Researchers to visit site of 2004, 2005 Indonesian quakes

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Researchers from Oregon State University and an Indonesian science center are collaborating on a pioneering project to analyze the history of great earthquakes and tsunamis on the Sunda subduction zone, along the western margin of Sumatra and Java – site of one of the most devastating tsunamis in modern history.

Led by OSU marine geologist Chris Goldfinger, the expedition will travel this May to the site of a 2004 Indonesian earthquake and its resulting tsunamis, which devastated nearby Banda Aceh and other coastal cities in the Indian Ocean. They also will visit the site of a second major earthquake that struck west of nearby Nias Island in 2005.

The 43-day research project is funded by the National Science Foundation. It is based on an agreement and collaborative research plan recently developed by Goldfinger and Yusuf S. Djadjadihardja, an official with the Agency for Assessment of Application of Technology in Indonesia.

The project "continues the important cooperation between Indonesia and the United States on potential tsunami and earthquake related natural disasters" that was embodied in a previous hazards research agreement, said John Heffern, United States Embassy Charge d'Affaires.

This will be the first research ship from the United States allowed in Indonesian waters in nearly 30 years, said Goldfinger, a professor in OSU's College of Oceanic and Atmospheric Sciences. The researchers

will take a series of piston core samples from aboard the R/V Roger Revelle, operated by the Scripps Institution of Oceanography. The 32-member scientific team will include at least eight scientists from Indonesia, who will collaborate closely on the analysis of the findings from the cruise.

"The region has had many, many earthquakes in its past, yet we know very little about its seismic history because of its remoteness and access issues," said Goldfinger, one of the world's leading experts on subduction zone earthquakes. "Historical records indicate that there were major earthquakes in Padang in 1797 and 1833 in addition to the two more recent quakes, but the evidence beyond that is a little spotty."

The researchers will leave Phuket, Thailand, on May 7 and cruise to an area in the Indian Ocean west of Banda Aceh, which is on the northern tip of Sumatra, the largest island in Indonesia. From there, they will begin taking a series of core samples – about five to six meters in length – from the seafloor, which is about 4,000 to 6,000 meters below the surface.

They will collect roughly 50 core samples from the ocean along the west coast of Sumatra. From those cores, they will be looking for coarse sediments called "turbidites" that provide evidence of past earthquakes.

When a major offshore earthquake occurs, Goldfinger says, the disturbance causes mud and sand to begin streaming down the continental margins and into the undersea canyons. Sediments run out onto the abyssal plain. The coarser turbidites stand out distinctly from the fine particulate matter that accumulates on a regular basis between major tectonic events.

By dating the fine particles through carbon-14 analysis and other methods, they can estimate with a great deal of accuracy when major

earthquakes have occurred.

Goldfinger has used the technique to recreate the seismic history of the Cascadia Subduction Zone off the coast of the Pacific Northwest, where he has documented 34 major earthquakes during the past 10,000 years. At least 19 of those quakes, he says, ruptured along the entire length of the subduction zone – requiring an event of magnitude 8.5 or larger.

Going back further than 10,000 years has been difficult in the Cascadia Subduction Zone because the sea level used to be lower and West Coast rivers emptied directly into offshore canyons, Goldfinger pointed out. Because of that, it was difficult to distinguish between storms debris and earthquake turbidites.

"We hope to create the same kind of history for the Indian Ocean region, which is surprisingly similar to the Cascadia Subduction Zone in structure," Goldfinger said. "If anything, the Indian Ocean is even better suited for this analysis because there is a huge basin between the rivers and the deep ocean that keeps the terrestrial sediments close to land."

The researchers will further hone in on the dates of the deposits by studying the fossil record and variations in magnetic north that are recorded in the sediments.

On Dec. 26, 2004, a massive undersea earthquake centered west of Sumatra shook the entire region, generating a series of tsunamis that swamped low-lying coastal areas. Nearly 230,000 persons were killed or are still missing – one of the most devastating natural disasters in history. The earthquake's magnitude was estimated between 9.1 and 9.3.

In March of 2005, a magnitude 8.7 quake struck an area just to the south, killing an estimated 1,300 people – most on the Indonesian island of Nias. Scientists are unsure whether the second quake was an

aftershock or took place because the entire fault has been weakened.

"That's why it is so important to gather the seismic history of the region," Goldfinger said.

Source: Oregon State University