

DECEMBER 26, 2004 SUMATRA, INDONESIA EARTHQUAKE AND TSUNAMI – TENTH ANNIVERSARY UPDATE

Updated: December 11, 2014

The December 26, 2004 magnitude 9.1 Sumatra, Indonesia earthquake (3.316 N, 95.854 E, depth 30 km) generated a tsunami that was observed worldwide and caused tremendous devastation and deaths throughout the Indian Ocean region*. The earthquake, which is the third largest in the world since 1900, caused severe damage and casualties in northern Sumatra, Indonesia, and in the Nicobar Islands, India. No separate death toll is available for the earthquake as the tsunami followed within 20 minutes. However, the death toll was probably no worse than for the earthquake of March 28, 2005--that is, fewer than 1,000. The tsunami that followed killed more people than any other tsunami in recorded history, with 227,898 dead or missing. The worst hit country was Indonesia with 167,540 listed as dead or missing and damages of \$4,451.6 million. The remaining fatalities occurred in Sri Lanka (35,322), India (16,269), Thailand (8,212), Somalia (289), Maldives (108), Malaysia (75), Myanmar (61), Tanzania (13), Bangladesh (2), Seychelles (2), South Africa (2), Yemen (2), and Kenya (1). The total estimated material losses in the Indian Ocean region were \$10 billion and insured losses were \$2 billion.

DECEMBER 26, 2004 EYEWITNESS ACCOUNTS, FIELD SURVEYS, AND INSTRUMENTAL RECORDINGS

International tsunami survey teams with experts from many countries surveyed the coasts of almost all of the Indian Ocean countries that were affected by the tsunami. They measured runup heights from 20-40 m on the northwest coast of Sumatra in the Aceh Province with a maximum runup of 51 m. Runup is the difference between the elevation of maximum tsunami penetration (inundation line) and the sea level at the time of the tsunami. Runup heights of 5 to 20 m were measured on the coasts of Thailand and 4 to 12 m in Sri Lanka and India. More than 5,000 km away in Somalia, runup heights of almost 10 m were measured. There were 40 tide gauge recordings in the Indian Ocean with a maximum amplitude of 1.75 m at Port Blair, Andaman Islands. The tsunami was also observed on over 150 tide gauges in the Pacific and Atlantic Oceans. A 60 cm wave in the open ocean was captured by the US-French satellites TOPEX/Poseidon and Jason-1 as they passed over the Indian Ocean just two hours after the earthquake occurred.

HISTORICAL TSUNAMIS IN THE INDIAN OCEAN

According to the NOAA National Geophysical Data Center / World Data Service for Geophysics Global Historical Tsunami Event database 2,229 tsunamis (validity $\geq 1^+$) have occurred in the world since 2000 B.C. Of these tsunamis, 1,212 are considered confirmed tsunamis (validity $\geq 3^+$). In the Indian Ocean region, 69 confirmed tsunamis have been observed since the beginning of the 18th Century, and 22 (32%) of these events caused deaths. Three of these deadly tsunamis occurred after the December 26, 2004 event. The majority of Indian Ocean tsunamis were generated by earthquakes (88%), the remainder resulted from volcanic eruptions (6%), landslides (1%), and unknown causes (4%). The most fatal Indian Ocean tsunami events are listed below:

- 1815 Bali, Indonesia earthquake and tsunami caused over **11,000 deaths**
- 1861 Sumatra, Indonesia earthquake and tsunami caused over **1,000 deaths**
- 1883 Krakatau, Indonesia volcanic eruption and tsunami caused over **36,000 deaths**
- 1945 Makran, Pakistan earthquake and tsunami caused **4,000 deaths**
- 1979 Lomblen Island, Indonesia submarine-landslide generated tsunami caused **1,239 deaths**
- 1992 Flores, Indonesia earthquake and tsunami caused at least **2,500 deaths**
- 2004 Sumatra, Indonesia earthquake and tsunami caused **227,898 deaths**

*Data are collected from the US NOAA National Weather Service Tsunami Warning Centers, UNESCO/IOC-NOAA International Tsunami Information Center, the US Geological Survey National Earthquake Information Center, International Post-Tsunami Field Surveys, and news organizations. Refer to the NGDC event page for data and their sources (http://ngdc.noaa.gov/hazard/tsu_db.shtml).

†A validity score or confidence designation is assigned to each tsunami event ranging from -1 for erroneous entries, 1 to 2 for unconfirmed, and 3 to 4 for definite or confirmed tsunamis.

