, managed by Texas A&M University; the riser-equipped *Chikyu*, operated by the Center for Deep Earth Research (CDEX), a subdivision of the Japan Agency for Marine-Earth Science and Technology (JAMSTEC); and various mission-specific platforms operated by the British Geological Survey on behalf of the European Consortium for Ocean Research Drilling (ECORD). For more information, visit: www.iodp.org.

To contact the editor of *Ocean Discovery*, email: *jspencer@LDEO.columbia.edu*; or call 845-365-8785

For more information about USSSP, visit: usoceandiscovery.org/what-is-usssp

# CALENDAR

**May**

**16-17** *JOIDES Resolution* Facility Board (Washington, DC)

**22-23** IODP-ICDP Workshop: Onshore-Offshore Drilling and Sampling to Understand Freshwater Resources along the New England Continental Shelf (Woods Hole, MA)

**June**

**13-16** Workshop: Australasian IODP Regional Planning (Sydney, Australia)

**21-23** Science Evaluation Panel (Lisbon, Portugal)

**July**

**2-7** Petrophysics Summer School 2017 (Leicester, UK)

**10-12** Workshop: Land-Ocean Interactions Across the Indian Ocean: Toward Regional Integration of Recent Drilling Results (Narragansett, RI)

**10-26** School of Rock *(JOIDES Resolution)*

**August**

**1-3** U.S. Advisory Committee for Scientific Ocean Drilling (New York, NY)

**28- Sept 1** ECORD Summer School 2017: Current-Controlled Sea Floor Archives: Coral Mounds and Contourites (Bremen, Germany)

**September**

**11-13** IODP Forum (Shanghai, China)

**26-27** Workshop: Assessment of the *JOIDES Resolution* in Meeting the Challenges of the IODP Science Plan (Denver, CO)

**October**

**11-13** Workshop: Drilling into Young Ocean Crust for Subseafloor Observations at Axial Seamount (Palisades, NY)

## *Letter From the JRFB Chair*

# *JOIDES Resolution* to Complete Global Circumnavigation

Dear Colleagues,

The International Ocean Discovery Program (IODP) is four years underway and we are now sailing the Drilling Vessel *JOIDES Resolution* (JR) close to eleven months per year. The fact that we are back operating at full capacity is due to the extremely hard work of the *JOIDES Resolution* Science Operator, the National Science Foundation, and the broader scientific ocean drilling community. These improvements were also made possible by introducing the *JOIDES Resolution* Facility Board (JRFB) and by slimming down the number of JRFB Advisory Panels to just two, namely the Science Evaluation Panel (SEP) and the Environmental Protection and Safety Panel (EPSP).

As the JRFB has the mandate to provide operational and management oversight of the *JOIDES Resolution* and the IODP Science Support Office, one of its primary goals is to implement all drilling proposals that have been thoroughly reviewed, scientifically evaluated, and forwarded by SEP, and recommended for approval by EPSP. Guiding the JRFB scheduling decisions are the planned regional JR track; the themes and challenges of the IODP 2013-2023 Science Plan; funding and JR ship time availability; and safety, permitting, and other logistical constraints.

This streamlined approach has resulted in many time and resource savings, most notably in the time it takes a proposal to move from its first submission to actual implementation as an IODP expedition, which now typically takes just four years or less, compared to seven to ten years in the previous IODP program.

These new efficiencies in the proposal process have in turn allowed the JRFB to design a ship track for the JR that reaches to the very end of the IODP 2013-2023 program. This provides proponent groups in the international IODP community with the opportunity to submit proposals that fit the proposed ship track as laid out at least five years in advance. The current ship track has the JR operating in the Southern Oceans in 2018, in the Gulf of California in 2019, in the Gulf of Mexico and the South Atlantic in 2020, and in the North Atlantic, Arctic and adjacent seas in 2021 and 2022. The JR will complete its global circumnavigation by the end the program in the Indo-Pacific region in 2023. The JRFB continues to encourage new proposals that propose new, exciting and transformative drilling projects!

Despite the many successes of the JR in the most recent phase of scientific ocean drilling, many challenges remain, including the renewal in 2019 of the cooperative agreement for the *JOIDES Resolution* Science Operator for another five years. I therefore urge all members of the IODP community, both in the United States and internationally, to stay engaged in the program by writing proposals, by using IODP samples and data, by publishing IODP-related science results, by volunteering your service for the IODP facility boards and panels, and by participating in IODP workshops and town halls. With your strong support, I foresee a great future for the *JOIDES Resolution* and IODP. There is so much exciting scientific ocean drilling to do!

Sincerely,

Anthony Koppers
Chair
*JOIDES Resolution* Facility Board

# Expedition 362 Examines the Inputs to the Sumatra Subduction Zone

**Brandon Dugan, Lisa McNeill, Katerina Petronotis, and the Expedition 362 Scientists**

The 2004 ~Mw 9.2 Sumatra-Andaman earthquake and tsunami devastated coasts throughout the Indian Ocean, killed more than 250,000 people, and made scientists reassess our understanding of great earthquakes. This unexpected and high moment release event was centered beneath a wide forearc plateau, and slip approached the trench. This earthquake was the first great earthquake to be recorded and analyzed with modern geophysical techniques, and rapid-response surveys collected high-quality multibeam and seismic data to help characterize the geology post-earthquake. Based on these data and analyses, many questions were raised, including: What controls the geometry of the wide forearc plateau? What enabled extensive slip along this plate boundary and to shallow depths? And what are the material properties and pressure and stress states along this margin? IODP Expedition 362 approached these questions by investigating the input sediments to the Sumatra subduction zone because input sediments are the building blocks for the forearc plateau and influence the location and conditions of the décollement and its slip behavior during earthquakes.

