

# Tsunami Online Extra Credit Assignment

**Introduction:** On December 26, 2004, Mother Nature handed an ugly and tragic Christmas present to the people of southeast Asia. On that day, the largest earthquake in decades ripped loose along a subduction zone west of the island of Sumatra in the Indian Ocean. The quake shifted the seabed to heave up a wave of water that, over the course of the next seven hours, would wipe out thousands of miles of coastline throughout the Indian Ocean and ultimately take some 232,000 lives. The so-called “Christmas Tsunami” of 2004 is by far the greatest natural disaster of modern times. It was caused by a single spasm of plate tectonic movement—one jump in the ever-active system of the earth’s moving plates. A very similar earthquake/tsunami event occurred along the Japan coast on March 10, 2011.

**Assignment Directions:** Your assignment this week is to learn about tsunamis. The assignment has three parts and is worth a maximum of 5 points.

**Part A)** How do tsunamis form, what are their wave characteristics, and how in particular the Sumatra tsunami formed?

**Part B)** What are threats of tsunami to the west coast of North America, in terms of where, the generation mechanism, and how massive?

**Part C)** What are the latest developments in tsunami warning systems—systems that (hopefully) will prevent a Sumatra-scale disaster happen to San Diego, Los Angeles, San Francisco, Portland or Seattle.

## Project Resources:

For the assignment, first go over the tsunami slide show [http://www.oceansci.com/ocean\\_pres9.htm](http://www.oceansci.com/ocean_pres9.htm) and lecture notes [http://www.oceansci.com/ocean120\\_lec10\\_dis.htm](http://www.oceansci.com/ocean120_lec10_dis.htm) found on our classroom website,

Then I recommend two excellent tsunami websites -- sites that will give you many links to clear and accurate tsunami information on the Internet. It’s your job to navigate through these sites to find the information you need to complete the assignment. Have fun!

United States Geological Survey (USGS) Tsunami site:  
<http://walrus.wr.usgs.gov/tsunami/index.html>

National Oceanographic & Atmospheric Administration (NOAA) Tsunami site:  
<http://www.noaa.gov/tsunamis.html>

Use the attached worksheet below for handwriting your answers to Parts A, B and C. This handout is also found on this website at [http://www.oceansci.com/tsunami\\_online\\_ws.htm](http://www.oceansci.com/tsunami_online_ws.htm), Make a Word.doc copy, and type your answers into the worksheet and save it as a doc file for printing and turning in. You may also e-mail the completed worksheet as an attached doc.file to me. As always, please keep in mind my [plagiarism policy](#). Thank you!

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## Step-by-Step Instructions for Parts A, B, and C

### **PART A. Tsunamis, Plate Tectonics and Sumatra (2 points)**

Begin by clicking the like below to play a cool animation of tsunami formation and propagation. This animation should play within your web browser (Explorer or Communicator). Once it downloads, press the 'play' arrow at the bottom left to play the animation: Prentice-Hall Tsunami Animation  
[http://esminfo.prenhall.com/science/geoanimations/animations/86\\_Tsunami.html](http://esminfo.prenhall.com/science/geoanimations/animations/86_Tsunami.html)

Note: if for some reason you can't play the animation, use your textbook. After this, use the internet links above to learn about the specific plate tectonic setting of the Sumatra tsunami of December 26, 2004.

**Directions:** In a couple short paragraphs, describe **1)** the various ways that tsunamis form, **2)** the characteristics of tsunami waves in the deep open ocean and **3)** how tsunami waves change going from deep water into shallow water (shoaling). **4)** Finally, briefly explain how the Sumatra tsunami formed, and what its affects were along shorelines in the Indian Ocean. Be sure to identify the tectonic plates involved, and describe their interaction to cause the tsunami.

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## **PART B. Tsunami Threats to the West Coast of North America (1.5 points)**

Navigate the USGS and NOAA sites to find information about tsunami threats to the U.S. west coast.

**Directions:** In a several short paragraphs answer the following questions: **1)** How vulnerable is the U.S. west coast to tsunamis and why? **2)** Which areas of the west coast have the greatest vulnerability, and why?; and **3)** Where are these tsunami being generated? Make sure to mention both, the northwestern US seaboard, and the California coast. Note that tsunami can be generated both locally and from far away. (Hint: find out about the evidence of past tsunamis striking the west coast, and the Cascadian Subduction Zone.)

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## **PART C. The DART System (1.5 points)**

Use the links below to learn about DART.

Pacific Marine Environmental Laboratory

<http://www.pmel.noaa.gov/tsunami/Dart>

National Buoy Data Center: Deep-ocean Assessment and Reporting of Tsunamis

<http://www.ndbc.noaa.gov/Dart/dart.shtml>

**Directions:** In several short paragraphs, describe and explain the DART system. Make sure to **1)** Describe the physical components, and the function of each of the components; **2)** How is the system deployed worldwide, and where are they deployed, and **3)** How is the DART system an improvement over previous tsunami warning systems? Be sure to briefly describe the previous systems.

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Thank you!

**Name:**

# Tsunami Online Worksheet

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