



ANZIC Weekly Bulletin

Australia and New Zealand form the Australia-New Zealand IODP Consortium (ANZIC), and the two countries have access to all IODP activities. This bulletin provides current news, job opportunities, scholarships and events relating to both national and international scientific communities.

U.S. to Leave Consortium And Go It Alone After 2013



Pleading poverty, the U.S. National Science Foundation (NSF) is ending a decade-long era of international collaboration in ocean drilling, leaving Japan and Europe to fend for themselves. Last week, NSF officials quietly posted a notice to the community that the United States would be pulling out of the Integrated Ocean Drilling Program (IODP) when the program expires in September 2013.

Instead of renewing the IODP relationship, which involves three drill ships and 26 countries, the United States hopes to reduce costs by going it alone and attracting enough foreign contributions to return its own drill ship to full-time operation. "Given the likely budget outlook," says Timothy Killeen, NSF assistant director for geosciences, "this is the best way to support U.S. investigators." The proposed realignment harkens back to an earlier era of scientific ocean drilling. Between 1985 and 2003, the United States led the Ocean Drilling Program that operated the *JOIDES Resolution*, also known as the *JR* (*Science*, 24 October 2008, p. 512).

Other countries contributed 40% of the funding in return for the opportunity to participate. Since 2003, IODP, co-led by Japan and the United States, has used a refurbished *JOIDES Resolution* along with the newer, larger, and far more capable *Chikyu* built and operated by Japan (*Science*, 22 February 2008, p. 1037). On occasion a European consortium has provided special platforms, such as one leased for drilling in ice-choked Arctic waters.

The *Chikyu* allows scientists to drill deeper into the sea floor's most challenging targets, such as the fault that generates great earthquakes off of Japan. But it is much more expensive to operate than the *JR*. Indeed, all manner of higher costs—for fuel, drilling pipe, and unexpected repairs—have been a perennial problem for the drilling platforms.

As a consequence, *Chikyu* has spent only 3 to 4 months a year doing scientific drilling, with some of the balance of its time hired out to industry for oil and gas exploration.

A budget squeeze has also forced NSF to trim 2 months off the *JR*'s scientific schedule in 2012, to only 6 months of operation. A 28 June update from NSF's Division of Ocean Sciences Director David Conover notes that operating costs for the *JR* have also skyrocketed, and that NSF is still paying for cost overruns from the *JR* refurbishment, completed in early 2009.

Some \$25 million in one-time funding for IODP from the 2009 stimulus package is almost exhausted, and NSF's overall budget this year is 1% lower than in 2010, when it spent \$63 million on IODP. In their letter, NSF's Killeen Conover announce "a new operating model that streamlines operating costs and generates new external sources of revenue to support the *JR*."

While short on details, the proposed realignment would have NSF operate the *JR* independently of any other lead agency, but the agency would solicit direct contributions from other countries. All told, "we believe this will get the *JR* close to if not at full-duty operation," Killeen says. U.S. scientists who have built their careers on rock and mud retrieved by ocean drilling say NSF's decision to go it alone makes sense given its gloomy financial outlook. "I view the proposal as an encouraging sign," says geochemist Steven D'Hondt of the University of Rhode Island, Narragansett. "What we're hearing is that NSF is going to protect the capability we provide to the international community." To Theodore Moore Jr., a professor emeritus at the University of Michigan, Ann Arbor, the options were "either dissolve the partnership and go our separate ways or kill everything."

There's lots of good science that remains to be done" that is within the *JR*'s capabilities. Japanese officials say that they aren't surprised by NSF's decision to pull out but that the timing is unfortunate. "I expected something like this was going to happen," says Asahiko Taira, an executive director of the Japan Agency for Marine-Earth Science and Technology. Both sides have long been frustrated with a rigid structure set up 15 years ago when the research



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environment was quite different, he says. Since then, budgets have shrunk.

There is also growing public scrutiny of scientific efforts and increasing expectations that research be more relevant to social needs. It didn't help, Taira says, that NSF ocean drilling program officials had a "difficult" time communicating with the career civil servants at Japan's Ministry of Education (MEXT). Still, the decision comes just weeks after the consortium unveiled a new 10-year plan for scientific exploration that would have relied upon drilling platforms from the United States, Japan, and Europe.