The primary objectives of Expedition 362 were to use drilling, coring, logging, and post-expedition research to: (1) determine the lithology, sedimentation rates, and physical, chemical, and thermal properties of the input section, and determine how temporal changes in sedimentation rate and lithology influence the physical properties; (2) assess compaction, induration, and diagenetic state of the deep input sediments that eventually form the interior and base of the accretionary prism and develop into the décollement; and (3) determine similarities and differences in lithology and physical properties within the stratigraphic section, in particular between the Bengal-Nicobar Fan sediments and the more slowly deposited pelagic sediments.

Expedition 362 addressed these objectives by drilling Sites U1480 and U1481 approximately 225 km seaward of the deformation front (Figure 1). Riserless drilling at these sites provided access to sediments and upper oceanic crust prior to their entering the subduction zone. This includes the section that is critical to earthquake behavior once subducted.

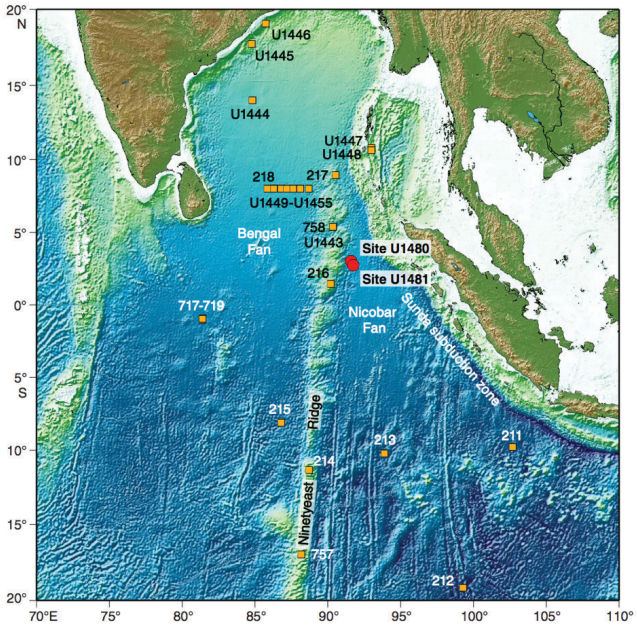



Figure 1. Regional base map showing the proximity of Expedition 362 Sites U1480 and U1481 (red dots) to the Sunda subduction zone. Additional sites (orange squares) show previous drilling by DSDP, ODP, and IODP.

Site U1480 is located in 4148 m water depth (Figure 1) and was drilled to 1432 m below seafloor (mbsf) providing information on the sedimentary sequence and upper oceanic basement. The sedimentary sequence includes a thin, distal wedge section, the Nicobar fan sediments, and a pre-Nicobar fan sequence. The primary lithologies identified were nannofossil-bearing mud, siliciclastic mud, and siliciclastic sand (Figure 2). In the deeper sedimentary succession we observed increased pelagic sediments, volcaniclastics, basaltic flows, and magmatic intrusions (Figure 2). The sedimentary succession was underlain by basalt with moderate-to-high alteration that was interpreted as oceanic crust.

Site U1481 is located 35 km from Site U1480 in 4178 m water depth (Figure 1) and was drilled to 1500 mbsf. Coring at Site U1481 was limited to the 1150-1500 mbsf interval to provide additional sampling of the deeper Nicobar fan and pre-Nicobar fan sediments. Primary lithologies observed were clay/claystone, silty clay/claystone, and muddy sand/sandstone. At Site U1481, the full section was successfully logged with a modified triple combo tool string providing a set of physical properties data complementary to core data and the ability to confidently integrate core with seismic data.

Based on shipboard analyses of sediments from Sites U1480 and U1481 and logging at Site U1481, the following preliminary assessments address the primary scientific objectives of the expedition:

We successfully characterized the principal lithologies, depositional environments, and diagenetic state of the entire sedimentary package that ranges in age from Holocene to Late Cretaceous. Sedimentation rates were very high during the deposition of the

Nicobar fan and one to two orders of magnitude lower when the pre-fan sediments were deposited. The Nicobar Fan depositional record will be integrated into that of the Bengal-Nicobar fan system and the wider Indian Ocean sediment record, strongly linked to Neogene regional orogenic tectonics and climate. Deformation features were relatively rare. Diagenesis was dominated by compaction, but some localized zones of calcite cementation were observed. Geochemical analyses indicated some chemical diagenesis in the deeper sediments. Physical properties and log data correlate well with lithologic observations and have been tied to regional seismic data. These ties facilitate linking downhole observations to seismic responses and to extrapolating properties toward the deformation front and subduction zone.

In addition to shipboard characterization, we collected multiple whole-round samples that will be used in postcruise studies to constrain hydrological, strength, and frictional properties of these input sediments and to document how these properties evolve with increasing confining stresses and burial temperatures.

The shipboard characterization of the input materials at Sites U1480 and U1481, their linkage to the seismic observations, and postcruise experiments and models will allow us to better understand the Sumatra subduction zone including the localization of the décollement, the unusually shallow/seaward seismic slip of the 2004 earthquake, the anomalous nature of the forearc plateau, and the role of thick submarine fan–derived sediment sections in forearc development and subduction fault slip behavior.

Additional details of the expedition can be found in the preliminary report (Dugan et al., 2017) and the expedition proceedings (McNeill et al., 2017).

**References Cited**


Dugan, B., McNeill, L., Petronotis, K., and the Expedition 362 Scientists, 2017. *Expedition 362 Preliminary Report: Sumatra Subduction Zone.* International Ocean Discovery Program. http://dx.doi.org/10.14379/iodp.pr.362.2017

McNeill, L., Dugan, B., Petronotis, K., and the Expedition 362 Scientists, In Press. *Sumatra Subduction Zone.* Proceedings of the International Ocean Discovery Program, 362: College Station, TX (International Ocean Discovery Program). http://dx.doi.org/10.14379/iodp.proc.362.2017



Figure 2. Core section images (362-U1480E-1H-2 and 3, 11H-1 and 2, and U1480G-61R-1, 2, 3, and 4) showing example sediments collected during Expedition 362. Image from McNeill et al. (In Press).