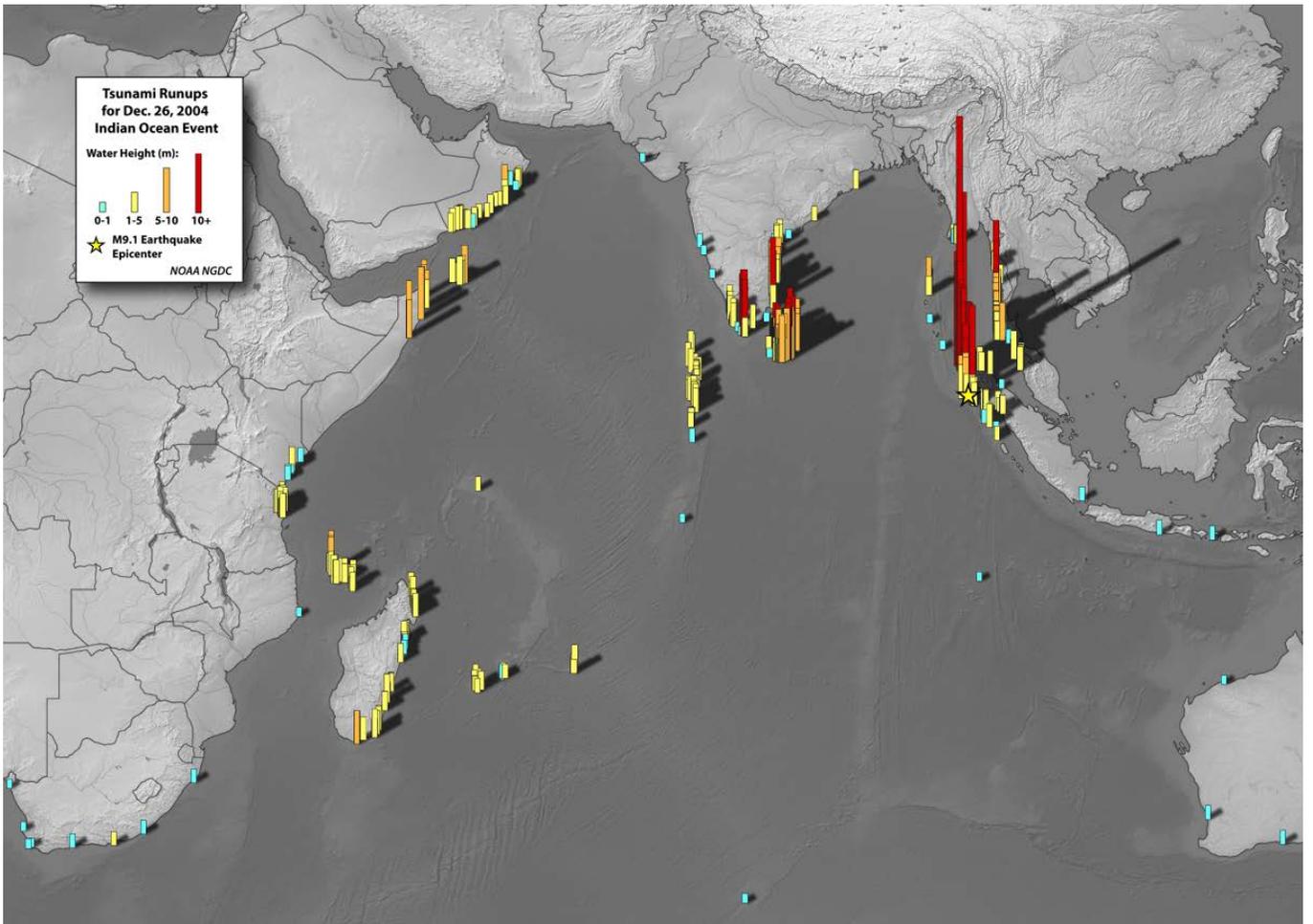


FIGURE 1 - TSUNAMI RUNUPS IN THE INDIAN OCEAN PRODUCED BY THE DECEMBER 26, 2004 SUMATRA, INDONESIA TSUNAMI. DATA FROM EYEWITNESS ACCOUNTS, FIELD SURVEYS, AND TIDE GAUGES. (SOURCE: NATIONAL GEOPHYSICAL DATA CENTER/WORLD DATA SERVICE FOR GEOPHYSICS.)

