


I'm not robot  reCAPTCHA

Continue

2004 tsunami map of impact



От халена! Ваш веб-переглядач не підтримує сервіс Google Планета Земля. Можливо, потрібно оновити веб-переглядач або перейти в Chrome. Щоб дізнатися більше, перегляньте вимоги до системи. Якщо у вас не встановлено Chrome, завантажте його тут. Хочете нових функцій? Спробуйте скористатися сервісом Google Планета Земля, вибравши опцію нижче.
Launch Wasm Multiple Threaded Launch Wasm Single Threaded
Докладніше про службу Google Планета Земля.
This page contains archived content and is no longer updated. At the time of publication, he represented the best available science. Set in orbit to record the shape of the ocean surface, the Jason-1 and TOPEX/Poseidon satellites help scientists understand the dynamics of the deadly tsunami that devastated countries around the Indian Ocean on December 26, 2004. Radar altimeter on board the satellites recorded the height of the wave as it traveled across the open ocean. By comparing sea altitude measurements taken on December 26 with measurements taken earlier, scientists from NASA's Jet Propulsion Laboratory, the National Atmospheric and Oceanic Administration (NOAA) and the French Space Agency (CNES) were able to measure combes and tsunami troughs as they traveled across the Indian Ocean. Although the data was not broadcast quickly enough to provide an early warning, they help NOAA scientists improve computer models that predict the effects of a tsunami and which can improve future early warning systems. The map above shows the Jason-1 satellite path superimposed on the computer model data of the tsunami height two hours after the earthquake (top). The graph displays satellite data compared to model calculations along the satellite path (above, bottom). At a height of about 60 centimeters (24 inches), the initial wave is similar in both satellite data and computer model. The next peaks of the waves are not so accurate. Satellite data allows scientists to check the accuracy of models that are based on seymmetric and bathymetric data. The satellite data obtained on 26 December is of particular value because it comes from the middle of the ocean, away from coastal tidal meters and other instruments that measure the height of the waves. By showing scientists where models have failed, the data will improve future models. More accurate models can show how tsunamis develop, travel and affect the coastline, so sensitive areas can prepare for future events. Photos courtesy of NOAA Laboratory for Satellite Altimetry
Megathrust underwater earthquake followed by tsunami in Indian Ocean
2004 Indian Ocean 2004 Oceaneearthquake tsunamiSouth-western suburbs of Banda Aceh, Sumatra. Taken on January 2, 2005 by the U.S. Navy>Show a map of the Indian Ocean>Show a map of Southeast Asia>Show map
earthtune2004-12-26 00:58:53ISC event74 Local date55151USGS-ANSSComCatLocal December26, 2004. [2004-12-26][L]Local time07:28:53 UT C+6 I/207:58:53 UTC+708:58:53 UTC+8Magnitude9.1–9.3 Mw[2]Depth30 km (30 km) 19 miles[1][E]Epicenter3°18′58″N 95°51′14″E / 3.316°N 95.854°E / 3.316; 95.854[1]TypeMegathrustAreas affectedIndian Ocean coast areasMax. IntensityIX (Violent)[1]Tsunami 15 to 30 m (50 to 100 ft); [3] The 227,898 earthquake and tsunami in the Indian Ocean killed in 2004 (also known as Boxing Day tsunami, by the scientific community, the Sumatra and Andaman earthquakes occurred on December 26 at 07:58:53 local time (UTC+7), from the epicenter off the west coast of north Sumatra, Indonesia. It was a subdued megathrust earthquake that recorded a magnitude of 9.1–9.3 Mw, reaching mercalli intensity to IX in some areas. The earthquake was caused by a rupture along the fault between the Burmese Plate and the Indian Plate. A series of huge tsunami waves rose to 30 m (100 ft) high after heading inland after underwater seimentation activity at sea. Communities along the surrounding Indian Ocean coast have been severely affected and the tsunami has killed some 227,898 people in 14 countries, making it one of the deadliest natural disasters in history. The direct results have severely disrupted living and trading conditions in the coastal provinces of the surrounded countries, including Aceh, Indonesia, Sri Lanka, Tamil Nadu, India and Khao Lak, Thailand. Banda Aceh recorded the highest number of deaths. The earthquake was the third largest in history and had the longest damage time ever observed, with eight to ten minutes. This caused the planet to vibrate as much as 10 mm[13] and also remotely trigger earthquakes as far away as Alaska. The epicenter was between Simeulue and mainland Sumatra. The plight of those affected and countries has provoked a worldwide humanitarian response, with donations totalling more than \$14 billion. [16] Earthquake 2004 Indian Ocean and Tsunami Countries Affected India Indonesia Malaysia Myanmar Somalia Sri Lanka Thailand Indirect: Finland Humane Response Classic Response Football for Hope Music for Relief Reach Out to Asia Rugby Aid Tsunami Relief Cardiff UK Radio AidEdoniaPositional World Cricket Tsunami Appeal Military Operations Garron Sumatra Assisted Assistance Related Topics Library Damage Sri Lanka Train Wreck Category Commons Timelinetve
2004 Indian Ocean Earthquake Was Initially as a magnitude moment of 8.8. In February 2005, scientists changed the estimated size to 9.0. Although the Pacific Tsunami Warning Center has accepted these new numbers, the United States Geological Survey has so far not changed its estimate to 9.1. The 2006 study estimated mw 9.1–9.3; Hiroo Kanamori of the California Institute of Technology estimates that Mw 9.2 is representative of the magnitude of the earthquake. The hypocenter of the main earthquake was located about 160 km from the west coast of northern Sumatra, in the Indian Ocean north of Simeulue Island at a depth of 30 km below average sea level (initially reported as 10 km or 6.2 miles). The northern part of the megathrust Sunda broke over a length of 1300 km. The earthquake (after the tsunami) was felt in Bangladesh, India, Malaysia, Myanmar, Thailand, Sri Lanka and the Maldives. Splay errors, or secondary pop-up errors, caused long, narrow parts of the seabed to appear within seconds. It quickly raised the altitude and increased the speed of the waves, destroying the nearby Indonesian city of Lhokgaa. Indonesia lies between the Pacific Ring of Fire along the northeastern islands adjacent to New Guinea and the Alpidic belt, which runs along the southern and western parts of Sumatra, Java, Bali, Flores to Timor. The 2002 Sumatra earthquake is believed to be a foreshock, before the main event for more than two years. Major earthquakes, such as the 2004 Indian Ocean earthquake, are associated with megathrust events in subduction zones. Their seismic moments can form a significant part of the global seismic moment during the century. Of all the moments released by earthquakes in 100 years from 1906 to 2005, roughly one-eighth was caused by an earthquake in the Indian Ocean in 2004. This earthquake, along with the Good Friday earthquake (Alaska, 1964) and the Great Chilean Earthquake (1960), account for almost half of the total moment. [citation needed] Since 1900, the only earthquakes recorded with a larger magnitude have been the 1964 Great Chile earthquake (magnitude 9.5) and the Good Friday earthquake at Prince William Sound (magnitude 9.2). The only recorded earthquakes with magnitude 9.0 or greater occurred on November 4, 1952 near Kamchatka, Russia (magnitude 9.0)[22] and Tōhoku, Japan (magnitude 9.1) in March 2011. Each of these megathrust earthquakes also spawned a tsunami in the Pacific Ocean. Compared to the 2004 Indian Ocean earthquake, the death toll from these earthquakes was significantly lower, mainly due to the lower population density along the coasts near the affected areas, much greater distances to more populated coasts and excellent infrastructure and warning systems in MEDCs (countries economically developed countries) such as Japan. [citation needed] citation] huge megathrust earthquakes occurred in 1868 (Peru, Nazca Plate and South American Plate); 1827 (Colombia, Nazca Plate and South American Plate); 1812 (Venezuela, Caribbean Plate and South American Plate) and 1700 (Western North America, Juan de Fuca Plate and North American Plate). All of them are considered larger than size 9, but no accurate measurements were available at the time. [citation needed] Tectonic plates
Main article: Epicentrum tectonics plate and related aftershocks
The 2004 Indian Ocean earthquake was extremely large geographically and geologically. About 1,600 km of fault surface has fallen (or ersted) about 15 m along the subduction zone, where the Indian plate slides (or subwives) under the oncoming burmese plate. The slippage did not occur immediately, but took place in two phases within minutes: seysmography and acoustic data indicate that the first phase involved a rupture about 400 km long and 100 km wide, 30 km below the seabed – the largest rupture ever found was caused by an earthquake. The rupture was about 2.8 km/s (1.7 mph; 10,000 km/h), starting from the Aceh coast and progressing northwest for about 100 seconds. After about 100 seconds of interruption, the rupture continued north towards the Andaman and Nicoman Islands. The northern rupture occurred more slowly than in the south, about 2.1 km/s (1.3 mi/s; 7,600 km/h; 4700 mph), continuing north for another five minutes to the boundary of the plate, where the type of fault changes from subduction to strike-slip (the two plates move side by side in opposite directions). The Indian Plate is part of the great Indo-Australian Plate, which lies at the base of the Indian Ocean and the Bay of Bengal, and moves northeast at an average of 60 mm/a (0.075 w/Ms). India Plate meets the Burma Plate (which is considered part of the great Eurasian Plate) in the Sunda Trench. At this point, the India Plate under the plate of Burma, which leads the Nikobar Islands, the Andaman Islands and northern Sumatra. India's plate sinks deeper and deeper beneath burma's plate until rising temperature and pressure produce volatile substances from the conductive plate. These volatile ones rise to the covering plate, causing partial melting and magma formation. The emerging magma penetrates into the crust above and emerges from the Earth's crust through volcanoes in the form of a volcanic arc. The volcanic activity that causes the Indo-Australian Plate subducts Eurasian Plate created the Sunda Arc. In addition to moving sideways between the plates, an earthquake in the Indian Ocean in 2004 caused the seabed to rise by several meters, displacing about 30 km3 (7.2 cu mi) of water and triggering devastating tsunami waves. Waves along the entire length of 1600 km (1000 miles) of cracks (acting as the source of the line). This significantly increased the geographical area where waves were observed, reaching as far as Mexico, Chile and the Arctic. Seabed elevation has significantly reduced the capacity of the Indian Ocean, causing global sea levels to rise by around 0.1 mm. [23] Aftershocks and other earthquakes