## Expedition 362 Science Party

# Schlanger Fellows 2017-2018

Meet our 2017-2018 Schlanger Ocean Drilling Fellows! Each of the recipients will receive a $30,000 award to conduct IODP-related research during the 2017-18 academic year. Additional information on their projects can be found at http://usoceandiscovery.org/fellowships/

## Laura Haynes

Lamont-Doherty Earth Observatory

*Assessing Deep Pacific Carbon Storage Across the Mid-Pleistocene Transition*

## Heather Jones

Pennsylvania State University

*Survivorship and Recovery of Calcareous Nannoplankton Following the K/Pg Mass Extinction at "Ground Zero"*

## Sarah White

University of California, Santa Cruz

*Constraining the Effect of Dissolution on Pliocene West Pacific Warm Pool SSTs and the "Permanent El Niño-Like State"*

## Amy Kuzminov

Rutgers University

*Uranium Isotope Ratios: A Proxy to Understand Carbon Burial in Varying Redox Environments in Ocean Anoxic Event 2*

## Reddit Science "Ask Me Anything"

Reddit is a massive online community that encourages discussion of a broad range of topics, including politics, culture, hobbies, and more. The subreddit dedicated to science, r/Science, supports a series of "Ask Me Anything" (AMA) sessions in which users submit and "upvote" questions they wish to have addressed by active researchers. The stated goal of the r/Science AMA series is "to encourage discussion and facilitate outreach while helping to bridge the gap between practicing scientists and the general public." Reddit AMAs are an opportunity for dynamic, interactive Q&A sessions and have allowed IODP scientists to engage with a diverse audience of students, science enthusiasts, and the general public.

Included here are samples from the Expedition 367 AMA that illustrate the types of questions that have been asked and the overall spirit of the community. AMA sessions are scheduled for specific times but promoted in advance, allowing members of the Reddit community to compile, vote, and comment on questions. The sessions are then archived permanently at the Reddit Journal of Science: https://www.reddit.com/r/science/.

More background on the Reddit Science AMA series and guidelines for hosting your own can be found at http://bit.ly/2prDscb.

**AMA - Expedition 367 South China Sea Rifted Margin: March 24th, 2017**

*Q: Assuming you've got some micro- and nannopaleontologists onboard (if not, how are you dating your sediments?), how does the stratigraphic story of a magma rich tectonic setting differ from a magma poor one? What signals would you expect to encounter for each scenario?*

A. We have 5 micro- and nannopaleontologists onboard to help us date the sediments that we collect. We also have three paleomagnetists that work with the paleontologists to constrain age. We would expect the lithology of the sediments to be different in a magma rich tectonic setting than in a magma poor one because a lack of volcanic activity will change how the basin was formed and how rifting occurred. However, what we expect to find in one particular margin may be different than what we collect, which is why we come out here to drill and find out!!!

*Q. What background do you all have to allow your place in such an interesting research endeavor? I would love to one day have an opportunity like this and contribute to the science community.*

A. We have scientists from many backgrounds. We are studying the sediment type, structures, physical properties, magnetics, chemistry, and fossils. We need experts in all of these areas to fully describe the rocks. We have scientists on board that range from graduate students to full professors. If you are interested in marine geology I would encourage you to keep looking into future IODP expeditions and apply to sail.

*Q. What conditions would have to exist for a planet NOT to have any plate tectonics? I'm guessing an older planet whose inner core has cooled down? (How long would that take?) Or is it something inherent in how planets form?*

A. This is an ongoing topic of research within the field of geology. Plate tectonics is an effect of the planet dissipating its internal heat. How long that takes depends on size and composition. We do not know of any other planets in our solar system that have earth-like plate tectonics.

# Expedition 371: Exploring Zealandia for Key Insights into Global Plate Tectonics, Greenhouse Climates, and Linkages Between the Two

**Gerald R. Dickens and Rupert Sutherland**

Most people by grade school recognize six continents: Africa, North America, South America, Antarctica, Australia, and Eurasia, the latter including Europe and Asia. However, the actual definition of a continent is not straightforward. For example, why are North American and South America generally considered distinct continents, even though they are connected by the Isthmus of Panama? Why is Eurasia a single continent, when components lie on at least four different plates? For geology, the best definition of a continent is probably "an extensive area of continental crust mostly separated from other such areas by oceanic crust."

A careful look at a globe that includes water depth reveals a curious area surrounding New Zealand. An immense (~5 million km$^2$) and relatively shallow water region extends from sub-Antarctic islands north to New Caledonia (Figure 1). Scientific evidence from exploration of this submerged region over the last five decades, especially during recent geophysical cruises, demonstrates that connected continental crust underlies the region. The size and composition distinguish it from much smaller micro-continents (e.g., Madagascar) or large igneous provinces (e.g., Ontong-Java Plateau). Thus, the region is a continent, albeit mostly (94%) underwater. Referred to as "Zealandia," its broad features include Lord Howe Rise (LHR), New Caledonia Trough, Norfolk Ridge, Challenger Plateau, Campbell Plateau and Chatham Rise.