"The NSF announcement was completely at odds with the discussions among the participating countries," says Shingo Shibata, director of deep-sea research for MEXT. Taira says Japan will continue ocean drilling and will look to the international community not so much for funding but for "scientific proposals and scientific participation."

He would still like to see "an overarching science advisory structure" to maintain an international vision for ocean drilling and to avoid duplication. Although Shibata says that "we understand NSF's decision given its severe

financial situation,"

Taira worries that "the U.S. is becoming more inward-looking" because of budget constraints. Such an attitude, he says, would be a blow to global scientific cooperation.

—RICHARD A. KERR AND DENNIS NORMILE

Downloaded from www.sciencemag.org on August 25, 2011



Call for submissions Marine Parks Independent Scientific Audit Panel

The NSW Government has commissioned an Independent Scientific Audit of Marine Parks in NSW to make recommendations on sustainable use of the marine environment and conservation of marine biodiversity.

The NSW Marine Parks Independent Scientific Audit Panel is now calling for submissions from all parties interested in contributing to the Audit. Submissions should be in writing, address one or more of the terms of reference and comply with submission guidelines found at

www.marineparksaudit.nsw.gov.au

Submissions close on **30 September 2011**. Submissions can be lodged through the **online submission form** at the Audit website: www.marineparksaudit.nsw.gov.au or **posted** to: Marine Park Audit Secretariat PO Box H292 Australia Square NSW 1215.



Conference

International Conference on a New Perspective of Great Earthquakes along Subduction Zones

Conference dates: 2.5 days starting from February 28 to the noon on March 1, 2012

Conference place: Kochi City Culture Plaza (next to a hospital two blocks NW away from the Hotel Nikko Kochi on Google Maps) **Registration and abstract deadlines:** **November 30, 2011** **Registration fee:** free **Optional events:** an ice breaker party (¥2,000) on February 28, a conference dinner (¥4,000) on February 29, and a 1.5-days field trip (free) to the Sambagawa and Shimanto belts from the afternoon on March 1 to March 2.

Conference outline:

The Mw9.0 earthquake and its accompanying tsunami on March 11 devastated a large area along the Pacific coast of NE Japan, killing at least 15,600 people and leaving about 5,000 people still missing. Such great earthquakes along subduction zones and their accompanying tsunamis have caused severe damage in the past. Scientists have worked hard to understand earthquakes and related phenomena along subduction zones, mostly based on seismic and geodetic observations. In addition to these remote monitoring studies, drilling into and directly sampling earthquake faults at depths, analyses and experiments of sampled fault materials, and borehole measurements at depths have recently been challenged. For example, the San Andreas Fault Observatory at Depth (SAFOD) project successfully sampled fault rocks from its creeping section at depths of ~2700 m in 2007. In case of subduction zones, the IODP Nankai Trough Seismogenic Zone Experiment (NanTroSEIZE) targets sampling seismogenic faults along the Nankai Trough by the drilling vessel "Chikyu" in a few years. With analyses and experiments of sampled fault materials, and borehole measurements at depths, NanTroSEIZE would significantly improve our understanding of earthquake processes along subduction zones.

Supported by a MEXT grant, we will hold an international conference in Kochi by which we aim to explore a new perspective of great earthquakes along subduction zones including the Nankai Trough, by integrating recent results of paleoseismological surveys, variable observations, laboratory experiments, material analyses, and numerical modeling on pre- and co-seismic processes, seismic links, and the recurrence.

We have four reasons to choose Kochi as the conference venue. First, it is close to the focus of a future Nankai Earthquake. Second, it is also close to the exhumed ancient subduction zones, i.e. Sambagawa and Shimanto belts, where we will go for a field trip. Third, JAMSTEC Kochi Institute for Core Sample Research stores core samples taken during the NanTroSEIZE expeditions. Finally and very importantly, you can enjoy good food and sake in Kochi. We limit talks at this conference to those by the following 25 invited speakers in order to leave enough time for discussions, but instead we encourage all participants to present posters for which we will allocate enough time and space.

Registration:

Send an e-mail including the following information to nantero-kaken-info@jamstec.go.jp by **November 30, 2011**.

Name, Affiliation, E-mail address
Ice breaker party on February 28 (¥2,000): Yes/No
Conference dinner on February 29 (¥4,000): Yes/No
Field trip to the Sambagawa and Shimanto belts on March 1-2 (Free): Yes/No

Abstract submission: Attach a MS Word file to the registration e-mail above. Please follow the guidelines below. Note that all presentations other than those by invited speakers will be posters.