See also: List of earthquakes in Indonesia and list of earthquakes in 2004
Initial earthquake and aftershocks of more than 4.0 Mw from 26 December 2004 to 10 January 2005
Aftershocks in 2004
Earthquake in the Indian Ocean
Numerous aftershocks were reported off the coast of the Andaman Islands, nikobar island and the region's primary epicenter in the following hours and days. The magnitude 8.7 2005 Nias-Simeulue earthquake, which occurred off the coast of the Sumatran island of Nias, is not considered a aftershock, despite its proximity to the epicenter and was most likely triggered by stress changes associated with the 2004 event. The earthquake triggered its own aftershocks (some of which recorded magnitude 6.1) and now ranks as the third largest earthquake ever recorded on a magnitude-scale moment or richter. The energy released by the original earthquake continued to make its presence felt after the event. A week after the earthquake, its reverberation can still be measured, providing valuable scientific data on the earth's interior. The 2004 Indian Ocean earthquake occurred just three days after an 8.1 magnitude earthquake in the subarctic Aukland Islands, an uninhabited region west of New Zealand, and Macquarie Island in northern Australia. This is unusual because earthquakes with magnitudes of eight or more occur on average only once a year. [26] The U.S. Geological Survey sees no evidence of a causal link between these events. The 2004 Indian Ocean earthquake is believed to have triggered activity in both Leuser Mountain[28] and Mount Talang [29] volcanoes in Aceh along the same range of peaks, while the 2005 earthquake in Nias-Simeulue triggered activity in Lake Toba, an ancient crater in Sumatra. Energy released
Energy released on the earth's surface (ME, which is a seismological potential for damage) by the Indian Ocean earthquake in 2004 was estimated at 1.1×1017 jules (110 PJ; 26 Mt). This energy is equivalent to more than 1,500 times the atomic bomb in Hiroshima, but less than the Tsar's Bomb, the largest nuclear weapon ever detonated. The total physical work done MW (and thus energy) by the quake was 4.0×1022 (40 ZJ).[32] the vast majority underground, which is more than 360,000 times equivalent to 9,600 gigatons of TNT equivalent (550 million times Hiroshima) or about 370 years of energy consumption in the United States at 1.08×1020 (108 EJ). The only recorded earthquakes with larger MW were earthquakes in Chile in 1960 and 1964 in Alaska, with 2.5×1023 Jules (250 ZJ) and 7.5×1022 Jules (75 ZJ) respectively. The earthquake caused a seismological oscillation of up to 200–300 mm of earth's surface, which corresponds to the effect of tidal forces caused by the Sun and moon. Seismic waves of earthquakes were felt all over the planet; Oklahoma State, where vertical movements of 3 mm were recorded. Until February 2005, the effects of the earthquake were still detectable as 20 µm (0.02 mm; 0.0008 inch) of the earth's complex harmonic oscillation, which gradually decreased along with any earth oscillation more than four months after the earthquake. Vertical ground movements recorded by the IRIS Consortium Due to the huge energy release and shallow depth of the earthquake rupture generated unusual seismic movements around the world, especially due to the huge flexible Rayleigh (surface) waves that exceeded 10 mm (0.4 inches) in vertical amplitude everywhere on Earth. The record section chart displays vertical displacements of the Earth's surface recorded by seismometers from the global IRIS/SUSGS seismography network plotted in relation to the time (since the start of the earthquake) on the horizontal axis and the vertical displacement of the Earth on the vertical axis (note the scale bar 1 cm at the bottom for the scale). Seistograms are arranged vertically at a distance from the epicenter in degrees. The earliest, lower amplitude signal is that of a compression (P) wave that takes about 22 minutes to reach the other side of the planet (antipode; in this case near Ecuador). The biggest amplitude signals are seismic surface waves that reach the antipodes after about 100 minutes. Surface waves can be clearly seen to strengthen near the antipodes (with the nearest seismic stations in Ecuador), and then circle the planet to return to the epicenter region after about 200 minutes. The main aftershock (magnitude 7.1) can be seen at the nearest stations, starting just by the 200-minute mark. A aftershock would be considered a major earthquake under normal circumstances, but it is chasitisation by mainshock. Mass displacement and mass release of energy have slightly changed the earth's rotation. The exact amount is not yet known, but theoretical models suggest that the earthquake shortened the length of the day by 2.68 microseconds due to a decrease in Earth's contraction. This has also caused the Earth to wobble slightly on its axis by up to 25 mm (1 inch) in the direction of 145° East longitude[36], maybe as much as 50 or 60 mm. Due to the effects of moon tides, the length of the day increases by an average of 15 microseconds per year, so any change in rotation caused by an earthquake will be quickly lost. Similarly, chandler Earth's natural woes, which in some cases can be up to 15 cm (50 feet), will eventually offset the minor woes caused by the earthquake. Movement at a distance of 10 m in the sideline and 4-5 m vertically along the fault line. Early speculation was that some of the smaller islands northwest of Sumatra, which is located on the Burmese plate (the southern regions are located on the Sunda Plate), could move to the southwest by as much as 36 m, but more accurate data published more than a month after the earthquake showed that this movement is about 200 mm. As the traffic was vertical and lateral, some coastal areas may have been moved to below sea level. The Andaman and Nicobar Islands appear to have sunk to the southwest by about 1.25 m and sank by 1 m. In February 2005, Royal Navy ship HMS Scott surveyed the seabed around the earthquake zone, which ranges in depth from 1,000 to 5,000 m. The study, conducted using a high-resolution multi-beam sonar system, showed that the earthquake had a significant impact on the topography of the seabed. Ridges along the 1500-meter-high push, created in connection with previous geological activity along the fault, generating landslides several kilometers wide. One such landslide consisted of one rock block with a height of about 100 m and a length of 2 km. The rush of water displaced by tectonic growth also dragged massive rock slabs, each weighing millions of tons, as much as 10 km (6 miles) across the seabed. An ocean trench several kilometres wide has been unveiled in the earthquake zone. The TOPEX/Poseidon and Jason-1 satellites went through a tsunami as they crossed the ocean. These satellites have radars that accurately measure the height of the water surface; anomalies of 500 mm (20 inch) were measured. Measurements from these satellites can prove invaluable for understanding earthquakes and tsunamis. [42] Unlike data from tide meters installed on land, measurements obtained in the middle of the ocean can be used to calculate the parameters of the source earthquake without having to compensate for the complex ways in which the proximity of the coast changes the size and shape of the wave. Tsunami Tsunami spread took 5 hours to reach Western Australia, 7 hours to reach the Arabian Peninsula, and did not reach the Coast of South Africa until almost 11 hours
Earthquake Sander vertical rise of the seabed by several meters during the earthquake has oversauntic amounts of water, resulting in a tsunami that struck the coast of the Indian Ocean. A tsunami that causes damage away from its source is sometimes called teletsunami and is much more likely to be produced by vertical seabed movement than by horizontal movement. The tsunami, like all others, behaved differently in deep water than in shallow water. In deep oceans, tsunami waves form only a low, wide hump, barely noticeable and harmless, which usually moves at high speeds of 500 to 1000 km/h (310 to 620 mph); in shallow water near the coast, the tsunami slows down to just tens of kilometers per hour, but this creates large destructive waves. Scientists studying the damage in Aceh found evidence that the wave reached a height of 24 m while sucking ashore along large stretches of coast, rising to 30 m in some areas while travelling inland. Radar satellites recorded the height of tsunami waves in deep water: the maximum altitude was 600 mm two hours after the earthquake, which was the first such observations in history. [44] According to Tada Murty, vice president of the Tsunami Association, the total tsunami wave energy was equivalent to about 5 megatons of TNT (21 PJ), which is more than twice the total explosive energy consumed throughout World War II (including two atomic bombs), but still several orders of magnitude smaller than the energy released in the earthquake itself. In many places, the waves reached as much as 2 km inland. Since the 1,600 km long fault that occurred in the earthquake was almost north-south orientation, the largest force of the tsunami waves was in the east-west. It also benefited from the fact that the earthquake was slower in the northern crack zone, significantly reducing the energy of water displacements in the region. The average height of coastal waves that have a build-up between them and tsunami sites of origin are usually safe; however, tsunami waves can sometimes dissuas around such land masses. In this way, the state of Kerala was hit by a tsunami, even though it was located on the west coast of India, and the west coast of Sri Lanka suffered significant effects. The distance itself was not a guarantee of security, as Somalia was hit harder