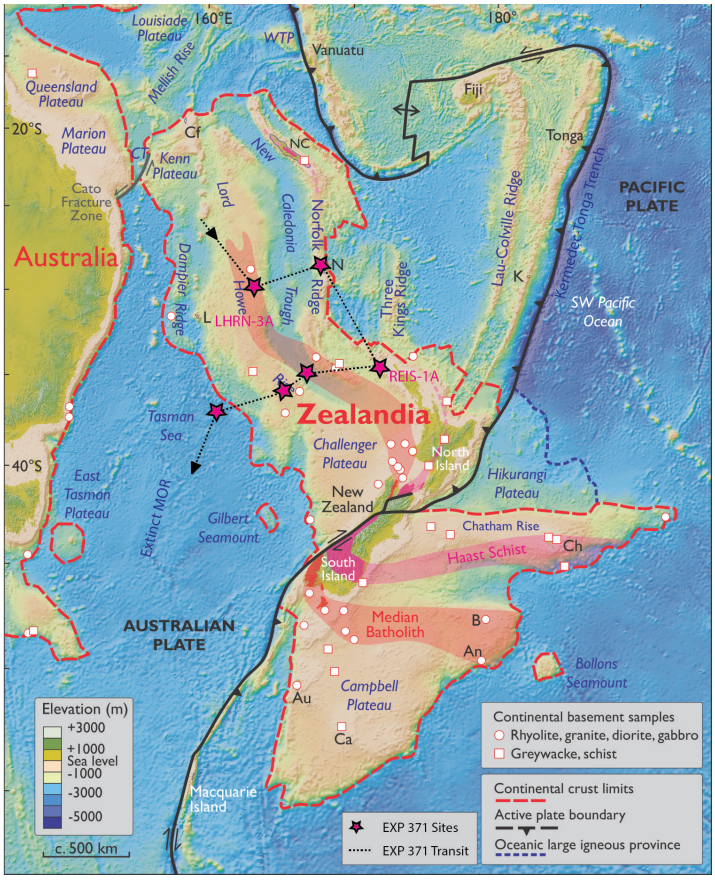



Figure 1. Map of Zealandia showing major bathymetric features with past and proposed drill sites.

The continent of Zealandia is about the same size as India (once a continent in its own right before collision with Eurasia). However, the remote location and modest water depth (on average approximately 1000 m below sea level) has meant much more sparse exploration than other continents, except perhaps Antarctica. Ironically, though, sediments on the submerged portion of Zealandia likely hold key information that impact all continents, including tectonic events that created the Pacific "Ring of Fire" and climatic conditions during extreme Early Eocene warmth.

The submerged nature of Zealandia reveals a fascinating and complex tectonic history. In the late Cretaceous, Zealandia began separating from the Australia and Antarctica. This extensional phase thinned the continental crust in many regions significantly and ceased in the early Eocene, sometime around 50-53 Ma, as clearly observed by magnetic lineations across the Tasman Sea. This was followed by a phase of compression, now referred to as TECTA ("Tectonic Event of the Cenozoic in the Tasman Area") deformation, and the initiation of subduction along the Kermadec-Tonga (K-T) Trench, which moved away from northern Zealandia through back-arc spreading in the Fiji Basin. The mostly underwater continent reflects the modest thickness of continental crust, typically between 10 and 30 km. Some of this thinned nature may have existed before rifting, but some occurred in association with rifting, as can be observed readily in seismic profiles across Lord Howe Rise, which consists of numerous horsts and grabens (Figure 2, next page).

Global plate motions since 80 Ma are fairly well known, with the most profound change between about 53 and 50 Ma. The modern "Ring of Fire" began forming at this time, with widespread initiation of subduction zones in the western Pacific, including perhaps the incipient K-T Trench. The massive change in tectonic forces at this time, which presumably relates to the global distribution of volcanoes and mountains, is especially interesting be-

cause it coincides with the Early Eocene Climatic Optimum (EECO), the warmest multi-million year interval of the Cenozoic and late Cretaceous. Below the waves across Zealandia lie sedimentary records that may constrain mechanistic links between subduction initiation and climate.

Submerged portions of Zealandia have long attracted the ocean drilling community for several reasons. Large expanses are shallower than 2000 m water depth, allowing for relatively straightforward and rapid scientific operations. Much of the region contains thick sediment sequences, ranging from late Cretaceous through much of the Cenozoic. Individual sediment packages, some truncated or folded, likely relate to the tectonic history, including Eocene subduction initiation. The sediments also, of course, hold information relevant to understanding regional and global paleoceanographic questions, particularly for the Early Paleogene.

Despite the interest, the region remains hugely unexplored. For example, across the entire north part of Zealandia (LHR, New Caledonia Trough, Norfolk Ridge, and Challenger Plateau) and the adjacent oceanic crust area in the Tasman Sea, only 12 holes have been drilled, all during the Deep Sea Drilling Project (DSDP Legs 21, 29 and 90; Figure 1). In fact, the total collection of Lower Paleogene sediment from this immense "Tasman Frontier" region amounts to ~360 m of core, mostly from three holes almost randomly placed over forty years ago and cored using rotary drilling.

Expedition 371 will greatly expand our knowledge of northern Zealandia by drilling six sites within the Tasman Frontier (Figure 1). The sites were chosen after compiling all seismic data from the region, which arose from collaborations between Australia, New Zealand and France (New Caledonia) in regard to the United Nations Convention on the Law of the Sea, and generating new seismic profiles across key features of interest. The first site targets one of many buried flat-lying features on the LHR, where the planar surface may have formed during the Early Eocene compression phase by some process, such as subaerial erosion or reef build-up (Figure 2). The next four sites focus on the timing of sediment deformation within sequences on the LHR and Norfolk Ridge. Seismic profiles clearly show that Lower Paleogene sediments are folded, whereas sediments above are tilted, and then nearly horizontal (Figure 3). The last site aims to understand the unusual nature of sediments above oceanic crust in the deep Tasman Sea. Here again, lower sediments (and even the oceanic crust) appear to have thrust faults and folds, presumably related to TECTA deformation, while overlying sediments are horizontal, presumably after initiation of subduction to the east.

