Activity Overview - Paleotsunami

Destructive tsunamis are rather rare events at a given coastal location. To estimate the existing tsunami hazard properly, long-term observations are required. Geologic records of pre-historical tsunamis can extend the historical and instrumental records to the recent past. They are also necessary in filling historic records gaps, or in filling geographic gaps for known tsunamis. Paleotsunami research, in conjunction with numerical modeling, can be useful for estimating the frequency of tsunamis and guiding development of the IOTWS.

US IOTWS Contribution

The US Geological Survey (USGS) helped scientists from Thailand, Indonesia, Sri Lanka, and India more effectively investigate evidence of tsunamis that have occurred over the past several hundred years. This paleotsunami field research has led to several landmark discoveries that will help better assess tsunami risk. For example, a team of Thai, Indian, and US scientists uncovered evidence for pre-2004 tsunamis on Phra Thong Island, Thailand. In the photo below, four beds of light-colored sand each rest on a dark soil. The uppermost sand bed records the tsunami of December 26, 2004, and the underlying sand beds probably represent earlier tsunamis from the last few thousand years.

Layer-cake evidence for four Indian Ocean tsunamis surrounds Kruawun Jankaew, a geologist at Chulalongkorn University, Thailand. Dr. Kruawun led the international team that made this discovery in March, with support from the US IOTWS Program.

The Indonesian Institute of Science (LIPI), has also taken up tsunami geology to assess risk and boost awareness under Indonesia's community-preparedness program. Field work in Java and Sumatra, co-led by scientists from LIPI and USGS

and supported in part by the US IOTWS Program, provided training to government researchers and to university students and lecturers. The group found clues to help determine the return periods for tsunamis in the region of Java's 2006 tsunami. The team also developed criteria for using coral boulders in the area to estimate the strength of the 1883 Krakatau tsunami in the Sunda Strait, which followed one of the most powerful volcanic explosions in recorded history.

Geologic field work supported by the US IOTWS Program has begun to clarify Indian Ocean tsunami history and hazards. Further study of such evidence is likely to show how often the Indian Ocean is engulfed by tsunamis like the one in 2004. The resulting estimates of tsunami frequency would provide guidance on coastal development and tsunameter siting.

Indonesian researchers and USGS staff during a field trip to examine evidence of recurrent tsunamis and mudslides

Next Steps

USGS will continue working with partners in the region on paleotsunami research. The International Tsunami Training Institute (ITTI) will include training materials and tools developed during the US IOTWS Program.

For Further Information

- Brian Atwater, USGS and University of Washington (atwater@u.washington.edu)