

# Recent Indian Ocean tsunamis: Where were the warnings?

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The  $M_w = 9.3$  megathrust earthquake of December 26, 2004 in the Indian Ocean offshore of the NW Sumatra coast generated a catastrophic “Boxing Day” tsunami that killed more than 226,000 people and created untold damage in coastal areas. Because of international tourism, many countries far removed from the major disaster areas lost citizens, triggering the largest international aid and relief effort in history. Tsunami waves recorded around the World Ocean revealed the unprecedented global reach of the 2004 tsunami. Marked tsunami signals were identified in the records of the Kuril and Aleutian islands, Alaska, British Columbia, and California (North Pacific), Nova Scotia, New Jersey, the Bermudas, the southwestern coast of England and northwestern coast of France (North Atlantic), Puerto Rico and the US Virgin Islands (Caribbean Sea), Antarctica, and many other locations. In South Africa, 8000 km from the source, one person was killed and tsunami wave heights in excess of 2.5 m were recorded. Waves of 1.5-m were measured in Brazil. Three months later, on March 28, 2005, a  $M_w = 8.7$  earthquake in the same region generated another large tsunami, killing approximately 1000 people. Although the second tsunami was much weaker than the first one, it was also clearly recorded throughout the Indian Ocean. More recently, on July 17, 2006, the  $M_w = 7.7$  earthquake off Southwestern Jawa created yet another tsunami that caused 900 more casualties. . . So, in less than three years there have been three catastrophic tsunamis in the same region. Why did these three events cause such an incredible loss of life? Could these disasters been mitigated? The first earthquake and tsunami were apparently unexpected. Unfortunately, the considerable death toll from two ensuing tsunamis indicates that there still remain important lessons to be learned from the 2004 tsunami. Moreover, some countries around the Indian Ocean continue to believe that they have their own viable solutions to the tsunami problem. It is regrettable that the half-century of success of the Pacific Tsunami Warning System is poorly appreciated by some Indian Ocean countries and by the many instant “tsunami experts” that market new technologies and disaster prevention systems to these countries. The situation needs to urgently addressed and improved before another tragedy occurs in the Indian Ocean or elsewhere in the World Ocean.