than Bangladesh, even though it was much further away. Due to the distance, the tsunami took from fifteen minutes to seven hours to reach the coast. [47] The northern regions of the Indonesian island of Sumatra were hit quickly, while Sri Lanka and the east coast have been hit 90 minutes to two hours later. Thailand was struck about two hours later, despite being closer to the epicenter, as the tsunami traveled slower in the shallow Andaman Sea off the west coast. The tsunami was spotted all the way to Struisbaai in South Africa, about 8,500 km away, where a 1.5-meter high (5-foot) high tide rose ashore about 16 hours after the earthquake. Getting to Struisbaai in africa's southernmost point, probably due to the wide continental shelf off the coast of South Africa and the tsunami that was to occur along the South African coast from east to west. The tsunami also reached Antarctica, where tidal gauges at Japan's Showa base recorded oscillations up to the subway, with disruptions lasting several days. Some of the tsunami's energy made its way into the Pacific Ocean, where it produced small but measurable tsunamis along the western coasts of North and South America, typically about 200 to 400 mm. A tsunami of 2.6 m was measured in Manzanillo, Mexico. As well, the tsunami was large enough to be detected in Vancouver, which surprised many scientists as tsunamis measured in some parts of South America were larger than those measured in some parts of the Indian Ocean. It was theorized that the tsunamis were concentrated and directed over long distances through the ridges of the mid-ocean that run along the margins of continental plates. Early signs and warnings
Maximum tsunami wave recession on Kata Noi beach at 10:25 am, before the third and strongest tsunami wave
Despite several hours of delay between the earthquake and the effects of the tsunami, almost all victims were surprised. There were no tsunami warning systems in the Indian Ocean that detected tsunamis or alerted the entire population living in the ocean. [52] Tsunami detection is not easy because it is in deep water during a tsunami, has a low altitude and a network of sensors is needed to detect it. Tsunamis are more common in the Pacific Ocean than in other oceans due to earthquakes in the Ring of Fire. Although the extreme western edge of the Ring of Fire extends to the Indian Ocean (the point where the earthquake struck), there is no warning system in this ocean. Tsunamis are relatively rare, although earthquakes are relatively common in Indonesia. The last major tsunami was caused by the eruption of Krakatoa in 1883. Not only every earthquake causes a major tsunami: on March 28, 2005, a magnitude 8.7 earthquake struck roughly the same area of the Indian Ocean, but did not cause a major tsunami. The first warning sign of a possible tsunami is the earthquake itself. However, the tsunami can strike thousands of kilometers away, where the earthquake is felt only poorly or not at all, in the pre-protocol preceding the Strike, the sea often retreats temporarily from the coast, which has been observed on the eastern side of the earthquake rupture zone, such as around the coast of Aceh, phuket island and khao lak area in Thailand, Penang island in Malaysia and andaman and Nikobar islands. Around the Indian Ocean, this rare sight reportedly prompted people, especially children, to visit the coast to explore and collect stranded fish on a 2.5 km (1.6 mile) exposed beach, with fatal results. However, not all tsunamis cause this effect disappearing sea. In some cases, there are no warning signs: the sea suddenly swells without retreating, surprising many people and giving them little time to escape. Play media
Tsunami wave field in the Bay of Bengal an hour after the earthquake
One of the few coastal areas to evacuate before the tsunami was on the Indonesian island of Simeulue, near the epicenter. The folklore of the island recounted the earthquake and tsunami in 1907, and the islanders fled to the inland hills after the initial quake and before the tsunami struck. These stories and oral folklore from previous generations could help the survival of the inhabitants. On Maikhaa Beach in northern Phuket, Thailand, 10-year-old British tourist Tilly Smith studied the tsunami in geography at school and recognized warning signs of retreating ocean and foaming bubbles. She and her parents warned others on the beach, which was safely evacuated. John Croston, a biology teacher from Scotland, also spotted signs in Kamala Bay north of Phuket, taking a busload of holidaymakers and locals to safety in the higher ground. [55] Anthropologists initially expected the indigenous people of the Andaman Islands to be severely affected by the tsunami, and even feared that the already depopulated Ongc tribe might have been wiped out. Many indigenous tribes evacuated and suffered fewer casualties. [57] Oral traditions developed from previous earthquakes helped native tribes escape the tsunami. For example, ongcs folklore speaks of a huge tremor of the earth and then high walls of water. Almost all of Ongc's people seemed to have survived the tsunami. The height of the tsunami flooding in Indonesia's Aceh can be seen at home as the Banda Aceh Tsunami devastated the northwestern coast of Sumatra, especially in Aceh province, about 20 minutes after the first earthquake. Banda Aceh, the nearest major city, suffered heavy losses. Eyewitnesses described three large waves, with the first wave rising gently to the foundation of the buildings, and a few minutes later a sudden retreat from the sea near the port of Ulee Lheue. This was achieved thanks to the appearance of two large black steep waves that traveled inland to the capital. Video
revealed black torrents of water moving at high speed, rolling through the windows of a two-story residential area located about 3.2 km inland. In addition, amateur footage recorded in the middle of the city captured an approaching black wave running down the streets of the city, full of debris, flooding them. The city experienced the highest number of deaths, with about 167,000 people killed directly from the tsunami. Apung 1, a 2,600-ton ship, was inland about 2 km long. In the years after the disaster, he became a local tourist attraction and stayed where he rested. The level of destruction was extreme on the northwestern flank of the city in areas directly inland ponds of aquaculture, directly overlooking the Indian Ocean. The height of the tsunami was reduced from 12 m in Ulee Lheue to 6 m further 8 km to the northeast. Flooding has been observed to extend 3-4 km inland throughout the city. At a distance of 2-3 km from the coastline, the houses, with the exception of heavily built reinforced concrete walls with brick walls that appeared to have been partially damaged by the earthquake before the tsunami, were swept away or destroyed by the tsunami. [61] The area towards the sea was cleared of almost every structure, while closer to the river, a dense structure in the commercial district showed the effects of severe flooding. The depth of flow in the city was only at the level of the second floor, and along the streets and on the ground floor storefronts piling up large amounts of debris. In the coastal part of Ulee Lheue, the flow depth was more than 9 m. Footage showed evidence of the return of the flowing River Aceh, carrying debris and people from destroyed villages on the coast and transporting them up to 40 km inland. A group of small islands: Weh, Breueh, Nasi, Teunom, Bunta, Lumpat and Batee lies north of the capital. The effects of the tsunami on two islands, Breueh Island and Nasi, were extreme, with a runup of 10-20 m (33-66 feet) on the west coast. Coastal villages were destroyed by tsunami waves. However, on Pulau Weh the island experienced strong jumps in the port of Sabang, but there was no major damage with the reported runup values of 3-5 m (9.8-16.4 ft), sheltered from a direct tsunami attack by the islands to the southwest. Lhoknga Lhoknga's overturned cement carier is a small coastal community located about 13 km southwest of Banda Aceh, located on a flat coastal plain between two hills covered with rainforests, overlooking a large bay and famous for its large sandy beach and surfing. The city was one of the first settlements located on the west coast, which were affected by the initial tsunami wave. The seabed was conducive to the development of large tsunami waves of the surfing type. Locals reported 10 to 12 waves, with the second and third waves being the highest and most destructive. Interviews with local people and fishermen showed that about 10-15 minutes after the earthquake, the sea drastically retreated and exposed coral reefs. In the distant horizon, giant vertical black waves about 30 m high made explosions like sounds as they burst and approached the shore. The first wave quickly landed from the southwest, when the stormy wave was about 0.5-2.5 m high. The second and third waves were located on the coast at an altitude of 15-30 m and looked like giant surf waves, but higher than coconut trees, and were like a mountain. The second wave was the largest; comes from west to southwest within five minutes of the first wave. The tsunami stranded cargo ships and barcas, as well as the destruction of a cement factory near the coast of Lampuuk, where evidence showed the tsunami reached the third level of the building. [5] [65] Meulaboh, a remote coastal town, was one of the hardest hit by the tsunami. The waves arrived after the sea retreated about 500 m, followed by a small tsunami. The second and third destructive wave arrived later, which exceeded the height of the coconut trees. The flooding distance is about 3.1 miles. Other cities on the west coast of Aceh affected by the disaster include Leupung, Lhokruet, Lamno, Patek, Calang and Teunom. Affected or destroyed cities on the north and east coasts of the region include Pidie Regency, Samalanga, Panther and Lhokseumawe. The high death rate in this area was mainly due to the lack of community preparation for the tsunami and the limited knowledge and education of the population on the natural phenomenon. Helicopter tests showed that entire settlements were virtually destroyed by destruction within a few kilometers inland, and only some mosques remained standing. The largest tsunami height was measured on a hill between Lhoknga and Leupung, on the west coast of northern Sumatra, near Banda Aceh, and