Title of the abstract Author One*1, Author Two2 and Author Three3
1 First author affiliation and address
2 Second author affiliation and address
3 Third author affiliation and address
* Presenting author's e-mail address: author.one@nowhere.jp
Main text. One page maximum.

Top and bottom margins should be 2.5 cm, while left and right margins should be 3 cm.

One figure or table can be placed if necessary.

Special issue publication:

We are planning to publish a special issue in Tectonophysics, and encourage all participants to submit their manuscripts to the special issue. Detail information will be announced later.



IODP response to the 11 March 2011 Tohoku earthquake

Following the devastating M9 Tohoku earthquake of 11 March 2011, the IODP Science Planning Committee (SPC) recommended that IODP and ICDP convene a Detailed Planning Group (DPG) to “to provide a scientific assessment of the viability, strategy, and time period for a potential rapid response drilling effort within the region affected by the Tohoku mega-earthquake.” The DPG’s terms of reference were as follows:

Evaluate the overall scientific merits and feasibility of a rapid response drilling project addressing this unprecedented, unexpected, and truly extraordinary geohazard event

Assuming (1) suggests a strong scientific case can be made, outline a research and drilling plan including required pre-drilling survey data, draft locations and depths of drilling, and hole and observatory design.

IODP Management International (IODP-MI) appointed Prof Emily Brodsky (UC Santa Cruz), Prof Jim Mori (University of Kyoto), and Dr Shuichi Kodaira (JAMSTEC) to chair the DPG and subsequently invited a further 20 scientists from Japan, the United States, China, France, Germany, Italy, and New Zealand to participate. Assoc Prof John Townend of Victoria University of Wellington was invited to take part on behalf of ANZIC.

The DPG and representatives of IODP-MI, the Center for Deep Earth Exploration (CDEX), and the United States Implementing Organisation (USIO) met in Tokyo on 18–20 May. By this time JAMSTEC had mounted cruises to resurvey multichannel seismic lines spanning the hypocentral area, and analyses of seabed deformation measurements and onshore seismological data were already in publication in *Science*. The underlying themes of the DPG’s discussions were whether drilling into the shallow portion of the ruptured subduction thrust would yield scientifically valuable results and whether such drilling is technically feasible.

The Tohoku earthquake is not the largest great earthquake ($M_w^{3.8}$) to have occurred in recent years, but it is without doubt the best-recorded. Japan’s geophysical infrastructure is unparalleled in terms of the number of broadband and strong-motion seismometers, many installed in boreholes, nationwide continuous GPS coverage, local GPS/acoustic seafloor geodetic observation systems, and tsunami gauges, and these facilities and others provided exceptional recordings of the earthquake and the tsunami and aftershocks that followed.

In particular, several data sets indicated that the earthquake produced much greater slip (many tens of metres) than previously considered possible, and that this slip propagated to the subduction trench along a portion of the fault previously thought not to rupture seismically.

These two factors raised the possibility that by drilling into the seabed near the trench, material that has undergone substantial seismic slip might be sampled and analysed. Moreover, and perhaps most intriguingly, these rupture characteristics suggested that rapid drilling might enable the heating associated with rapid fault slip to be measured, and the stresses acting on the fault plane during rupture to be determined. Calculations made during the DPG meeting and since refined indicate that intersecting the subduction thrust approximately 1000 m below the seabed within two years of the earthquake would enable the thermal perturbation produced by low-friction fault slip to be measured.

An obstacle to drilling into the shallow portion of the fault that ruptured in the earthquake is the extreme water depth. Updip of the Tohoku earthquake hypocenter, the subduction thrust intersects the seabed in water depths exceeding 7000 m. Such water depths are much greater than either the *JOIDES Resolution* or *Chikyū* have successfully drilled in (5980 m and 4080 m, respectively), and pose major technical challenges to drilling, logging, casing, and re-entry.

The DPG’s report was submitted to IODP -MI on 10 June, and forwarded to the SPC for consideration. The DPG’s paraphrased recommendations were that IODP should carry out a rapid response drilling project if there was a reasonable chance of reaching, sampling, and logging the fault that slipped and making diagnostic measurements of transient signals (including temperature); and that IODP should not carry out such drilling if the fault could not be reached. DPG members had varying opinions on whether drilling was recommended if the fault could be reached but no measurements of transient signals accomplished.

