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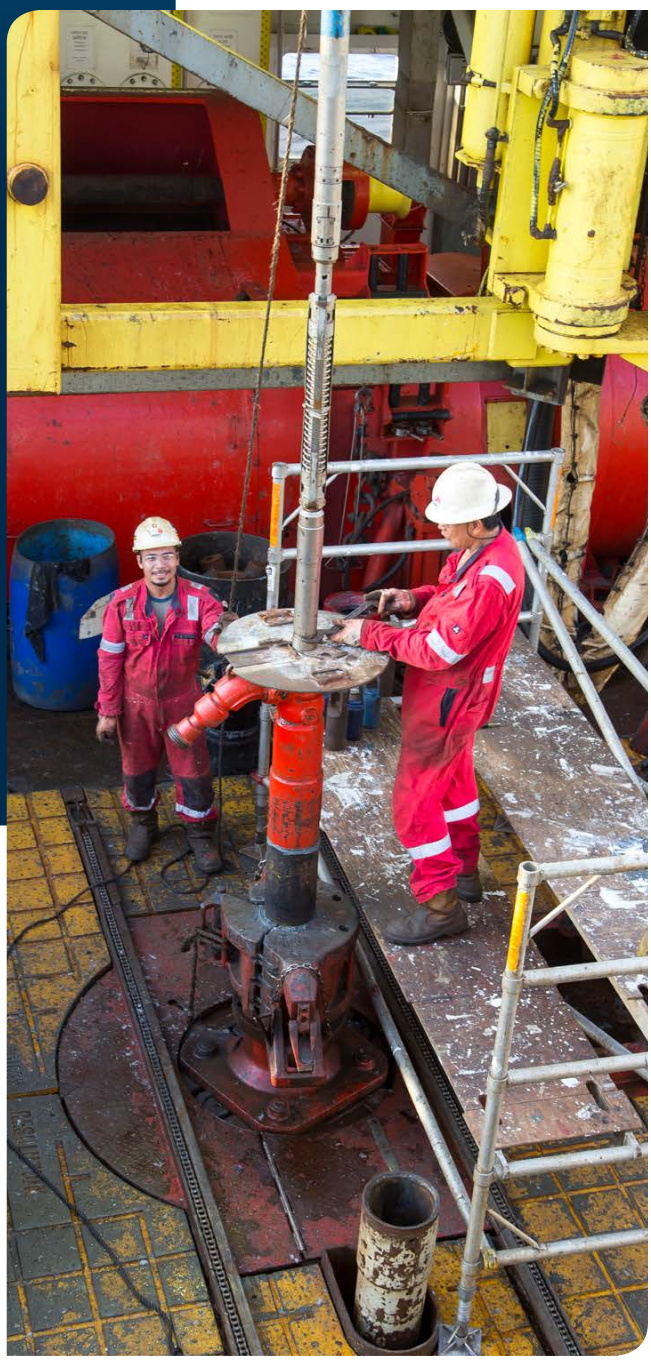
SPOTLIGHT 10. Future Opportunities in Scientific Ocean Drilling: Natural Hazards

The source regions of undersea natural hazards, including earthquakes and slope failures, are prominent targets for scientific ocean drilling. The marriage of coring and integrated borehole instrumentation has changed our view of these phenomena, revealing variations in subsurface conditions that precede and follow them.

Since 2004, a series of devastating tsunamis, earthquakes, and submarine landslides resulted in the loss of hundreds of thousands of lives and caused hundreds of billions of dollars worth of damage. Meanwhile, revolutions in instrumentation and remote sensing are enabling us to detect and monitor such events in novel ways and in ever-greater detail. For example, successful borehole observatory installations along the Costa Rica, Hikurangi, and Nankai subduction margins are identifying transient slow fault slip events that were previously undetectable. These successes demonstrate the value of expanded monitoring efforts at subduction and transform fault systems globally (e.g., Cascadia, Alaska, Peru-Chile) to learn more about the diversity of fault environments and behaviors.

Future work will illuminate the earthquake cycle by integrating ever-higher resolution seafloor maps and subsurface images with geological and mechanical research on samples recovered by scientific ocean drilling from fault zones, in situ logging measurements of rock properties and stress recorded in downhole logs, and long-term borehole observations. In addition to movement on active fault systems, submarine slope stability, hazards from gas venting and gas hydrate deposits, and the resulting mass transport and turbidite flows are all significant sources of tsunami hazard. The time is ripe for pursuing ambitious new drilling targets, including collecting cores and in situ measurements to study both the history of and conditions for slope failure on both sedimented continental margins and the flanks of volcanic islands and seamounts.

— Harold J. Tobin and Demian M. Saffer



Siem Offshore personnel assemble a logging tool string on the rig floor of *JOIDES Resolution* during IODP Expedition 362, Sumatra Seismogenic Zone. *Photo credit: Tim Fulton, IODP JRSO*