reached 51 m (100 m). [5] Tsunami height in Sumatra[61] 15-30 m (49-98 ft) on the west coast of Aceh 6-12 m (20-39 ft) off the coast of Banda A 6 m (20 ft) on the coast of Banda Aceh Krueang Raya coast 5 m on the coast of Sigli 3-6 m (9.8-19.7 m) on the north coast of the island of Weh, directly opposite the tsunami source 3 m (9.8 ft) on the opposite side of the coast of the island of Weh tsunami Sri Lanka Fishing boat stuck in Batticaloa Sri Lanka Islanders, located about 1,700 km (1,100 miles) from Sumatra, it was destroyed about 2 hours after the earthquake. Reports indicated that the tremors were not felt by the population. The tsunami first hit the east coast and then around the southern point of Sri Lanka (Dondra Head). Collapsed tsunami waves flooded the southwestern part of Sri Lanka after some of its energy was reflected in the impact on the Maldives. The first tsunami waves initially caused a small flood (positive wave) that hit the coast of Sri Lanka. Moments later, the ocean floor was exposed to up to 1 km in places due to an insuch (negative wave), followed by a powerful second tsunami wave. The construction of sea walls and breakwaters has reduced the power of waves in some places. The largest outflow was 12.5 m and the flood distance was 390–1500 m in Yala. In Hambantota, the tsunami measured 11 m at the greatest distance of 2 km. Tsunami measurements along the coast of Sri Lanka are at 2.4-4.11 m (7 ft 10 in-13 ft 6 in). [70] Tsunami waves measured on the east coast ranged from 4.5 to 9 m in Pottuvil to Batticaloa at 2.6-5 m (8) in the northeast near Trincomalee and 4-5 m on the west coast from Moravia to Ambalangoda. Sri Lanka tsunami altitude test: 9 m in Koggala 6 m at Galle Harbour 4.8 m (16 ft) around galle coast 8.7 m (29 ft) in Nonagama 4.9 m (16 ft) in Weligama 4 m (13 ft) in Do dundaw 4.7 m at Ambalangoda 4.7 m at hikkaduwa fishing port 10 m in Kahawa 4.8 m (16 ft) in North Beach of Beruvala 6 m (20 ft) in Paiyagala A regular passenger train runs between Maradana and Matarata it was derailed and knocked over by a tsunami and has absorbed at least 1,700 deaths, the largest single fatality of a train crash in history. [72] Estimates based on the state of the coastline and the high water mark on a nearby building place a tsunami 7.5-9 m (25-30 feet) above sea level and 2-3 m (6 ft 7 in-9 ft 10 in) higher than the top of the train. In Sri Lanka, civilian casualties are second only to those in Indonesia. Sri Lanka's eastern coasts have been hardest hit since they face the epicenter of the earthquake. The southwestern shores were hit later, but the death toll was equally severe. The south-west shores are a flashpoint for tourists and fishing. Environmental degradation in Sri Lanka has contributed to a high number of deaths. About 90,000 buildings, many wooden houses, were destroyed. Thailand
Tsunami in 2004 passed through the Andaman Sea and hit the southwest coast of Thailand, which was located about 500 km from the epicenter. Many tourists were caught by the tsunami because they had not had Major tourist locations damaged include phuket's western coastline, Khao Lak resort in Phang Nga Province, Phi Phi Islands, Surin Islands and Similan Archipelago, coastal areas of Krabi Province, Satun, Ranong and Trang, and small coastal islands such as Ko Racha Yai. About 5,400 people were killed and 3,100 were reported missing. Khao Lak and others on the mainland of Thailand experienced the highest tsunami height outside Sumatra, in Khao Lak, which stands before the Andaman Sea. Tsunami height recorded:[74][75] The Thai navy was stuck almost 2 km inland 6–10 m in Khao Lak 3–6 m along the west coast of Phuket Island 3 m along the southern coast of Phuket Island 2 m along the east coast of Phuket 4–6 m at Phi Islands 19.6 m at Ban Thung Dap 5 m (16 ft) at Ramson 6.8 m (22 ft) at Ban Thale Nok 5 m (16 ft) at Hat Praphat (Ranong Coastal Resources Research Station) 6.3 m (21 ft) at Thai Mueang District 6.8 m (22 ft) at Rai Dan The province of Phang Nga was the most affected area in Thailand. The quiet resort of Khao Lak was hit by a tsunami about 2 hours after the earthquake and had the highest death toll in Thailand. The maximum flooding of about 2 km and flooded depth was 4-7 m in Khao Lak, flooded the third floor of the hotel. The height of the tsunami in Khao Lak was much higher than on phuket island. The reason for the difference seems to be caused by local bathymetry off Khao Lak. According to interviews, the leading wave caused an initial depression, called a tsunami defect or the effect of a disappearing sea, and the second wave was larger. [74] [site needed] The highest tsunami recorded was 19.6 m (64 ft) in Ban Thung Dap, at the southwestern tip of Ko Phra Thong Island, and the second highest at 15.8 m (52 ft) in Ban Nam Kim. [75] Phuket and other islands
Tsunami wave hitting the coast of Phuket
On Phuket Island affected many west coast beaches. In Patong Beach, a tourist mecca, the height of the tsunami was 5-6 m, and the flooded depth was about 2 m. The height of the tsunami fell from the west coast, the south coast to the east coast of the island. On Karon beach on the west coast, the coastal road was built higher than the shore, protecting the hotel that was behind it. On the east coast of Phuket island, the height of the tsunami was about 2 m. In an estuary of the river, many boats were damaged. The tsunami has seduced to the left around Phuket Island, as happened on Okushiri Island in the 1993 Hokkaido earthquake. According to interviews, the leading wave caused the initial depression, and the second wave was the largest. Phi Phi Islands are a group of small islands that were Tsunami. The northern bay of Phi Phi Don Island opens to the northwest in the direction of the tsunami. The measured height of the tsunami on this beach was 5.8 m. According to some eyewitness accounts, the tsunami came from the north and south. The ground level was about 2 m above sea level and there were many cottages and hotels. The southern bay opens to the southeast and stands in the opposite direction from the tsunami. In addition, Phi Phi Le Island is the port of Phi Phi Don Island. The measured tsunami height was 4.6 m in the port. India
Stumps and Debris Remain on Karaikal Beach
A Few Years After The 2004 Tsunami
The tsunami reached the states of Andhra Pradesh and Tamil Nadu along the southeast coast of the Indian Mainland shortly after 9:00 a.m. At least two hours later, it reached kerala state along the southwest coast. Tamil Nadu, the union territory of Pondicherry and Kerala were badly damaged, while Andhra Pradesh suffered moderate damage. There were two to five waves of different heights that coincided with the local high tide in some areas. [77] [78] [79] [80] The tsunami height measured in mainland India by the Ministry of the Interior includes: [80] 3.4 m (11 ft) in Kerala, a flood distance of 0.5 to

1.5 km (0.31 to 0.93 miles) at 250 km of coastline, impacted by 4.5 m (15 ft) on the south coast of Tamil Nadu, flooding distance 0.2–2 km (0.12–1.24 miles) at 1 00 km of coastline touched 5 m on the east coast of Tamil Nadu in the face of a tsunami flooding distance of 0.4–1.5 km (0.25–0.93 miles) at 800 km of coastline affected by 4 m in Pondichery, the flooding distance of 0.2–2 km (0.12–1.24 miles) at 25 km of coastline touched 2.2 m (7.2 ft) in Andhra Pradesh, the distance from 0.2 to 1 km (0.12–0.62 miles) from the 985 km coastline touched Tamil Nadu and Puducherry Tsunami. 6 m in areas in the state of Tamil Nadu, sheltered by the island of Sri Lanka, but was located 4-5 m in coastal districts such as Nagapattinam in Tamil Nadu, opposite Sumatra. On the west coast, runup elevations were 4.5 meters (15 feet) in the Kanyakumari District in Tamil Nadu and 3.4 meters (11 feet) each in Kollam and Ernakulam counties in Kerala. The time between the waves ranged from about 15 minutes to 90 minutes. [77] [79] The tsunami ranged from 2 m to 10 m based on survivors' reports, where 6,051 tsunami deaths were reported, followed by the Cuddalore district, where many villages were destroyed. 13 km Marina Beach in Chennai was battered by a tsunami that swept through the beach , taking in the morning Unaware. In addition, a 10 m (33 ft) black muddy tsunami ravaged the city of Karaikal, where 492 people died. The town of Pondichery, protected by sea walls was relatively unscathed. The effects of the tsunami varied significantly in different coastal areas depending on the number of waves experienced, the distance and height of the waves, and the population density of the area, as well as topological and geographical characteristics. Most of those killed are members of the fishing community. The tsunami traveled 2.5 km in Karaikal State in Puducherry. The distance of flooding ranged between 1006 and 500 m in most areas, except for the estuary, where it was more than 1 km. Areas with dense coconut groves or mangroves had much smaller flood distances, and those with estuaries or backwaters saw greater flood distances. [citation needed] The presence of sea walls on the coasts of Kerala and Tamil Nadu reduced the impact of waves. However, when the sea walls were made of loose stones, the stones were moved and transported a few meters inland. [77] [79] Others on the mainland of Kerala state suffered tsunami-related damage in three southern densely populated districts, Ernakulam, Alappuzha and Kollam, due to the diffraction of waves around Sri Lanka. However, the southernmost district of Thiruvananthapuram escaped damage, probably due to the wide circulation of scattered waves at the end of the peninsula. Serious damage occurred in two narrow strips of land bound in the west of the Arabian Sea and in the east by the backwaters of Kerala. Waves subsided before the first tsunami with the highest death toll reported from the densely populated Panchayath Alappad (including the villages of Cheriya Azhikkal and Azhikkal) in Kollam district, caused by a 4 m (13 ft) tsunami. Many villages in Andhra Pradesh state were destroyed. In the Krishna district, the tsunami wreaked havoc in Manginapudi and Machalipattanam beach. Prakasham District suffered the most, killing 35 people, with maximum injuries in Singraikonda. [80] Given the enormous force of the tsunami, the fishing industry has suffered the most. Moreover, the cost of damage to the transport sector has been reported in the tens of thousands. The Andaman islands and Nicobar Tsunami reached