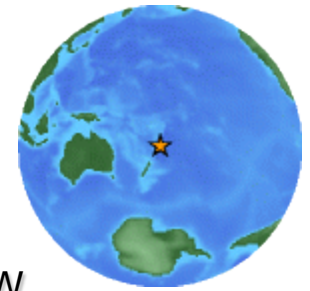


Magnitude 7.4 KERMADEC ISLANDS REGION

Friday, October 21, 2011 at 17:57:16 UTC



Local Time 5:57 AM

Latitude 28.998° S

Longitude 176.183° W

Depth 32.9 km

Major earthquake near the Kermadec Trench

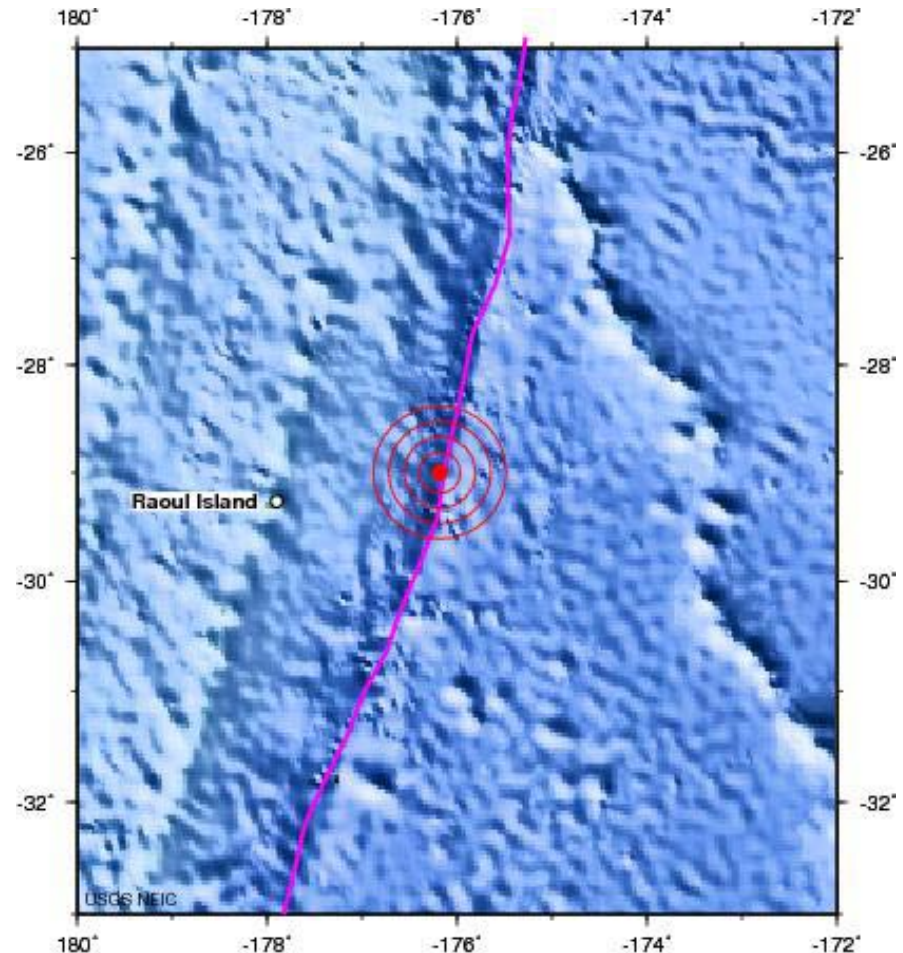
Location:

- 500 km South of Tonga
- 700 km North of New Zealand

Kermadec Islands:

- Mostly uninhabited
- Reserves for biologic protection

Seismic waves from this event demonstrate types of seismic waves arriving at different distances.



Images courtesy of the US Geological Survey

Raoul Islands:

- Most volcanically active island in Kermadec Islands.
- DOC Hostel houses New Zealand Station weather and radio station and Department of Conservation (DOC) officers and volunteers.