By chasing tectonic objectives related to subduction initiation, thick sequences of Paleogene and Neogene sediment necessarily will be collected. These sediments can be used to address key paleoceanographic problems. Of particular interest is why Zealandia and surroundings were extremely warm during the EECO, even more so than other locations across the globe. One possibility is that the area, because of tectonic uplift, had significantly different bathymetry and oceanography than generally modeled. More importantly, though, Expedition 371 will focus on how the EECO aligns with subduction initiation in the region and the circum-Pacific in general.

*A general bibliography for further reading related to this article can be found online at [http://bit.ly/2sMHkKI](http://bit.ly/2sMHkKI).*

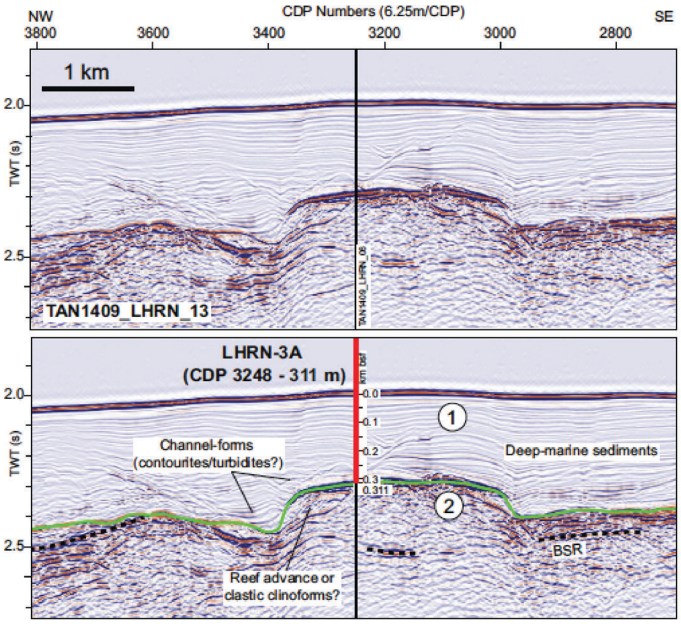



Figure 2. Seismic cross-section (NE-SW) spanning proposed drill Site LHRN-3A on the crest of the Lord Howe Rise (LHR). The upper "transparent" seismic facies (1) is Lower Miocene-present nannofossil ooze and chalk, as known from DSDP Sites 208 and 590. The "bright" flat-topped structure (2) is postulated to be a subaerial erosion surface or reef formed during uplift and TECTA deformation.

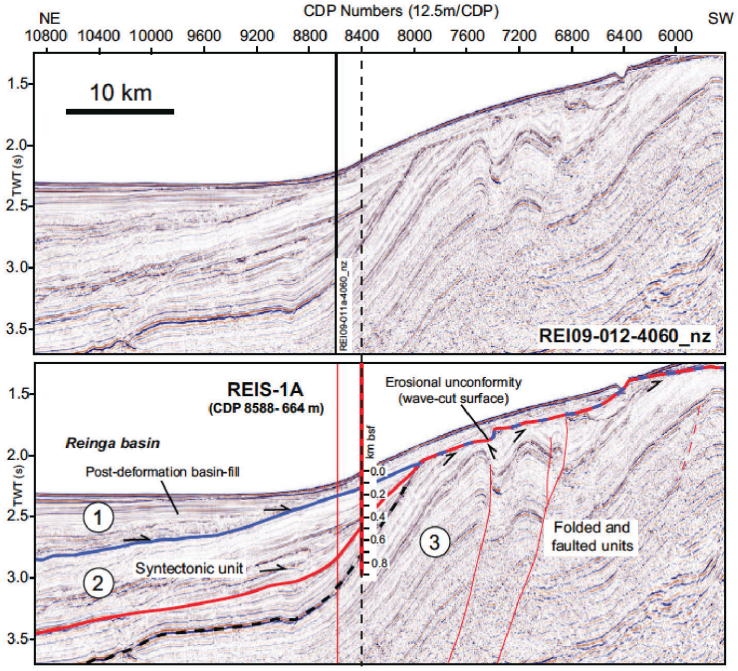


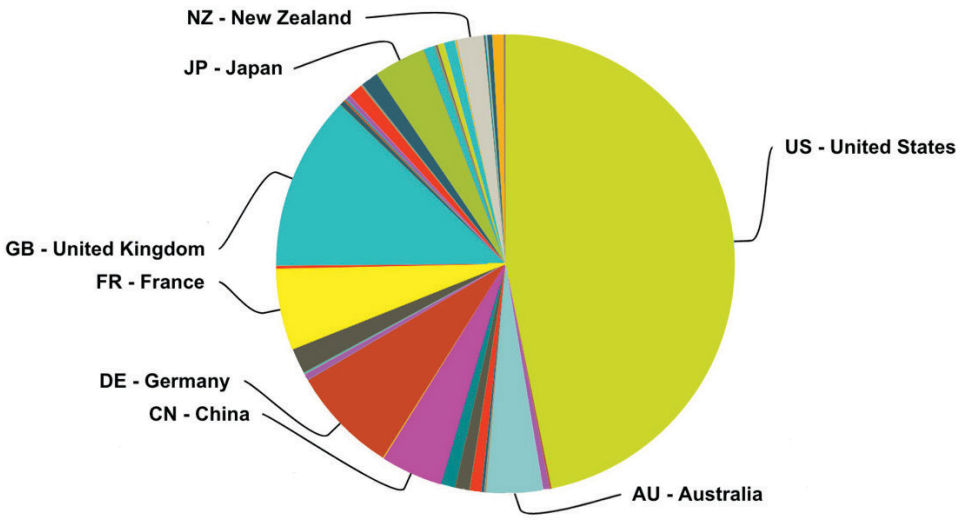

Figure 3. Seismic cross-section (NE-SW) spanning proposed drill Site REIS-1A in the Reinga Basin. Three seismic facies and an erosional unconformity can be observed. These are postulated as being: (1) undeformed Neogene marine sediments; (2) Middle Eocene sediments emplaced during TECTA deformation (syntectonic); and (3) Paleocene-Lower Eocene marine sediments folded.