the Andaman and Nicobar Islands a few minutes after the earthquake, causing extensive damage to the island's environment. In particular, the Andaman Islands have been moderately affected, while the island of Little Andaman and the Nicobar Islands have been severely affected by the tsunami. A tsunami wave was conducted in Little Andaman, South Andaman, mainly in and around Port Blair, Car Nicobar along kankana-Mus and The Great Krishna. In South Andaman, based on local eyewitnesses, there were three tsunami waves. Of these three, the third was the most devastating. Flooding occurred on the coasts of islands and low-lying inland areas connected to the open sea by creeks. Flooding was observed along the east coast of South Andaman Island, limited to Chidiyapatay, Burmanallah, Kodiahang, Beadnabad, Corbyn's coves and Marina Park/Aberdeen Jetty. Flooding was observed along the west coast around guptapura, Manjeri, Wandoor, Collimpur and Tirur. Several nearby buildings and numerous infrastructures, such as the sea walls and bamboo flat 20 MW diesel power plant, have been severely damaged. [82] Results of a tsunami survey in South Andaman along Chiriyapatay, Corbyn's Cove and Wandoor beaches:[source needed] 5 m (16 ft) at maximum tsunami height with a run-up of 4.24 m (13.9 ft) at Chiri Beach, 5.5m (18ft) in maximum tsunami height and run-up at Corbyn's Cove Beach 6.6m (22ft) in maximum tsunami height and run-up 4.63m (15.2ft) at Wandoor Beach Meanwhile, in Little Andaman, Tsunami waves pounded the eastern shore of this island 25 to 30 minutes after the earthquake in a cycle of four waves, the fourth of which was the most destructive with a wave height of about 10 m (33 feet). Tsunami wave destroyed settlements in Hut Bay 1 km from the seashore. The level was measured up to 3.8 m. In Malacca, located on the island of Car Nicobar, there were three tsunami waves. The first wave came 5 minutes after the earthquake, preceded by a seawater recession of up to 600-700 m. [citation needed] The second and third waves appeared at intervals of 10 minutes after the first wave. The third wave was the strongest, with a maximum tsunami height of 11 m. Waves of nearly three floors high devastated the Indian Air Force base, located south of Malacca. Maximum tsunami height 11 m (36 ft). [citation needed] The flood limit was found to be up to 1.25 km inland. The impact of the waves was so strong that four IOC oil tankers were ejected nearly 800 m from the seashore near Malacca to the main gate of the air force colony. In Chukkuchucha and Lapat, the tsunami reached a cycle of three waves with a maximum tsunami height of 12 m. In Campbell Bay on Great Nicobar Island, tsunami waves hit the area three times with a flood limit of 250-500 m. The first wave came within 5 minutes of the earthquake. The second and third wave appeared at 10-minute intervals after the first. The second wave was the strongest. Deadly tsunami waves wreaked havoc in the densely populated Yogindrar Nagar area, located 13 km south of Campbell according to local information[attribution needed] tsunami waves attacked this area three times. The first wave came five minutes after mainshock (0629 hours) with a marginal drop in sea level. The second wave came 10 minutes after the first with a maximum height of 4.8 m and caused severe damage. The third wave came within 15 minutes after the second with a wave height. The maximum flood limit due to the tsunami was about 500 m. The most affected island in the Andaman & Nicobar network is Katchall Island, with 303 people confirmed dead and 4,354 missing out of a total of 5,312. However, in Hut Bay, Malacca and Campbell Bay, locations south of Port Blair, water levels rose by about 1-2m (3ft 3in-6ft 7in) from average sea level before the first wave crashed on land. [citation needed] Tsunami height reports:[86][87] 1.5 m in Diglipur and Rangat on North Andaman Island 8 m high at Campbell Bay on Great Nicobar Island 10–12 m (10–12 m). 33-39 feet high in Malacca (at Car Nicobar Island) and at Hut Bay on Little Andaman Island 3 m (9.8 ft) high at Port Blair on South Andaman Island Significant shielding of Port Blair and Campbell Bay by steep mountainous outcrops have contributed to relatively low wave heights in these places, while the open terrain along the east coast in Malacca and Hut Bay contributed to the high altitude of the tsunami waves. [84] The Maldives Tsunami severely affected the Maldives 2,500 km from the epicenter. As in Sri Lanka, the survivors reported three waves, and the second wave was the most powerful. Being rich in coral reefs, the Maldives gives scientists an opportunity to assess the impact of tsunamis on coral atolls. The much lower impact of the tsunami on the Maldives compared to Sri Lanka is mainly due to the topography and bathymetry of the atoll chain of marine coral reefs, the deep channels separating the individual atolls and its arrival at low tide, which reduced the power of the tsunami. After the tsunami, there were fears that the country could be completely submerged and become incompressible. However, this turned out to be untrue. The highest tsunami wave measured was 4 m on Vilufushi Island. The tsunami arrived about 2 hours after the earthquake. The largest tsunami occurred on the northern male island on male island at an altitude of 250 m along the streets. Maldivian tsunami wave analysis: 1.3–2.4 m on northern Male Atoll, 2 m on North Male Atoll, 1.7–2.8 m at South Male Atoll, Embudhu 2.5–3.3 m on Laamu Atoll, Fonadhoo Island 2.2–2.9 m at Laamu Atoll, Gan Island 2.3–3 m on northern atoll , Huraa Island over 1.5 m (4 ft 11 in) at North Male Atoll, Kuda Huraa Island Myanmar in Burma, tsunami caused only moderate damage that occurred between 2 and 5.5 hours after the earthquake. Although the west coast of the Andaman Sea lies near the crack zone, there were smaller tsunamis than the neighboring coast of Thailand, probably because the main source of the tsunami did not extend to the Andaman Islands. Another factor is that some of the coasts of the Tanintharyi Division were protected by the meyk archipelago. Based on scientific research conducted by delta Ayeeyarwady by the Tanintharyi Division, it turned out that the height of the tsunami along the coast of Myanmar is from 0.4 to 2.9 m. Eyewitnesses often compared the December tsunami heights with the rainy tide; although in most places the height of the tsunami was similar or lower than the level of the rainy high tide. [89] Tsunami study height:[source needed] 0.6–2.3 m in dawei region 0.7 m – 2.2 m around 1.5 m near Kawthung Interviews with local people indicate that they have not felt earthquakes in the Tanintharyi area or the Ayeayawaddy Delta. The 17 victims can be attributed to poor housing infrastructure and, moreover, to the fact that coastal residents in the areas surveyed live in flat areas along the coast, especially in the Ayeayawaddy Delta, and that there is no higher land to evacuate. The height of the tsunami since the December 2004 earthquake was not more than 3 m along the coast of Myanmar, the amplitude is slightly larger by the Ayeayawaddy Delta, probably because the shallow delta causes the concentration of tsunami energy. The Somalia Tsunami crossed 5,000 km west across the open ocean before hitting the North African country of Somalia. Some 289 deaths were reported in the Horn of Africa, drowned by four tsunami waves. The 650 km stretch of the Somali coast between Garacad (Mudug region) and Xaafuun (Bari region), which forms part of puntland province, suffered the most. Most of the casualties were reported along the low-lying Xaafuun Peninsula. The puntland coast in northern Somalia was by far the area most affected by waves west of the Indian subcontinent. The waves arrived around noon local time. [90] As a result, the tsunami altitude varies from 5 m to 9 m distance from 44 m to 704 m (2310 ft). The maximum rune height of almost 9 m was recorded in Bandarbayla. An even higher point of the shooting was measured on a cliff near the town of Eyl, only on eyewitness accounts. The highest number of fatalities were recorded in Hafun, where 19 people were killed and 160 people were reported missing from 5,000 inhabitants. This was the highest death toll in a single African city and the highest number of tsunami deaths in one city west of the Indian subcontinent. Small defects were observed in Xaafuun before the third and most powerful tsunami wave flooded the city. Other flood locations in George Town, Malaysia The Tsunami has also reached Malaysia, mainly in northern states such as Kedah, Perak and Penang, and on coastal islands such as Langkawi Island. The Malaysia peninsula was protected by the full force of the tsunami due to the protection offered by the island of Sumatra, which lies just off the west coast. Bangladesh avoided serious damage and fatalities because the water displaced by the impact fault was relatively small in the northern part of the crack zone, which cracked slowly. In Yemen, a tsunami killed two people with a maximum runoff of 2 m. Tsunamis have been detected in southern parts of eastern Africa, where rough seas have been reported, particularly on the east and south coasts that overlook the Indian Ocean. Several other African countries have also reported fatalities; one in Kenya, three in the Seychelles, ten in Tanzania and South Africa, where two died as a result of the tsunami - the furthest from the epicenter. [93] Tidal waves also occurred along australia's west coast, which lasted several hours, resulting in boats losing their moorings and two people had to be rescued. [95] Impact of affected countries Main Article: Countries affected by the 2004 Indian Ocean earthquake and tsunami Affected countries according to the U.S. Geological Survey, a total of 227,988 people died. [1] Measured in lost life, this is one of the ten worst earthquakes in history, as well as one of the worst tsunamis in history. The most affected area was Indonesia, where the majority of fatalities are estimated at around 170,000. The original report by Siti Fadiah Supari, Indonesia's Health Minister, estimated that there were as many as 220,000 deaths in Indonesia alone, totaling 280,000 deaths. However, the estimated number of dead and missing in Indonesia was later reduced by more than 50,000. In its report, the Tsunami Assessment Coalition said: It is important to remember that all such data is wrong, as missing persons data is not always as good