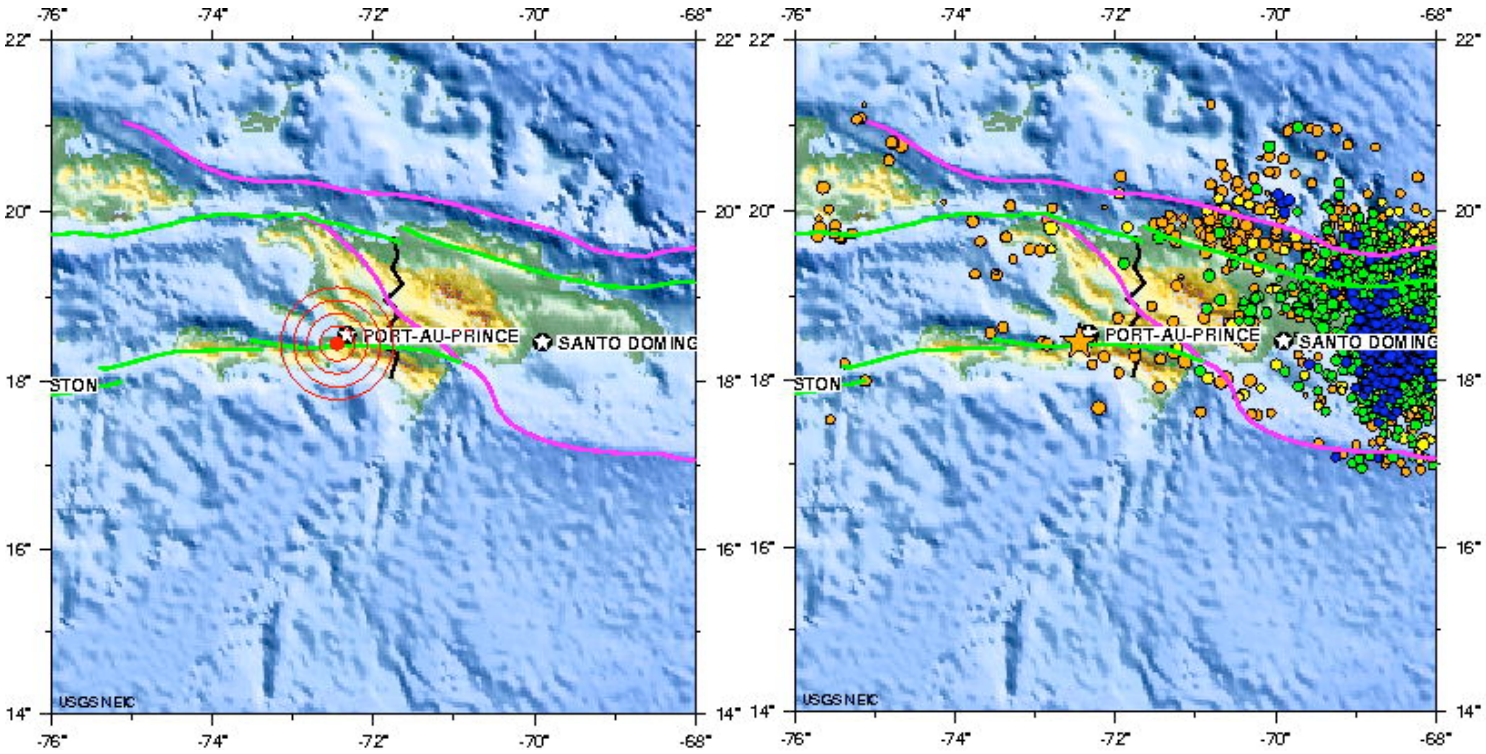
Major 7.0 Earthquake Near Port-Au-Prince, Haiti
Tuesday, January 12, 2010 at 21:53:09 UTC
Tuesday, January 12, 2010 at 1:53:09 PM Pacific Standard Time
Epicenter: Latitude 18.451°N, 72.445°W. Depth: 10 kilometers.

