occurrence under Kanto can be explained by the frictional contact between the slab fragment with the Pacific plate below it, the Eurasian plate at its eastern end, and the Philippine Sea plate at its southern extent. However, although Toda and co-authors[3] agree with previous studies[9–11] regarding the estimated location and geometry of the Pacific plate at depth, their interpretation of the geometry and position of the Philippine Sea plate differs.

Previously, the seismic anomaly has been interpreted as the bottom end of the northwestward subducting Philippine Sea plate[2]. Toda and colleagues[3], contend that the Philippine Sea plate does not, in fact, extend as far north as previously interpreted[2], and suggest that the anomaly originally associated with the Philippine Sea plate is actually a fragment of the Pacific plate.

The identification of this fragment as a piece of the Pacific plate is based on its similarity with characteristics of the Pacific slab beneath Japan, as documented elsewhere. These include a double zone of seismicity and a thick zone of high–velocity perturbations of 5%, which is unlike the thinner, slower Philippine Sea slab. Plate reconstructions for this region also suggest that the Philippine Sea plate could not extend as far north as previously thought.

The explanation of the seismicity and its link to recurring earthquakes beneath Kanto is dependent on the interpretation of the slab fragment. The authors attribute the cluster of seismicity, and the occurrence of the large devastating earthquakes that occur under the Kanto region, to frictional contact between the slab fragment and the Pacific plate. The bounds of the seismicity are consistent with the position of the piece that has broken off the Pacific slab. This mechanism, however, differs from previous interpretations that invoked the interaction of the Philippine Sea slab with the Pacific slab[8–11].

The interpretation of tectonic processes and seismic hazard analysis in this region is inherently complex due to several interacting structures at depth and at the surface. These include the Philippine Sea plate, the Pacific plate, possible slab fragments, subducted seamounts, as well as large subaerial features such as the Izu-Bonin island arc and Sagami Trough that are colliding with the Kanto region of Japan (Fig. 1). The ongoing debate regarding the link between seamounts, tectonic evolution, and seismogenesis will inevitably continue. As we obtain more seismic and geophysical data and as computations become faster, we can add more complexity to models of subduction-zone processes.

The unique image of a slab fragment beneath Kanto was produced from dense, high-quality seismic data and extensive three-dimensional interpretation of a series of different geophysical datasets. As Toda and co-authors suggest, similar slab fragments are likely to exist in other regions. As equally extensive geophysical datasets become available, three-dimensional visualization similar to that used by these researchers may help locate such fragments.

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NATURAL DISASTER

Flood of evidence

On 26 December 2004, a massive tsunami inundated the coastline of southeast Asia with no warning. The wave left behind death and destruction on a scale virtually unprecedented in living memory. Devastation crossed political borders and was worsened by a lack of preparedness: in many of the hardest-hit regions there were no historical records of a tsunami of similar magnitude.

Government attention soon turned towards better early-warning systems for future tsunamis. These efforts, however, were hampered by a lack of knowledge about the history of tsunami activity in the region. Now, two teams have reconstructed the millennial-scale history of tsunamis in Thailand (*Nature* **455,** 1228–1231; 2008) and the Indonesian island of Sumatra (*Nature* **455,** 1232–1234; 2008).

As the flood waters receded, they left behind a thick layer of sand on many beach plains and ridges. A team led by Kruawun Jankaew of Chulalongkorn University, Thailand, dug and drilled into the marshy sediments of the Thai island of Phra Thong, hoping to identify similar sand layers. Their efforts were rewarded with two such deposits. Using radiocarbon dating of the shell and organic material that sandwiched the layers, they conclude that the older tsunami occurred approximately 2,800 years ago, and that the younger layer was deposited sometime around or immediately after AD 1300–1450.

USGS

Meanwhile, a team led by Katrin Monecke of Kent State University, Ohio, was searching the depressions between beach ridges in Aceh, Sumatra, where they uncovered a thick sand layer. Their radiocarbon measurements placed the timing of deposition between AD 1290 and 1400, roughly corresponding to the Thai deposits. The team's transects also revealed another large tsunami event from the period AD 780–990.

The two groups' findings suggest that tsunamis such as the 2004 event have a recurrence interval of approximately 600 years. However, the studies were not designed to detect tsunamis of smaller magnitudes, such as the one that followed the 28 March 2005 earthquake, which still caused extensive damage to buildings and infrastructure.

Both teams stress that despite the apparently low risk of a large tsunami event in the near future, there is still a need to maintain adequate warning systems and evacuation plans to protect coastal residents from the unpredictable seas.

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