as it might seem. [6] On the basis of reports from Thailand, a much higher number of deaths in Myanmar/Burma have been suggested. Tsunami serious injury deaths all the way to the east coast of Africa, with the most reported deaths directly attributed to the tsunami in Rofi-Elis, near Cape Town, 8,000 km (5,000 miles) from the epicenter. A total of eight people in South Africa died from high sea levels and waves. [citation needed] Aid agencies reported that a third of those killed appeared to be children. This was due to the high proportion of children in the populations of many affected regions and because children were least able to resist being overcome by rising waters. Often called that many as four times as many women were killed in some regions than men as they walked on the beach for fishermen to return and look after their children in their homes. [99] States of emergency have been declared in Sri Lanka, Indonesia and the Maldives. The United Nations at the outset estimated that the aid operation would be the costliest in human history. [citation needed] The then UN Secretary-General Kofi Annan said reconstruction was likely to take between five and ten years. Governments and NGOs feared that the final death toll could double as a result of disease, triggering a massive humanitarian response. [citation needed] In addition to the large number of inhabitants, up to 9000 foreign tourists (mainly Europeans) enjoying the peak holiday season of travel were among the dead or missing, especially people from the Nordic countries. Sweden suffered the most, with 543 fatalities. Germany was close behind with 539 identified victims. Affected country[s] Confirmed deaths Estimated number of deaths[6] Of Injured Missing Displaced Persons Ref Indonesia 130 736 167 540 37 063 500 000 [101] Sri Lanka 35 322[1] 31 415 516 150 [102] India 165 269 3 874 647 1 599 Thailand 5 395[6] 8 212 8 167 2 817 7 000 [100] 103[104] Somalia 78 289 50 00 [105][106] Myanmar 61, 400-600 45 200 3, 200 [98][107] Maldives 82,108 26 1 5000+ [108][109] Maldives 68 575 299 6 5000+ [110][111] Tanzania 10 13 [112] Seychelles 3 57 200 [113][114] Bangladesh 2 South Africa 2[6] 115 Yemen 2 2 [116] Kenya 1 2 [116] Madagascar 1000+ [117] Total estimates 184 167 22 7, 898 125 000 43,786 1,740,000+ * This table applies only to countries directly affected by the tsunami, and not to countries whose nationals have suffered while abroad.* Includes those reported in Confirmed. If separate estimates are not available, the number in this column is the same as that reported in Confirmed.* Does not include approximately 19,000 missing persons initially declared by the Tamil Tiger authorities from regions under their control.* The data includes at least 2,464 foreigners.*e This does not include South African citizens who have died outside Of South Africa (e.g. tourists in Thailand). Economic impact of Marina Beach Chennai after tsunami Damage level in the economy depends on the scale studied. While local economies were devastated, the overall impact on national economies was small. The two main occupations affected by the tsunami were fishing and tourism. [118] The impact on coastal fishing communities and the people living there, the poorest in the region, was devastating, as well as with high losses of income, as well as boats and fishing gear. [119] [120] In Sri Lanka, traditional fisheries, where fish baskets, fishing traps and spears are commonly used, is an important source of fish on local markets; industrial fishing is a major economic activity, providing direct employment for around 250 000 people. In recent years, the fishing industry has become a dynamic export-oriented sector, generating significant foreign exchange returns. Preliminary estimates indicate that 66% of the fishing fleet and industrial infrastructure in coastal regions have been destroyed by waves that will have negative economic impacts at both local and national level. While the tsunami destroyed many of the boats needed for Sri Lanka's fishing industry, it also created a demand for glass fibre reinforced plastic catamarans at Tamil shipyards. As more than 51,000 ships were lost due to the tsunami, the industry flourished. However, huge demand has led to a reduction in quality in this process, and some important materials have been devoted to lowering prices for those who have been depleted by the tsunami. [122] Some economists believe that the damage to the affected national economies will be small, as losses in the tourism and fisheries sectors represent a relatively small percentage of GDP. However, others warn that infrastructure damage is paramount. In some areas, drinking water supplies and farmland may have been contaminated with salt water from the ocean for years. [123] Although the tsunami waters directly affected only coastal regions, indirect effects also spread to inland provinces. Because the media reports about the event were so extensive, many tourists canceled holidays and trips to this part of the world, even though their destinations may not have been affected. This ripple effect can be especially felt in the inland provinces of Thailand, such as Krabi, which have acted as a starting point for many other tourist destinations in Thailand. Both the earthquake and the tsunami may have affected navigation in the Strait of Malacca, which separates Malaysia and the Indonesian island of Sumatra, altering the depth of the seabed and disrupting navigational fears and old shipwrecks. In one area of the strait, the water depth was previously up to 1200 m, and currently in some regions it was only 30 m, which prevented and was dangerous. These problems have also humanitarian aid has become more difficult. Compiling Compiles months or years. Officials, however, hope that piracy in the region will fall as a result of the tsunami. Countries in the region have called on tourists to return, pointing out that most of the tourist infrastructure is undamaged. However, tourists were reluctant to do so for psychological reasons. Even beach resorts in parts of Thailand, which were untouched by the tsunami, have been affected by cancellations. [126] The environmental impact of the tsunami flooding in Khao Lak, Thailand in addition to the beach, destroyed the lives of the 89 people in the inland area, which had caused a high environmental impact that will affect the region for many years to come. For example, coral reefs, coastal wetlands, vegetation, dunes and rock formations, animal and plant biodiversity and groundwater. In addition, the spread of solid and liquid waste and industrial chemicals, water pollution and the destruction of waste water collectors and treatment plants threaten the environment even further, in an unspesakable way. The environmental impact assessment will take a long time and considerable resources. [127] According to experts, the main effect is the poisoning of fresh water and soil resources by the penetration of salt water and sediment of the salt layer on arable land. It has been reported that in the Maldives, 16 to 17 coral reef atolls that have been overcome by sea waves are without fresh water and may be considered uninhabitable for decades. Countless wells that served communities were attacked by the sea, sand and land; and aquifers were attacked by a porous rock. Salted soil becomes sterile, and restoring it is difficult and costly for agriculture. It also causes the death of plants and important soil microorganisms. Thousands of rice, mango and banana plantations in Sri Lanka have been almost completely destroyed and will take many years to recover. On the east coast of the island tsunami tainted wells, on which many residents relied on drinking water. The Colombo-based International Institute of Water Management monitored the operation of salt water and concluded that wells recovered to drinking water quality before the tsunami a year and a half after the event. [128] IWMH has developed protocols for cleaning wells contaminated with salt water; they were subsequently officially approved by the World Health Organisation as part of a series of emergency guidelines. [129] The United Nations Environment Programme (UNEP) worked with the governments of the region to determine the severity of the environmental impact and how it is resolved. [requires update] [130] UNEP has decided to retract the USD 1 million crisis fund and to set up a task force in response to requests for technical assistance from tsunami-affected countries. In response to a request from the Maldives The Australian government has sent humanitarian supplies to help restore marine environments and coral reefs, the driving force behind Maldivian tourism. Much of the ecological knowledge has been brought out of working with the Great Barrier Reef, in the north-eastern waters of Australia. Historical context See also: Library damage resulting from the 2004 Indian Ocean earthquake 200418332005186120071797 Of the ten strongest Indonesian earthquakes ≈ 8.3 Mw, six occurred near Sumatra The last major tsunami in the Indian Ocean was around 1400 [132] In 2008, a team of scientists working on Phra Thong, a barrier island along Thailand's hard-hit west coast, reported evidence of at least three previous major tsunamis in the past 2,800 years , the last one about 700 years ago. The second team found similar evidence of a previous tsunami in Aceh, a province on the northern tip of Sumatra; Radiocarbon dating of bark fragments in soil below the second layer of sand led scientists to estimate that the last predecessor of the 2004 tsunami was likely between 1300 and 1450 1300 and 1450. The 2004 earthquake and tsunami are the deadliest natural disaster in the world since the Tangshan earthquake in 1976. The earthquake was the third most powerful earthquake recorded since 1900. The deadliest known earthquake in history occurred in 1556 in Shaanxi, China, with an estimated death toll of 830,000, though data from that period may not be as reliable. Before 2004, the tsunami induced in both indian and Pacific waters by the Krakatoa eruption in 1883, which probably killed between 36,000 and 120,000 people, was probably the deadliest in the region. In 1782, about 40,000 people are believed to have been killed by a tsunami (or cyclone) in the South China Sea. The deadliest tsunami before 2004 was an earthquake in Italy in 1908 in the Mediterranean Sea, where an earthquake and tsunami killed about 123,000 people. Other effects of the