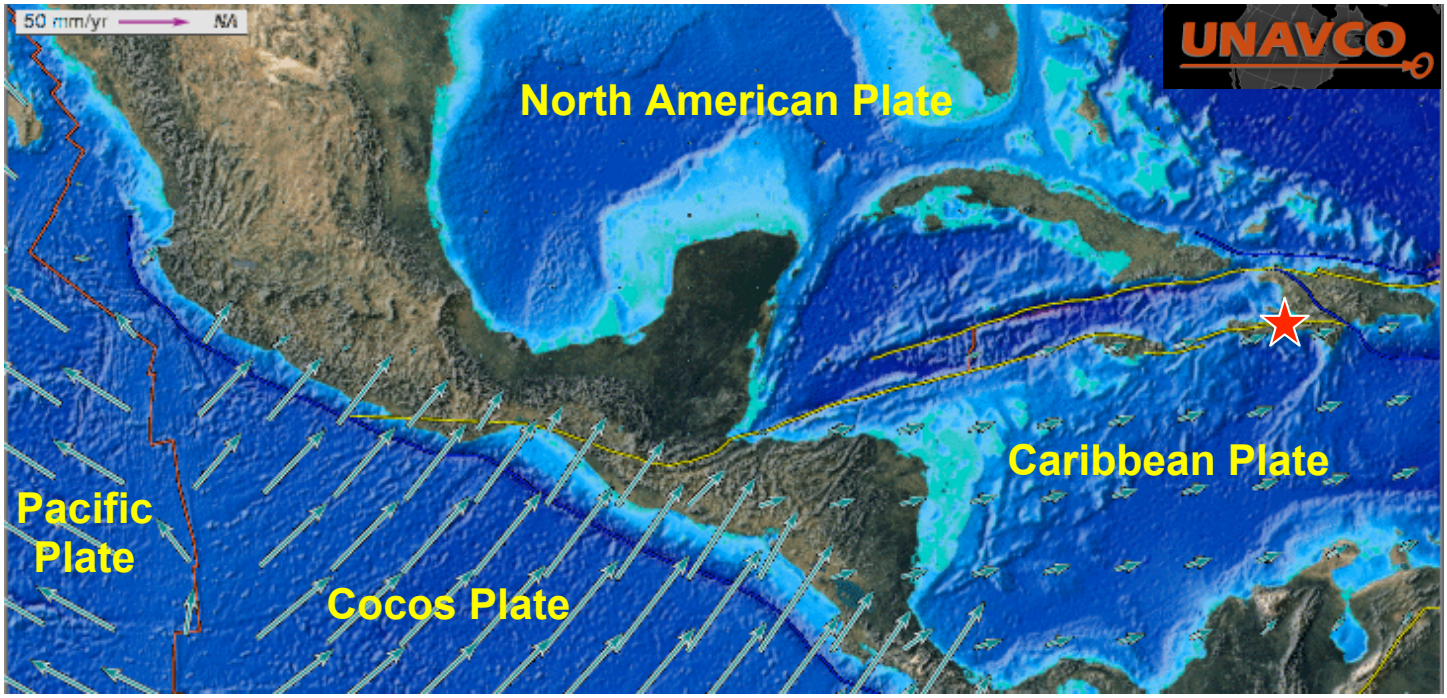
A major earthquake occurred Tuesday afternoon Portland time near Port-au-Prince, Haiti. The circle with surrounding rings on the left-side map below illustrates the epicenter of this earthquake as determined by the US Geological Survey National Earthquake Information Center (NEIC). The map on the right below shows historic earthquake activity near the epicenter (star) from 1990 to present. The earthquake of January 12, 2010 occurred on the transform plate boundary between the Caribbean and North American plates. As expected for an earthquake on a transform boundary, the depth of the event was quite shallow at about 10 km. The Pacific Tsunami Warning Center reported that "a tsunami measuring 12 cm crest-to-trough was recorded at Santo Domingo in the Dominican Republic and a tsunami less than 1 cm crest-to-trough was recorded on a deep ocean gauge in the east-central Caribbean. Based on these data there could have been destructive tsunami waves near the earthquake epicenter but there is not a threat to coastal areas further away."



LEFT: January 12, 2010 earthquake epicenter. RIGHT: Earthquakes since 1990.

News of damage, injuries, and fatalities is very preliminary at this time. However, indications are that many buildings suffered major damage including total collapse of some multi-story structures. Given the very poor economic conditions in Haiti with resulting lack of earthquake-resistant homes and buildings, this is likely to be a devastating earthquake with many lives lost.

The map below shows a plate-tectonic map of the Central America and the western Caribbean region. The epicenter of the earthquake that occurred of January 12, 2010 is indicated by the red star on the map below. Red lines on this map are divergent plate boundaries (seafloor spreading centers) like the East Pacific Rise that separates the Pacific Plate from the Cocos Plate. Yellow lines are transform (side-by-side) plate boundaries like the San Andreas Fault in California. This map shows the rates and directions of motion of the Cocos, Pacific, and Caribbean plates with respect to the North American Plate. The small arrows on the Caribbean Plate show that it moves eastward at a rate of about 20 mm/yr (2 cm/yr) with respect to the North American Plate. This is a fairly slow rate of transform motion between the Caribbean and North American plates. For comparison, the rate of transform motion across the San Andreas transform fault between the North American and Pacific plates is about 50 mm/yr (5 cm/yr).



The NEIC tectonic summary for the January 12, 2010 earthquake states:
“Haiti occupies the western part of the island of Hispaniola, one of the Greater Antilles islands, situated between Puerto Rico and Cuba. At the longitude of the January 12 earthquake, motion between the Caribbean and North American plates is partitioned between two major east-west trending, strike-slip fault systems -- the Septentrional fault system in northern Haiti and the Enriquillo-Plaintain Garden fault system in southern Haiti. The location and focal mechanism of the earthquake are consistent with the event having occurred as left-lateral strike-slip faulting on the Enriquillo-Plaintain Garden fault system. This fault system accommodates about 7 mm/yr, nearly half the overall motion between the Caribbean Plate and North America Plate.”

The record of the January 12, 2010 Haitian earthquake on the University of Portland seismometer is illustrated below. Portland is about 5500 km (~3400 miles) from the location of this earthquake. The waves labeled P and S are “body” waves that traveled through Earth’s mantle from the earthquake to Portland. (P waves are compressional waves while S waves are shear waves). It took about 8 minutes and 50 seconds (530 seconds) for the P waves to travel from the earthquake to Portland while the S waves started arriving about 15 minutes and 58 seconds (958 seconds) after the earthquake occurred near Port-au-Prince. Notice that a wave labeled PP is a prominent arrival on this seismogram. PP waves are compressional waves that bounced off the Earth’s surface halfway between the earthquake and the station. PP energy arrived 10 minutes and 44 seconds (644 seconds) after the earthquake. The surface waves (Love and Rayleigh waves) traveled from the earthquake to Portland around the perimeter of the Earth. Because the distance around the perimeter is longer than the distance through Earth’s mantle and the speed of surface waves is slower than body waves, it takes surface waves much longer than body waves to travel from an earthquake to a distant seismic station. In this case, the first surface waves from the earthquake in Haiti started arriving at the University of Portland about 21 minutes after the earthquake.