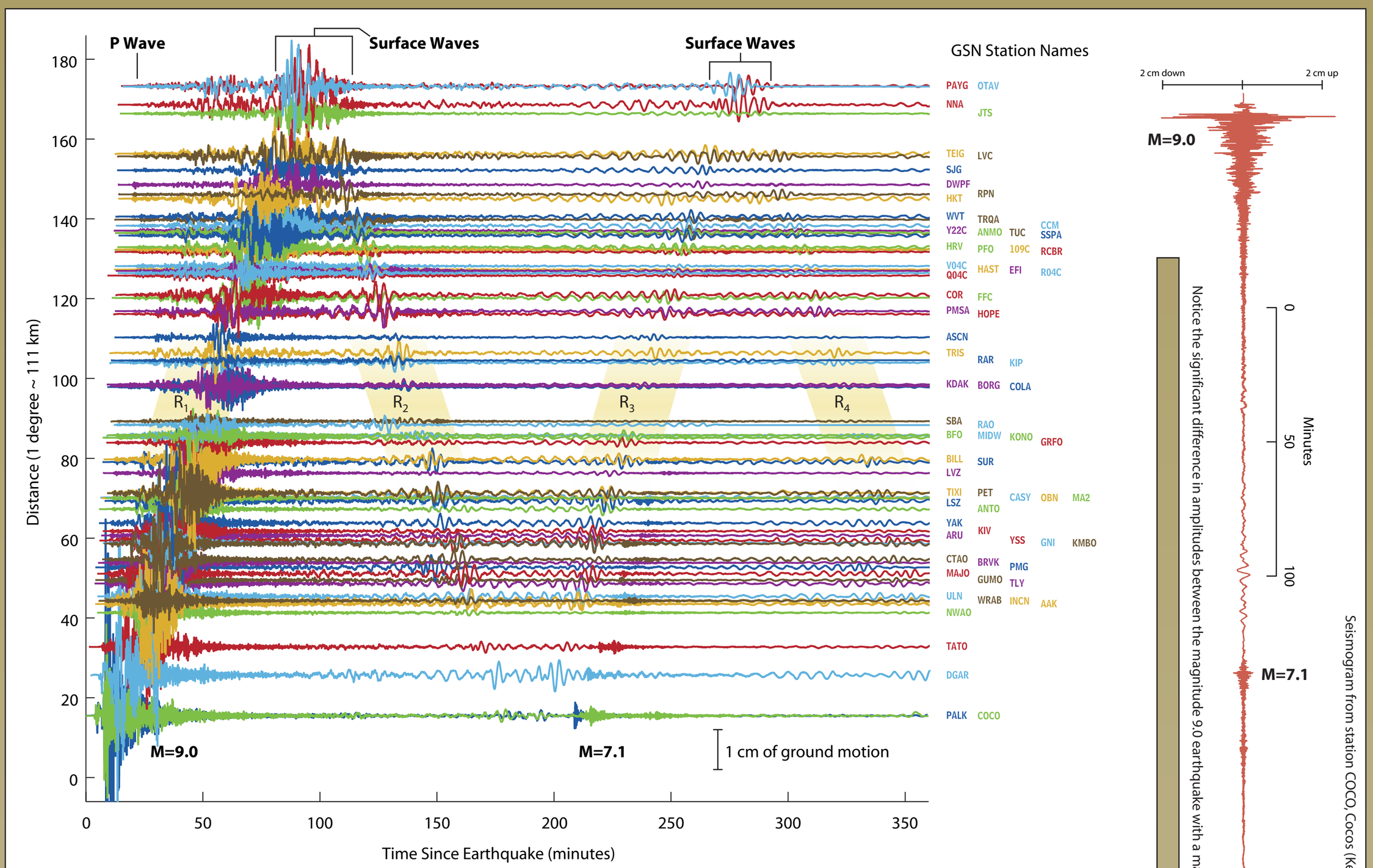
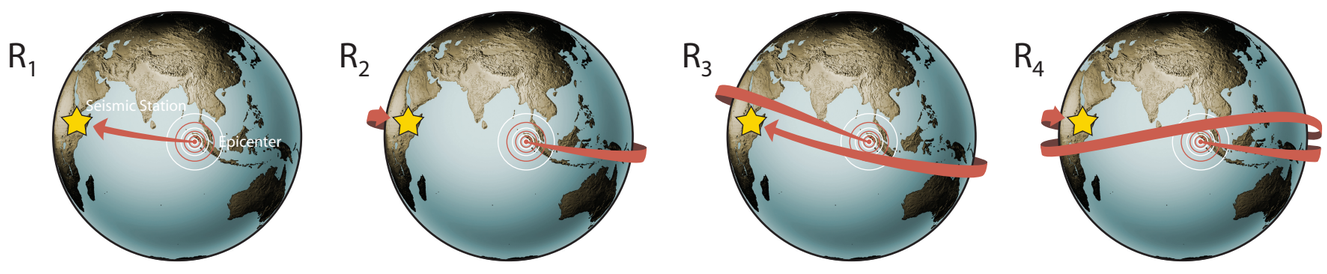
Sumatra - Andaman Islands Earthquake (M_W=9.0)

As Recorded by the Global Seismographic Network





Paths of earthquake surface waves as they travel multiple times around the Earth.