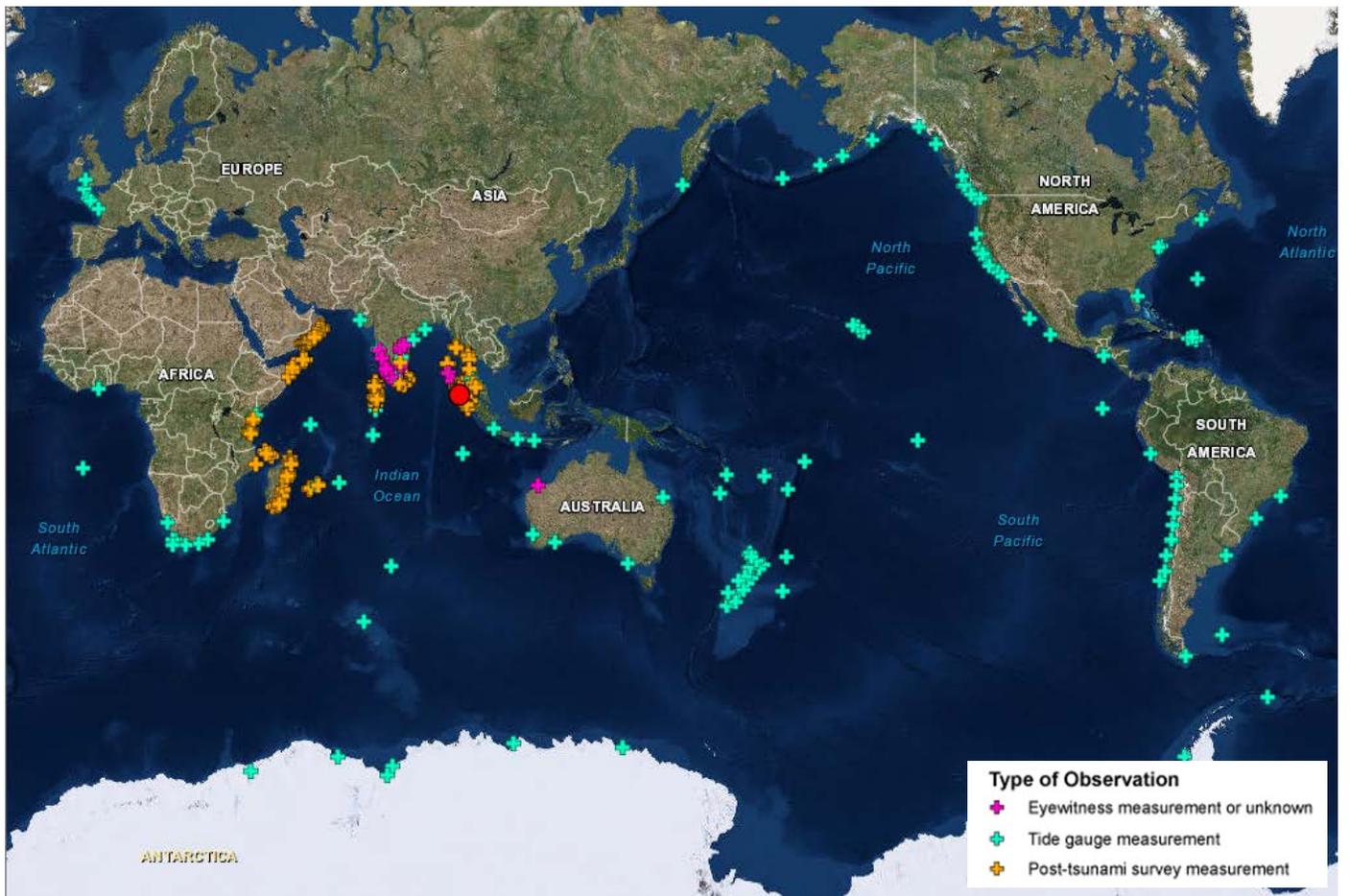


FIGURE 2 - TSUNAMI RUNUPS IN THE ATLANTIC, INDIAN, AND PACIFIC OCEANS PRODUCED BY THE DECEMBER 26, 2004 SUMATRA, INDONESIA TSUNAMI. DATA FROM EYEWITNESS ACCOUNTS, FIELD SURVEYS, AND TIDE GAUGES. (SOURCE: NATIONAL GEOPHYSICAL DATA CENTER/WORLD DATA SERVICE FOR GEOPHYSICS.)