# *JOIDES Resolution* Community Survey

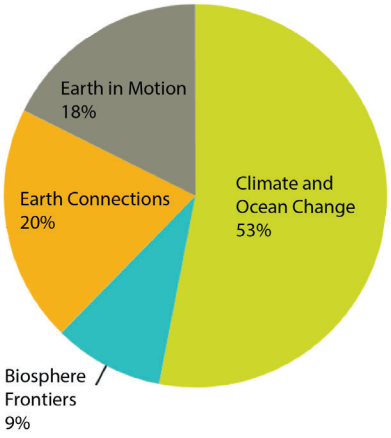
On September 26-27, 2017, the U.S. Science Support Program (USSSP) will sponsor a workshop in Denver, Colorado that will review and evaluate the role of the *JOIDES Resolution* facility in fulfilling the challenges of 2013-2023 IODP Science Plan, *Illuminating Earth's Past, Present and Future*. The goal of the workshop is to provide community guidance to the National Science Foundation in its request to the National Science Board for renewal of the JR facility.

As the first step of the assessment, a survey was conducted to solicit feedback from members of the IODP community on the capabilities and suitability of the facility in meeting the challenges outlined in the science plan. A total of 876 valid responses were received from 37 different countries, a remarkable testament to the enthusiasm and geographical breadth of the community of IODP researchers. At the workshop, breakout groups organized by IODP science theme will examine community views on the specific merits of the JR, key challenges that remain to be realized, the success of regional expedition operations, and other issues.

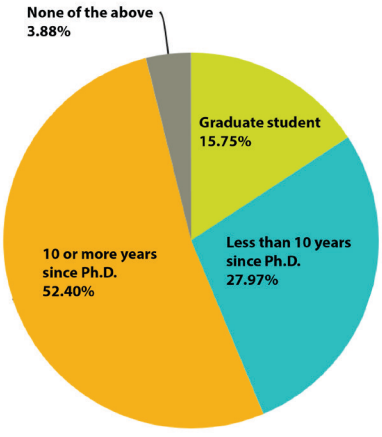
Analysis of the survey results is still underway, but here are some initial findings about the demographics and opinions of the survey responders.



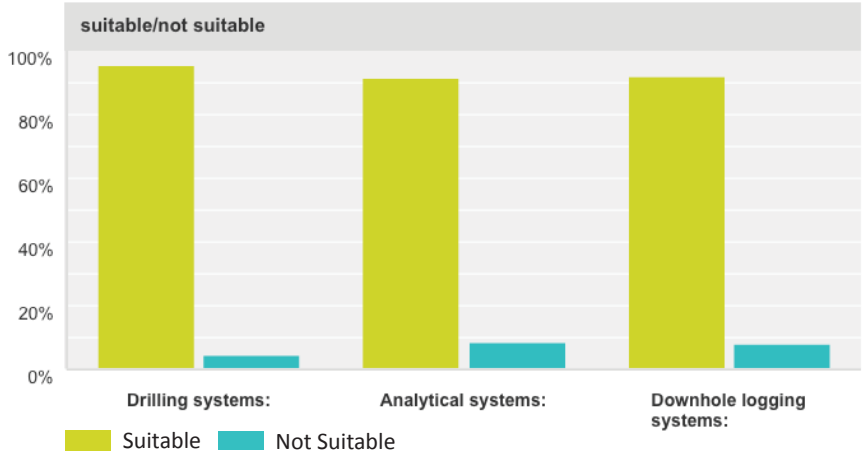

**Country of Residence**
This pie chart shows the percentage of respondents by country of residence. Of the 876 individual responses, 410 (46.8%) were from the United States. Responses from the European Consortium for Ocean Research Drilling (ECORD) totaled just over 300, with the United Kingdom (108), Germany (66) and France (50) leading the way. China (38), Australia (35) and Japan (32) were next.




**Science Theme**
When asked which IODP science theme they identified most closely with, slightly more than 50% of respondents chose Climate and Ocean Change. When the option to select additional themes relevant to their research was offered, respondents chose each of the remaining themes in a range of 26-37%, indicating broad interest in all four of the IODP science themes (data not shown).




**Career/Experience Level**
Just over 50% of survey respondents had held their Ph.D. for at least 10 years. About 28% were "early career" (defined as 10 years or fewer post-Ph.D.) and an additional 16% were graduate students.




**Shipboard system satisfaction**
When asked to evaluate the JR platform's capabilities for addressing the challenges in the IODP Science Plan, strong majorities—over 90% in all cases—rated each of the JR's major systems (drilling, analytical and downhole) as suitable. This indicates an exceptionally high level of community satisfaction with the facility and its ability to address the major goals of IODP.

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# Education and Outreach Activities

## Winter/Spring 2017 AMNH Events

***Dinos After Dark***

On December 16, 2016, Sean Gulick, Research Professor at the Institute for Geophysics at the University of Texas at Austin, discussed the preliminary results of the recent expedition to the Chicxulub crater off the Yucatán Peninsula in Mexico. As expedition co-chief, Gulick gave an overview of the rationale for the expedition, how it was conducted, and what has been gleaned so far from the results. The sold-out and adults-only event provided after-hours access to the "Dinosaurs Among Us" exhibit on the top floor of the museum.