The magnitude (M_w) 9.0 earthquake near Sumatra on December 26, 2004 was one of the largest and most significant seismic events during the past 100 years. While earthquake damage and casualties were limited to the immediate vicinity of the epicenter, tsunamis generated by this event caused over 250,000 deaths in the Indian Ocean region spanning more than 10 nations.

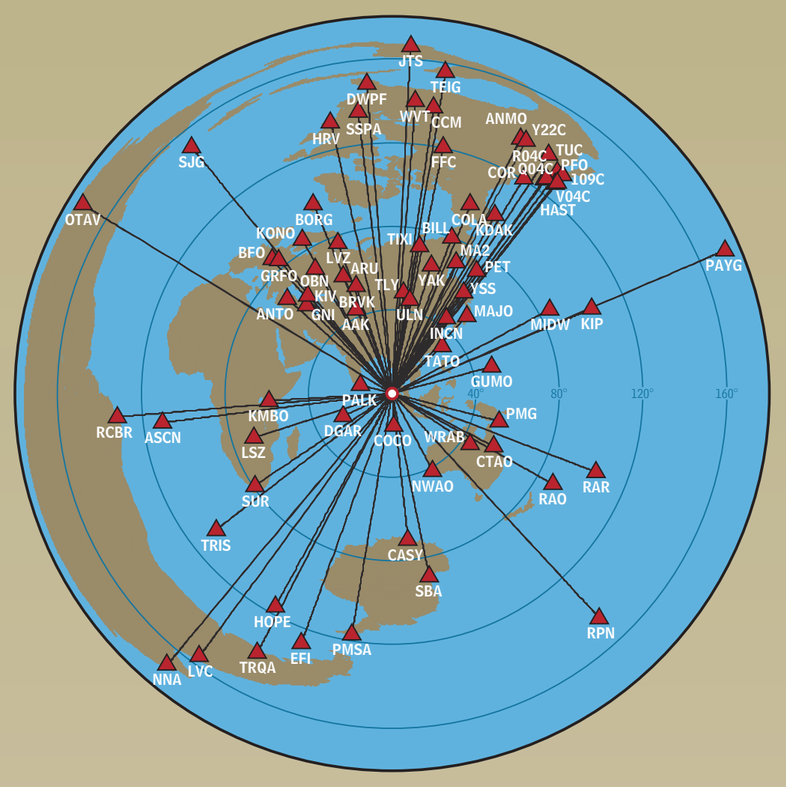
This assembly of seismograms displays the vertical movement of the Earth's surface due to seismic waves generated by the earthquake. The seismograms are plotted with respect to time since the start of the earthquake on the horizontal axis and are sorted vertically according to distance from the epicenter in degrees.

An earthquake generates many different types of seismic waves that travel through the earth simultaneously. At any particular station they are recorded at different times due to differences in the speed and in the paths that they travel. The earliest arriving signal is the compressional (P) wave. This P-wave takes about 21 minutes to reach the other side of the planet (the antipode, at 180 degrees). The largest amplitude signals are seismic surface (Rayleigh) waves that reach the antipode after about 95 minutes. The arrival of the surface waves at each seismic station above are labeled above as:

R_1 – surface waves traveling the shortest route from the epicenter to the recording station;
R_2 – surface waves traveling the longest route from the epicenter to the recording station;
R_3 – surface waves traveling completely around the Earth, plus the R_1 path;
R_4 – surface waves traveling completely around the Earth, plus the R_2 path.

The vertical ground motion as the surface waves passed was generally 1 cm or more. Though this movement occurred everywhere on the planet, you would not have noticed it since this oscillating ground motion occurred over periods of many tens of seconds. Signals from a large aftershock (magnitude 7.1) can be seen at the closest stations starting just after the 200-minute mark. Note the relative size of this aftershock (which would be considered a major earthquake under ordinary circumstances) compared to the mainshock.

Global Seismographic Network Stations



Credits: *Data provided by the IRIS/USGS Global Seismographic Network, and distributed through the IRIS Data Management System. Seismic stations are operated by the US Geological Survey, Albuquerque Seismological Laboratory, and the University of California, San Diego. Support for these networks is provided by the National Science Foundation (through the IRIS Consortium) and U.S. Geological Survey. Figure by Richard Aster, New Mexico Institute of Mining and Technology.*

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