In response to the DPG’s report, the SPC requested the preparation of a full drilling proposal but emphasised the major operational challenges to be overcome in accomplishing a drilling project of the scale required given the timing constraints.



IODP response to the 11 March 2011 Tohoku earthquake cont'd.....

The SPC noted the need for careful consideration to be given to how a drilling project might be received by the Japanese public, particularly those people who had suffered directly in the earthquake and tsunami. In this regard, the SPC requested that issues of hazard (whether drilling might trigger more earthquakes) and necessity (whether costly science is a high priority given the enormous recovery efforts required) be given careful consideration in further developing a drilling proposal.

A full proposal detailing focussed on two closely spaced 840 m boreholes (one drilled using logging-while-drilling techniques, the other cored) in ~7000 m water depth was submitted by the three DPG chairs and 27 other proponents on 2 August and is currently under review. Work is also underway by CDEX and other agencies to fully evaluate *Chikyū's* capability for drilling, coring, casing, and logging operations at the target sites.

In view of the substantial technical and logistical challenges of drilling into the shallow portion of the ruptured fault, it remains to be seen whether rapid response drilling can proceed within the timeframe necessary to measure transient thermal or hydrologic signals produced by the Tohoku earthquake. Nevertheless, the discussions that have taken place to date about drilling into shallow subduction zones and active faults generally are topical and relevant to ANZIC for several reasons.

The newly completed IODP Science Plan for 2013–2023 highlights the need to improve scientific understanding of when, where, and how great earthquakes occur (Challenge 12 — What mechanisms control the occurrence of destructive earthquakes, landslides, and tsunami?). In the aftermath of the devastating Sumatra 2004 and Tohoku 2011 earthquakes, there is no doubt that the potential for all subduction zones to generate great earthquakes — and to generate large tsunami by rupturing to the seabed — is under renewed discussion. From an Australasian standpoint, better understanding of the subduction zones throughout Southwest Pacific and Southeast Asian regions and further afield will facilitate hazard assessment and assist in developing local expertise in active tectonics and seismology.

Offshore drilling into active faults is expensive and time-consuming, and as noted in the IODP Science Plan it is unlikely that more than one or two large-scale subduction zone riser drilling projects will be undertaken in the coming decade. It is important, therefore, that ANZIC continue to engage with the international active fault drilling community to maintain awareness of scientific expertise in Australia and New Zealand, and of opportunities to conduct internationally significant drilling projects in this part of the world.

One such project may be focussed on the Hikurangi subduction zone, off the eastern coast of New Zealand's North Island.

Experience gained in planning and evaluating the Tohoku rapid response drilling project is likely to prove relevant to a New Zealand-led effort to drill into the source area of slow slip events at the northern Hikurangi margin.

The Hikurangi pre-proposal submitted to IODP in 2010 is currently being developed into a complex drilling proposal (CDP) with underpinning riser, riserless, and monitoring components. An international workshop was held in Gisborne and Wellington on 1–7 August to consider the role of drilling in understanding slow slip and to develop the proposals and an implementation plan for the Hikurangi project. The project coordinators are now preparing to submit the CDP and riserless proposals to IODP by the 1 October deadline.

Finally, New Zealand has been identified as a primary focus area for GeoPRISMS in the "Subduction Cycles and Deformation" initiative, along with Alaska and Cascadia. This selection may help to focus international efforts on evolving Hikurangi margin drilling project, and reinforce **Australasian expertise in active tectonics and seismogenesis.**

John Townend
Victoria University of Wellington

Assoc Prof John Townend is the EQC Fellow in Seismic Studies at Victoria University of Wellington and served on the Tohoku Rapid Response Drilling DPG. His research focuses on fault mechanics, seismotectonics, and earthquake physics, and he co-leads the Deep Fault Drilling Project—Alpine Fault (<http://wiki.gns.cri.nz/DFDP>). John speaks Japanese and has lived in Japan on two occasions. His participation in the DPG meeting was funded by ANZIC and the School of Geography, Environment, and Earth Sciences, Victoria University of Wellington.

For more information contact:
Website: www.iodp.edu.au
Website: www.drill.gns.cri.nz