***An Evening for Educators with Dr. Bärbel Hönisch:***

The Educators' Evening provided curriculum materials, demonstrations, and resources for the New York-area education community. On March 10, 2017, Dr. Bärbel Hönisch, Associate Professor in the Department of Earth and Environmental Sciences at the Lamont-Doherty Earth Observatory of Columbia University, opened the evening by presenting a lecture on an introduction to the techniques applied in the field of paleoceanography. Her talk focused on past variations in atmospheric carbon dioxide levels, ocean acidification, and climate change over the past 60 million years. Table displays also represented the International Ocean Discovery Program, providing opportunities to learn about the program, available classroom activities, and professional development opportunities.

***Sun/Earth Day***

On March 18, 2017, USSSP participated in Sun/Earth Day at the museum. Visitors discovered how the International Ocean Discovery Program plays a role in understanding the special relationship between the Sun and Earth. The team presented visitors with hands-on activities, the chance to peer through a microscope to view microfossil specimens, and the opportunity to speak with Dr. Steve Pekar, professor at Queens College in the Earth and Environmental Sciences department. Dr. Pekar also spoke with a group of teens who are involved in an ongoing enrichment program run by the museum.


## NSTA

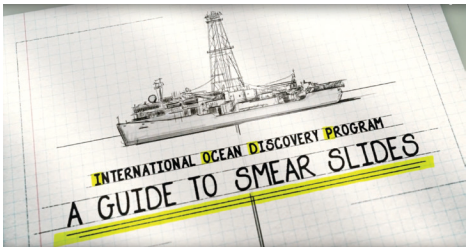
The Education and Outreach deparment represented the USSSP/IODP program at the annual meeting of the National Science Teachers Association (NSTA) March 28-April 2, 2017 in Los Angeles. The single largest education event of the year, NSTA allows the program to spread the word about IODP resources and opportunities to thousands of science educators from across the country. USSSP staffers were joined at the exhibit booth by recent Education and Outreach officers from Expeditions 360, 362 and 366, who shared their enthusiasm and knowledge of the program. In addition, staff brought resources to several share-a-thons sponsored by the National Earth Science Teachers Association (NESTA) and the Informal Science Education committee.

## New joidesresolution.org!

The joidesresolution.org website is currently being overhauled to provide better ease of access to past and current expeditions, resources, and information. In addition to bringing the design up to date with today's current web design standards, the re-design aims to streamline the broad, rich and diverse content and make it much easier to find what the user is searching for within a few clicks. The effort was assisted by an oversight committee of educators, Education Officers, School of Rock alumni, and other users. The new site is scheduled go live in July, 2017.

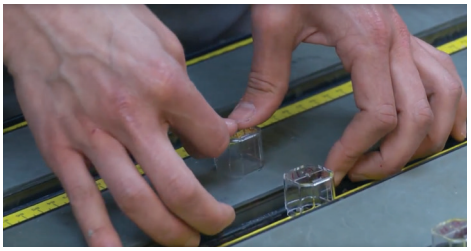
# IODP Community Resources: New Videos Released

In an effort to provide informative and instructive resources for the IODP community, a series of videos was recently developed and released on the *JOIDES Resolution* YouTube channel (https://www.youtube.com/user/theJOIDESResolution). The subjects of the three videos are varied, but the goal of all three was to address specific needs and frequently asked questions from IODP community members.



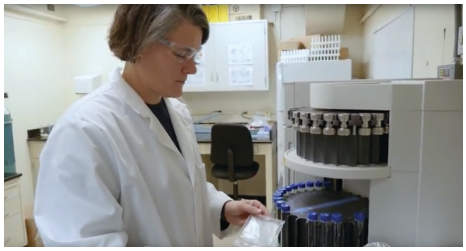

**IODP: A Guide to Smear Slides**

This video takes you through the step-by-step process of preparing a smear slide to determine the composition of deep-sea sediments. Scientists participating in the "Short Course on Shipboard Sedimentology: Data Collection, Interpretation, and Integration" (November 14-17, 2016) learned the best techniques for making smear slides, then demonstrated them here. Using smear slides, scientists can tease apart the various components in marine sediments, from microfossils to minerals, helping to make key interpretations while still at sea.



**Sailing with IODP: Shipboard Sedimentology**

It takes a diverse team of scientists with wide-ranging expertise to conduct an IODP expedition. Shipboard sedimentologists are entrusted with the task of observing every core collected at sea and making initial observations about past Earth conditions. This video follows Pincelli Hull (Yale) and Brian Romans (Virginia Tech) through a typical day aboard the JR, from describing grain size and composition to digitally logging these data to inform further analyses for other teams aboard the ship.

