



The Great Sumatra tsunami of December 26, 2004: Observation and analysis

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The $M=9.0$ megathrust Earthquake of December 26, 2004 in the Indian Ocean generated a catastrophic tsunami that killed about 300,000 people and created untold damage in coastal areas. This was the first global-scale tsunami to occur during the "instrumental era" and was recorded throughout the world ocean. Careful analysis of tide gauge data revealed marked tsunami signals in the records of the Kuril and Aleutian islands, Alaska, British Columbia, and California (North Pacific), Nova Scotia, New Jersey, the Bermudas, and the southwestern coast of England (North Atlantic), Puerto Rico and the US Virgin Islands (Caribbean Sea), Antarctica, and other locations. Tsunami wave heights in excess of 2.5 m were recorded at sites in Mexico and South Africa, while 1.5-m waves were measured in Brazil. The large volume of observational data associated with the event enabled us to revise some previous misconceptions regarding tsunami propagation and transformation. In particular, we find that the main features of tsunami records in the Indian Ocean (close to the source area) and in the North Pacific/North Atlantic oceans (in far-field regions) are significantly different: waves were short-ringing (1-1.5 day duration) and fast-decaying for the Indian Ocean region and long-ringing (3-5 day duration) and slowly-decaying with obvious "wave-train structure" in two other regions. The complicated structure of the observed "remote" waves made it difficult to obtain a precise determination of the tsunami arrival times. The main similarity among tsunami records in all three oceans are the long periods of the observed waves (30-60 min) apparently associated with the large extension of the initial source area.