tsunami in Aceh, Indonesia Many health workers and aid workers have reported widespread psychological injuries associated with the tsunami. Traditional beliefs in many affected regions state that a relative of the family must bury the body of the dead, and in many cases no body remains to be buried. The women in Aceh required a special approach from foreign aid agencies and still have exceptional needs. [citation needed] The most affected area, Aceh, is a religiously conservative Islamic society and has had no tourism or western presence in recent years due to the insurgency between the Indonesian military and the Aceh Free Movement (GAM). Some believe that the tsunami was a divine punishment for secular Muslims their prayers or after a materialistic lifestyle. Others said that God was angry that Muslims were killing each other during the ongoing conflict. [138] [138] Cleric Muhammad Al-Munajjid attributed this to divine retaliation against non-Muslim holidaymakers who once swam on beaches and in wine-filled pubs during Christmas trees. The widespread denial caused by the tsunami led to the announcement of a ceasefire by gam on 29 December 2004, followed by the Indonesian Government, and the two groups resumed the long-running peace talks that led to the peace agreement signed on 15 August 2005. Another cleric publicly mentioned the tsunami as a justification. [140] In a survey of 27 countries, 63% of respondents believed the tsunami is the most important event of the year. Only the war in Iraq has been named by the international media reports on the tsunami and the role of media and journalists in reconstruction were discussed by newspaper and media editors in tsunami-affected areas, in special video conferences set up by the Asia-Pacific Journalism Centre. The tsunami has left both the nation and the Indian government in a state of heightened alarm. On December 30, 2004, four days after the tsunami, Terra Research notified the GOI that its sensors indicated that there was a possibility of a tectonic change of magnitude 7.9 to 8.1 over the next 12 hours between Sumatra and New Zealand. In response, india's interior minister announced that there was likely a renewed deadly tsunami attack on the southern coast of India and the Andaman and Nicobar Islands, even if there were no signs of turbulence in the region. The announcement caused panic in the Indian Ocean region and caused thousands of people to leave their homes, causing blocked roads. The announcement was a false alarm and the Interior Minister withdrew his statement. [144] Following further investigation, the GOI learned that the consulting firm Terra Research had been run from the home of an earthquake forecaster it described, which had no telephone list and ran a website where it sold copies of its detection system. Patong Beach in Thailand after the Tsunami tsunami had serious humanitarian and political consequences in Sweden. The most affected country outside Asia, Sweden, lost 543 tourists, mainly in Thailand. Person's cabinet was heavily criticized for his inaction. [citation needed] Smith Dharmasaroja, a meteorologist who predicted that an earthquake and tsunami would occur in 1994.[147][148] was assigned to develop the Thai tsunami warning system. In early 2005, a tsunami warning system was set up in the Indian Ocean to provide early tsunami warnings for residents around the Indian Ocean coast. Changes in the distribution of masses inside the Earth due to the earthquake had several consequences. It will move the North Pole by 25 mm. It has also changed the shape of the Earth, in particular by reducing the earth's depth by about one part in 10 billion, consequently increasing the rotation of the Earth a little, thereby shortening the length of the day by 2.68 microseconds. [150] Humanitarian response Main article: Humanitarian response to the 2004 Indian Ocean earthquake German tsunami relief mission In Mullaitivu in northern Sri Lanka A large amount of humanitarian aid was needed due to extensive infrastructure damage, food and water shortages and economic damage. Epidemics were particularly worrying due to the high population density and tropical climate of the affected areas. The main problem for humanitarian and government agencies was to provide sanitation and fresh drinking water to stop the spread of diseases such as cholera, diphtheria, dysentery, typhoid and hepatitis A, and hepatitis B. There was also great concern that the death toll could increase with the spread of disease and hunger. However, due to the initial rapid response, this has been minimized. In the days after the tsunami, considerable efforts were made to bury bodies for fear of spreading the disease. However, public health risks may have been exaggerated and therefore this was not the best way to allocate resources. The World Food Programme has provided food aid to more than 1.3 million people affected by the tsunami. [152] Further information: Health risks from dead bodies Nations worldwide provided more than USD 14 billion in aid to devastated regions[153], and Australian governments pledged USD 819.9 million (including a \$760.6 million aid package for Indonesia), Germany offered USD 660 million, Japan offers \$500 million, Canada offers \$343 million, Norway and the Netherlands offer both \$183 million , the United States initially offered \$35 million (up to \$350 million) and the World Bank offered \$250 million. In addition, Italy offered US\$95 million, later increased to \$113 million, of which \$42 million was donated by the population via the SMS system [154] Memorial dedicated to tsunami victims, Batticaloa, in Sri Lanka According to USAID, the U.S. has committed additional funds in long-term U.S. support to help tsunami victims rebuild their lives. On February 9, 2005, President Bush asked Congress to increase the U.S. commitment to \$950 million. Officials estimated that billions of dollars would be needed. Bush also asked his father, former President George H. W. Bush and former President Bill Clinton, to lead U.S. efforts to provide private assistance to tsunami victims. In mid-March, the Asian Development Bank reported that government-promised aid of more than \$4 billion had been delayed. Sri Lanka that they had not received any foreign government assistance while foreigners were generous. [156] Many World received significant donations from the public. In the UK, for example, the public donated around 330 million pounds (nearly \$600 million). This far exceeded the government's allocation of £75 million in disaster relief and reconstruction. [157] [158] In August 2006, fifteen local workers working in a rebuild after a tsunami was found made in northern Sri Lanka after heavy fighting, the country's main umbrella body for aid agencies said. In Popular Culture. Children of Tsunami: No More Tears (2005), the 24-minute documentary The Wave That Shook The World (2005), an educational documentary series about tsunami Tsunami: The Aftermath (2006), a two-part TV miniseries about its aftermath (2010), and The Life of the Main Character has an impact on life after surviving a tsunami while vacationing Hafslan Shalat Delisa (2011), the Indonesian film Impossible (2012), an English-language Spanish film based on the story of María Belón and her kayal family (2014), a Tamil dramatic film culminating in a work of Literature Paint the Sky with Stars, Selected Poetry in Remembrance of the Boxing Day Tsunami 2004 (2005) edited by Stephen Robert Kuta [160] The Killing Sea (2006), two teenagers struggling to survive in the days after tsunami Wave (2013), diary of Sonali Deraniyagala Music 12/26 Kimiya Dawson , about this event and humanitarian efforts, from the perspective of the victim whose family died in the disaster See also Death in December 2004 – famous people killed in the 2004 Tsunami List of earthquakes in 2004. List of earthquakes in Japan List of natural disasters by number of fatalities List of earthquakes List of conspiracy theories Reference ^ a b c d e Magnitude 9.1 - Off the West Coast of Sumatra, U.S. Geological Survey. Archived from the original on 17 August 2012 Accessed August 26, 2012 . ^ Satake, K.; Atwater, B. (2007). Long-term prospects for giant earthquakes and tsunamis in subduction zones (PDF), annual review of earth and planetary sciences, annual reviews, 35 (1): 351. Bibcode:2007AREPS...35..349S..D. doi:10.1146/annurev.earth.35.031306.140302 ^ Astonishing wave heights among the findings of the Indian Ocean Tsunami Research Team in Sumatra. U.S. Geological Survey. Accessed June 16, 2016 . ^ a b Paris, R.; Lavigne, F.; Wassmer P.; Sartohadi J. (2007). Coastal sedimentation related to the tsunami de 26 December 2004 in Lhoknga, western Banda Aceh (Sumatra, Indonesia). Marine Geology: Elsevier. 238 (1–4): 93–106. Bibcode:2007MGeol.238...93P..D. doi:10.1016/j.margeo.2006.12.009 . ^ a b C. Paris, Raphael; Cachão, Mário; Fournier, Jérôme; Voldoire, Olivier (April 1, 2010). Broths of abundance and in tsunamis: december exemplar tsunami in Lhok Nga (northwest Sumatra, Indonesia). Géomorphologie : Relief, Processus, Environnement. 16 (1): 109–118. doi:10.4000/geomorphology.7865 . ^ a b Joint assessment of the international response to the Indian Ocean tsunami: Synthesis Report (PDF). Tech. July 2006 Archived from the original (PDF) on 25 August 2006 Accessed July 9, 2018 . ^ Earthquakes with 50,000 or more deaths. U.S. Geological Survey. Archived from the original on June 5, 2013 (Indian Ocean Tsunami Anniversary: Commemorative reviews. BBC News. 26 December 2014 Accessed December 15, 2016 . ^ Indian Ocean tsunami—economic aspects. indianoceansunami.web.unc.edu . ^ Lay, T.; Kanamori, H.; Ammon, C.; Nettle, M.; Ward, S.; Aster, R.; Beck, S.; Bilek, S.; Brudzinski, M.; Butler, R.; DeShon, H.; Ekström, G.; Satake, K.; Sipkin, S. (May 20, 2005). The Great Sumatra-Andaman Earthquake of 26 December 2004 (PDF). Science. 308 (5725): 1127–1133. Bibcode:2005Sci...308.1127L..D. doi:10.1126/science.1112250. PMID 15905392. S2CID 43739943 . ^ Tsunami and Earthquakes: Tsunami Generation of the 2004 Sumatra Earthquake – USGS Western Coastal and Marine Geology. Walrus.w.usgs.gov. Accessed August 12, 2010 . ^ Analysis of the Sumatra-Andaman Earthquake Reveals Longest Fault Rupture Ever. National Science Foundation. 19 May 2005 Accessed December 15, 2016 . ^ Walton, Marsha (May 20, 2005). Scientists: Sumatra quake longest ever recorded. Cnn. Accessed December 15, 2016 . ^ West, Michael; Sanchez, John J.; McNutt, Stephen R. (May 20, 2005). Periodically triggered seisim in Mount Wrangell, Alaska, after an earthquake in Sumatra. Science. 