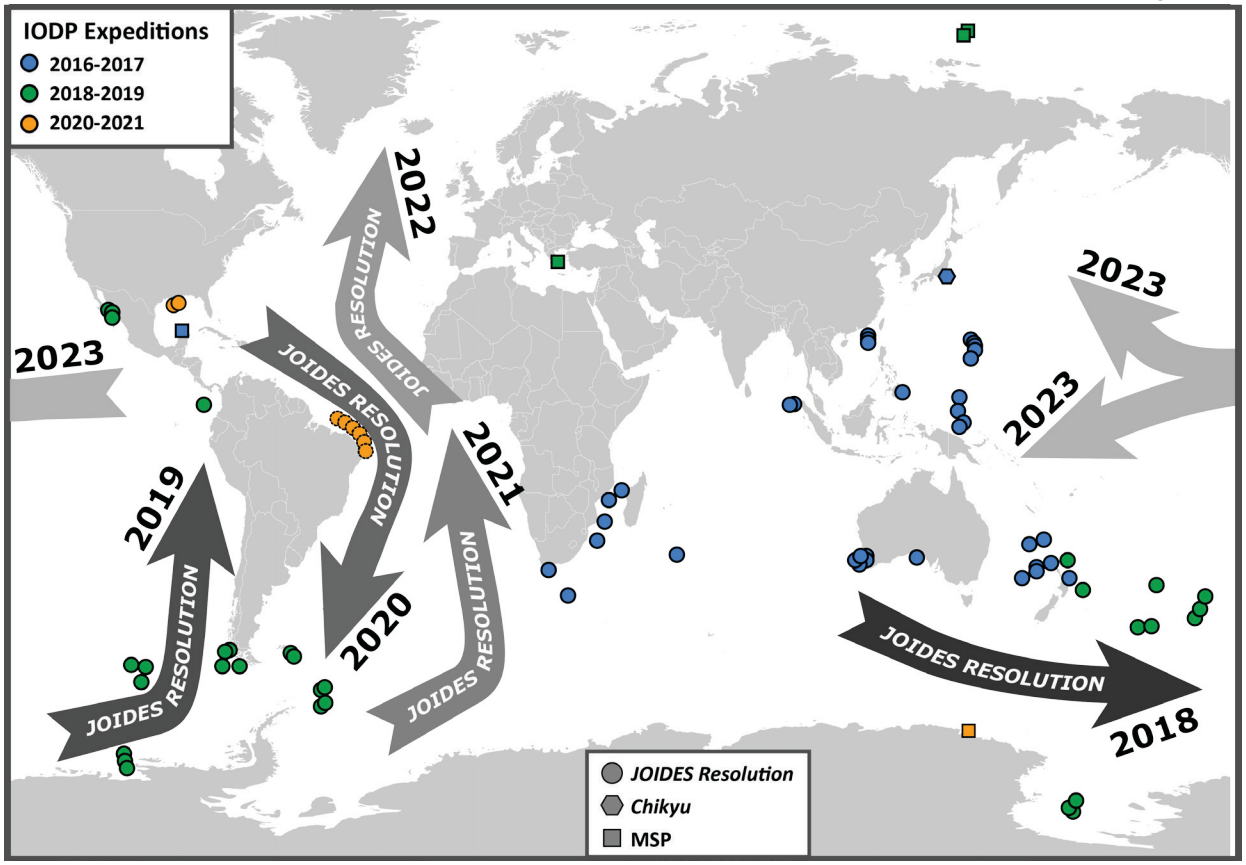


**IODP: Open Data for Global Research**

In IODP, deep-sea sediments are collected and analyzed at sea, and the cores are then stored in one of three repositories: the Gulf Coast Repository (USA), the Bremen Core Repository (Germany), and the Kochi Core Center (Japan). Scientists have free, open access to a wealth of data through the IODP web portal (http://web.iodp.tamu.edu/OVERVIEW/). In this video, Kira Lawrence (Lafayette College) explains how her research using alkenone paleothermometry relies on samples she requests through the IODP repositories.

**What resources would you like to see in the future?** Email usssp@ldeo.columbia.edu and let us know!
https://www.youtube.com/user/theJOIDESResolution

## The *JOIDES Resolution* Ship Track: Summer 2017 and beyond




Map modified with permission from the IODP-JRFB

# 2017 - 2020 IODP EXPEDITION SCHEDULE

| Platform | # | Expedition | Dates | Ports |
|---|---|---|---|---|
|  | 371 | Tasman Frontier Subduction Initiation and Paleogene Climate | 07/27/17 - 09/26/17 | Townsville, Australia - Hobart, Australia |
|  | 369 | Australia Cretaceous Climate and Tectonics | 09/26/17 - 11/26/17 | Hobart, Australia - Fremantle, Australia |
|  | 381 | 381 Corinth Active Rift Development | 10/17 - 11/17 (offshore) | TBD |
|  | 372 | Creeping Gas Hydrate Slides and Hikurangi LWD | 11/26/17 - 01/04/18 | Fremantle, Australia - Wellington, New Zealand |
|  | 374 | Ross Sea West Antarctic Ice Sheet History | 01/04/18 - 03/08/18 | Wellington, New Zealand - Wellington, New Zealand |
|  | 380 | NanTroSEIZE Stage 3: Frontal Thrust Long-Term Borehole Monitoring System (LTBMS) | 01/12/18 - 02/24/18 | Shimizu, Japan - Shimizu, Japan |
|  | 375 | Hikurangi Subduction Margin | 03/08/18 - 05/05/18 | Wellington, New Zealand - Auckland, New Zealand |
|  | 376 | Brothers Arc Flux | 05/05/18 - 07/05/18 | Auckland, New Zealand - Auckland, New Zealand |
|  | 377 | Arctic Ocean Paleoceanography (ArcOP) | Fall 2018 (offshore) | TBD |
|  | 378 | South Pacific Paleogene Climate | 10/14/18 - 12/14/18 | Wellington, New Zealand - Papeete, Tahiti |
|  | 379 | Amundsen Sea West Antarctic Ice Sheet History | 01/18/19 - 03/20/19 | Punta Arenas, Chile - Punta Arenas, Chile |
|  | 382 | Iceberg Alley Paleoceanography & South Falkland Slope Drift | 03/20/19 - 05/19 | TBD |
|  | 383 | Dynamics of Pacific Antarctic Circumpolar Current | 05/19 - 07/19 | TBD |
|  | 384 | Panama Basin Crustal Architecture (504B) & Engineering Testing | 07/19 - 09/19 | TBD |
|  | 385 | Guaymas Basin Tectonics and Biosphere | 09/19 - 11/19 | TBD |
|  | 386 | Gulf of Mexico Methane Hydrate | 01/20 - 03/20 | TBD |

*JOIDES Resolution*
***Chikyu***
**Mission Specific Platform**