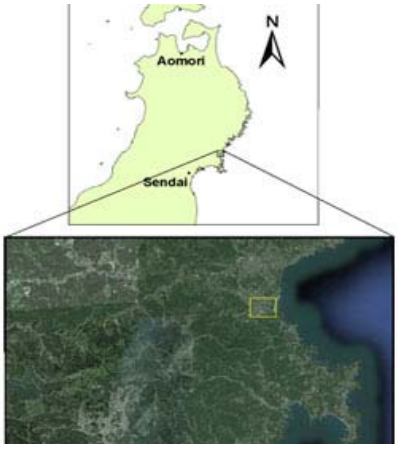
Japan Earthquake and Tsunami



The Earthquake

Magnitue: 8.9
Date-Time: Friday, March 11, 2011 at 2:46:23 PM at the epicenter
Location: 38.322 N, 142.369 E
Depth: 24.5 km (15.2 miles)
Region: Near the east coast of Honsshu, Japan
Major impact: City of Sendai
Distances: 130 km (80 miles) E of Sendai, Honshu, Japan
373 km (231 miles) NE Tokyo, Japan

The March 11, 2011 earthquake (preliminary magnitude 8.9) near the east coast of Honshu, Japan, occurred as a result of thrust faulting on or near the subduction zone interface plate boundary between the Pacific and North America plates. The Pacific plate thrusts underneath Japan at the Japan Trench, and at the latitude of this earthquake, the Pacific plate moves approximately westwards with respect to the North America plate at a velocity of 83 mm/yr. The location, depth, and focal mechanism of the March 11th earthquake are consistent with the event occurring as thrust faulting associated with subduction along the plate boundary.

The March 11th earthquake was preceded by a series of large foreshocks over the previous two days, beginning on March 9th with an M 7.2 event approximately 40 km from the March 11th earthquake, and continuing with a further three (3) earthquakes greater than M 6 on the same day.

The Japan Trench subduction zone has hosted nine (9) events of magnitude seven (7) or greater since 1973. The largest of these was an M 7.8 earthquake approximately 260 km to the north of the March 11th event, in December 1994, which caused three (3) fatalities and almost 700 injuries.

Early Reports of Tsunamis Resulting from the Earthquake

A Tsunami is a series of long ocean waves resulting from earthquakes occurring below the seafloor; however, the first wave may not be the largest. Each individual wave crest can last from five minutes to an hour and can extensively flood coastal areas. The danger can continue for many hours after the initial wave as subsequent waves arrive. Debris picked up and carried by a tsunami increases its destructive power.

The result of the March 11, 2011 earthquake triggered a serious tsunami that impacted the western coast of Japan. The tsunami and earthquake caused fires, blackouts, and flooding several miles inland. The waves reached maximum heights of over 3m (10 ft.) and swept people, vehicles, buildings, and debris inland, then as the waves receded, out to sea. Tsunami waves of 3 to 6 feet high were reported eight (8) hours after the earthquake in Hawaii. The Worldview 1 panchromatic images show the area of Rikuzun-Koizumi, Miyagi, Japan on March 11, 2011, and March 14, 2011.

Interpretive Learning…

1. What is the relationship between a subsea earthquake and a tsunami?
2. Identify the damage observed between the pre-tsunami and post-tsunami images.
3. If the tsunami wave traveled approximately 8 hours from the epicenter near Japan to the islands of Hawaii, approximately 3,680 miles, what was the speed of the tsunami wave across the Pacific Ocean? At that speed how many minutes of warning did the City of Sendai (approx. 1 million people) have between feeling the earthquake and the tsunami reaching the city?

[Answers: within the discussion section of CNL World's facebook page as well as at icearth.cnlworld.org]

Sources:

Preliminary Earthquake Report: US Geological Survey, National Information Center: World Data Center for Seismology, Denver Earth Summary. Available at: *earthquake.usgs.gov earthquakes*
NOAA's National Weather Service: Pacific Tsunami Warning Center. Available at: *http://ptwc.weather.gov/*
Images from the USGS International Charter Space and Major Disasters website at: *http://www.disasterscharter.org*

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