308 (5725): 1144–1146. Bibcode:2005Sci...308.1144W..D. doi:10.1126/science.112462. PMID 15905395. S2CID 27869948 . ^ a b Nalbant, Süleyman S.; Steacy, Sandy; Sieh, Kerry; Nantawadja, Danny; McCloskey, John (June 9, 2005). Seismology: The risk of an earthquake in the Sundra trench (PDF). Nature. 435 (7043): 756–757. Bibcode:2005Natur.435..756N..D. doi:10.1038/nature.435756a. PMID 15944691. S2CID 43217396. Archived from the original (PDF) on 19 May 2009 Accessed May 16, 2009 . ^ Jayasuriya, Sisira; McCawley, Peter (2010). Asian tsunami: disaster relief and reconstruction. Cheltenham United Kingdom and Northampton MA: Edward Elgar. ISBN 978-1-84844-692-2. Archived from the original on 22 July 2011 Accessed December 6, 2010 . ^ McKee, Maggie (February 9, 2005). The strength of the tsunami earthquake is greatly underestimated. New scientist. Archived from the original on 27 February 2005 . eERI Publication 2006-2006, page 14 . ^ Løvhold, F.; et al. Earthquake-related tsunami tsbren along the west coast of Thailand (PDF). Natural hazards and earth system science. 6 (6): 979–997. 6. 979L. doi:10.5194/nhess-6-979-2006. doi:11250/2426113. Bibuet, J., et al. On 26 December 2004, the Great Earthquake: scythe and post-seismic movements in northern Sumatra (PDF). Earth and Planetary Science Letters. 263 (1–2): 85–103. doi:10.1016/j.epsl.2005.09.015. Archived from the original (PDF) on 19 May 2009 Accessed May 16, 2009 . ^ Fialle, M. (2007). The Great Earthquake of 26 December 2004. Archived from the original (PDF) on 19 May 2009 Accessed May 16, 2009 . ^ "The Great Earthquake of 26 December 2004". Archived from the original on 12 October 2007 . ^ Billham, Roger (May 20, 2005). Flying start, then slow glide. Science. 308 (5725): 1126–1127. Bibcode:2005Sci...308.1126B..D. doi:10.1126/science.1133663. PMID 15905391. S2CID 30721065 . ^ USGS (July 22, 2010). North Sumatra earthquake poster of 28 March 2005 – magnitude 8.7. Archived from the original on 14 May 2011 Accessed June 26, 2011 . ^ Sumatra shocked by new earthquake. BBC News. 10 April 2005 Accessed December 24, 2012 . ^ USGS Earthquake Hazard Program: FAQ. Earthquake.usgs.gov 30 December 2012 Archived from the original on 20 November 2014 Accessed December 24, 2012 . ^ Magnitude 9.1 Earthquake in Sumatra and Andaman Islands FAQ ^ Magnitude 9.1 Sumatra-Andaman Shakes Earthquake FAQ. UBCS. 29 December 2014 Archived from the original on 13 December 2014 Accessed January 6, 2015 . ^ Rinaldo, Aditya (April 12, 2005). Thousands feel as an Indonesian volcano comes to life. Hindustan Times. Archived from the original on February 17, 2006 . ^ Eileen Ng (October 3, 2018). The volcano erupts on the same Indonesian island as the earlier earthquake. Associated Press. Danny Hillman Natavidiyaja, geologist at the Indonesian Institute of Science... he cited an example of the eruption of Mount Talang volcano in the Indonesian province of Sumatra in April 2005, which geologists believe was linked to the devastating Earthquake in the Indian Ocean in December 2004 and the tsunami. ^ A volcano in Indonesian Sumatra erupts. ABC News. 11 April 2005 Archived from the original on September 19, 2005 . ^ USGS Energy and Broadband Solution, National Earthquake Information Center, U.S. Geological Survey. Archived from the original on 4 April 2010 Accessed August 12, 2010 . ^ USGS, Harvard Moment Tensor Solution. National Earthquake Information Center, U.S. Geological Survey. 26 December 2004 Archived from the original on 17 January 2010 Accessed August 12, 2010 . ^ USGS:Measuring the magnitude of earthquakes. Earthquake.usgs.gov 27 October 2009 Archived from the original on 1 September 2009 August 12th, 2010 . ^ Virtanen, Heikki (2006). Study the dynamics of the earth using a superconducting gravimeter (PDF) (Dissertation). University of Helsinki. Archived from the original (PDF) on 5, 2011 Accessed September 21, 2009 . ^ Cook-Anderson, Gretchen; Beasley Beasley (10 January 2005). NASA Details The Effects of Earthquakes on Earth (Press Release). Nasa. Accessed December 16, 2016 . ^ Schechner, Sam. Earthquakes vs. Earth rotation. Science. December 27, 2004 . ^ Italian scientists claim that Asian quakes cause the Earth's axis to shift. Xinhua. 29 December 2004 Archived from the original on July 5, 2009 . ^ Staff Writer (January 31, 2005). The quake moved Sumatra by just 20 centimetres: Danish scientists. Agence France-Presse. ^ Bagla, Pallava (January 28, 2005). On the ground he moved. Learning now. Accessed December 16, 2016 . ^ Knight, Will (February 10, 2005). Asian seabed tsunami pictued with sonar. New scientist. Archived from the original on February 27, 2005 . ^ NASA/French Satellite Data Reveal New Details of Tsunami. Jet Propulsion Laboratory/NASA. 11 January 2005 Archived from the original on 5 March 2016 Accessed December 16, 2016 . ^ Topex/Poseidon Satellite Data on 26 December 2004 tsunami in the Indian Ocean. Aviso. Archived from the original on June 24, 2011 . ^ Lorca, Emilio; Recabarren, Margot (1997). Earthquake and tsunamis: High schools textbook (PDF). Accessed December 16, 2016 . ^ Leslie, John (January 10, 2005). Noaa Scientists able to measure the height of a tsunami in space. NOAA magazine. National Oceanic and Atmospheric Administration. Accessed December 16, 2016 . ^ McKee, Maggie (January 6, 2005). Radar satellites capture the height of a tsunami wave. New scientist. Archived from the original on September 24, 2008 . ^ Pearce, Fred; Holmes, Bob (January 15, 2005). Tsunami: The effects will continue for decades. New scientist. Archived from the original on April 17, 2008 . ^ Tsunami Travel Map. Tsunami Laboratory, Novosibirsk, Russia. Archived from the original on 3 April 2012 Accessed July 20, 2012 . ^ Time travel map: Active Fault Research Center: National Institute of Advanced Industrial Science and Technology, Japan. Staff.aist.go.jp. Archived from the original on 17 July 2012 Accessed December 24, 2012 . ^ Tsunami in the Indian Ocean at Syowa Station in Antarctica. Hydrographic and Oceanographic Department of the Coast Guard of Japan. Accessed December 17, 2016 . ^ Indian Ocean Tsunami of December 26, 2004, West Coast/Alaska Tsunami Warning Center (USGS). 31 December 2004 Archived from the original on February 4, 2016 . ^ Carey, Bjorn (August 20, 2005). Indian Ocean Tsunami Waves Channeled Around the Globe in the 2004 Disaster. LiveScience. Accessed December 17, 2016 . ^ Tsunami impact on the East Coast of Australia. Australian Geographic. Accessed March 27, 2016 . ^ Block, Melissa (December 27, 2004). Los Angeles are searching for lost relatives after the tsunami. All things taken account. E. g. Accessed December 20, 2016 . ^ Campbell, Matthew; Loveland, Keith; et al. Tsunami disaster. Focus: Nature's timebomb. Times January 9, 2005 . ^ A girl, 10 years old, used a geography lesson to save her life. Cable, London . 1 January 2005 Accessed December 20, 2016 . ^ Subir Bhattacharya (30 April 2005). Andaman's fate is unclear. BBC News. Accessed February 13, 2010 . ^ Gupta, Manu; Sharma, Anshu (2006). Compounded losses: the experience of recovering from the tsunami in Indian island communities. Disaster prevention and management. 15 (4): 67–76. doi:10.1108/09653560610654448 . ^ Mathematics, Suresh Bada; Girmaji, I.; Satish Chandra, Bengal; V. Udhay Kumar, GS; Hamza, A.; Nagaraja, D (2006). Tsunami: Psychosocial aspects of the Andaman and Nicobar islands. Evaluations and interventions at an early stage. International Psychiatry Review. 18 (3): 233–239. doi:10.1080/001054060600656001. PMID 16753660. S2CID 10258905 . ^ Bhaumik, Subir (January 20, 2005). Tsunami folklore revealed the islands' BBC News. Accessed December 20, 2016 . ^ Borrero, Jose C. (February 9, 2005). Field Survey of Northern Sumatra and Banda Aceh, Indonesia and after the tsunami and earthquake of 26 December 2004 (PDF). Los Angeles: Faculty of Civil Engineering, University of Southern California. Accessed December 20, 2016 . ^ a b Chapter 2 Earthquake, Tsunami and Damage in Banda Aceh and Northern Sumatra (PDF). tsunami.civil.tohoku.ac.jp. Accessed December 20, 2016 . ^ a b Borrero, Jose C.; Synolakis, Costas E.; Fritz, Hermann (June 2006). Northern Sumatra Field Survey after the December 2004 Sumatra earthquake and the Indian Ocean tsunami (PDF). The spectre of an earthquake. Earthquake Engineering Research Institute. 22 (S3): 93-104. doi:10.1193/1.2207193. S2CID 109582188 . ^ Borrero, Jose C. (10 June, 2005). Field Data and Satellite Imagery of Tsunami Effects in Banda Aceh. Science. 308 (5728). 1596. doi:10.1126/science.1110957. ISSN 0036-8075. PMID 15947180. S2CID 9702107. ^ Kagnet Mera (January 25, 2016). Seconds From Disaster S03E13 Asian Tsunami (video) - via YouTube. ^ red21khrer (November 30, 2008). Great Tsunami 12-26-04 in Banda Aceh, Sumatra, Indonesia 3 of 3 (Video) - via YouTube . ^ geoffmalkin (November 19, 2009). Boxing Day Tsunami Banda Aceh 4 of 4 (Video) - via YouTube . ^ Yalciner, A. C.; Perincek, C.; Ersoy, S.; Prasetya, G.; Hidayat, R.; McDood, B. (2005). Report on December 26, 2004, Indian Ocean Tsunami, Field Survey on Jan 21-31 at North of Sumatra (PDF). ITST UNESCO IOC. Archived from original (PDF) on October 10, 2016 Accessed December 20, 2016 . ^ Tsunami Wave Run-up: Indian Ocean – 2004. Science on the realm. National Oceanic and Atmospheric Administration. Accessed December 20, 2016 . ^ Goff, James (2009). Indian Ocean tsunami survey of December 26, 2004 in Sri Lanka (PDF). New Zealand Society of Earthquake Engineering. Accessed March 10, 2016 . ^ a b Goff, James; et al. Sri Lanka Field Survey after the Indian Ocean tsunami in December 2004. The spectre of an earthquake. 22 (S3): 155-172. doi:10.1193/1.2205987. S2CID 220297852 . ^ 40235.pdf . ^ Liu, P.-F. (1 July 2005), by the International Tsunami Research Team in Sri Lanka. Science. 308 (5728): 1595. doi:10.1126/science.1110730. PMID 15947179. S2CID 11312069 . ^ a b Helgeson, T. J. (Spring 2005). Tsunami disaster in Sri Lanka. Waves of devastation. University of Wisconsin-Eau Claire. Archived from the original on 17 June 2008 . ^ a b c Chapter 4: Field study and numerical simulation on the 2004 Sumatra earthquake and tsunami (PDF). Tohoku University. ^ a b Tsuji, Yoshihito; et al. Indian tsunami in Thailand in 2004: surveyed increases and records of tidal meter (PDF). Space Planet Earth. 58 (2): 223–23