Tsunami:

- No tsunami warning for Pacific Ocean Region
- Raoul Island tide gauges measured:
 - 0.10 m (0.3 ft) wave at Boat Cove
 - 0.17 m (0.6 ft) wave at Fishing Rock



Historic Seismicity:

- Map shows earthquakes 1990 to present
- October 21 earthquake Indicated by orange star
- Tonga-Kermadec subduction zone has high seismic activity
- 50 events of $M \geq 6.5$ and 5 events of $M \geq 7.5$ during past 38 years

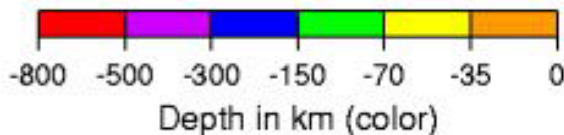
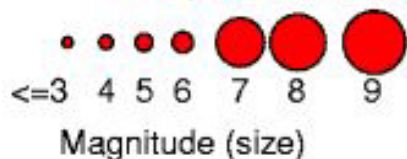
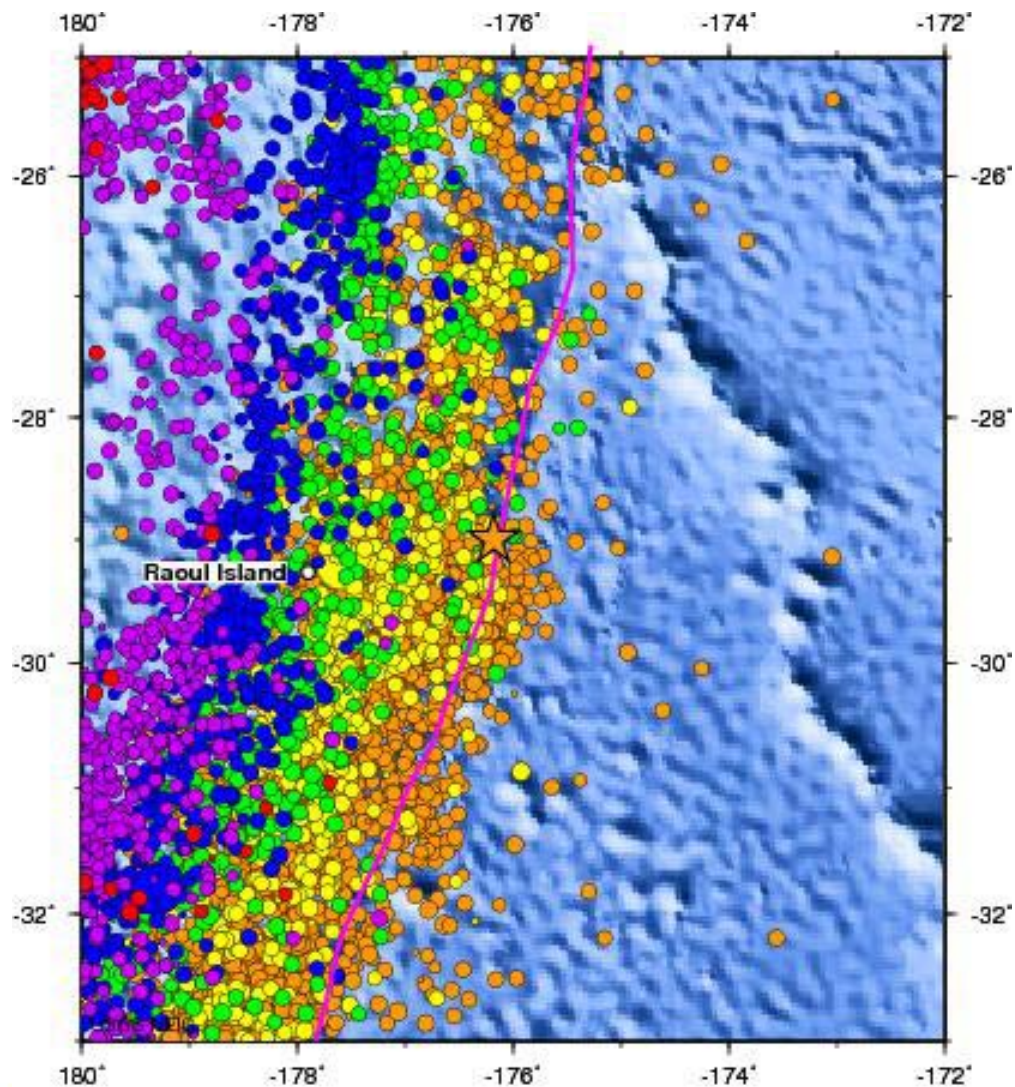
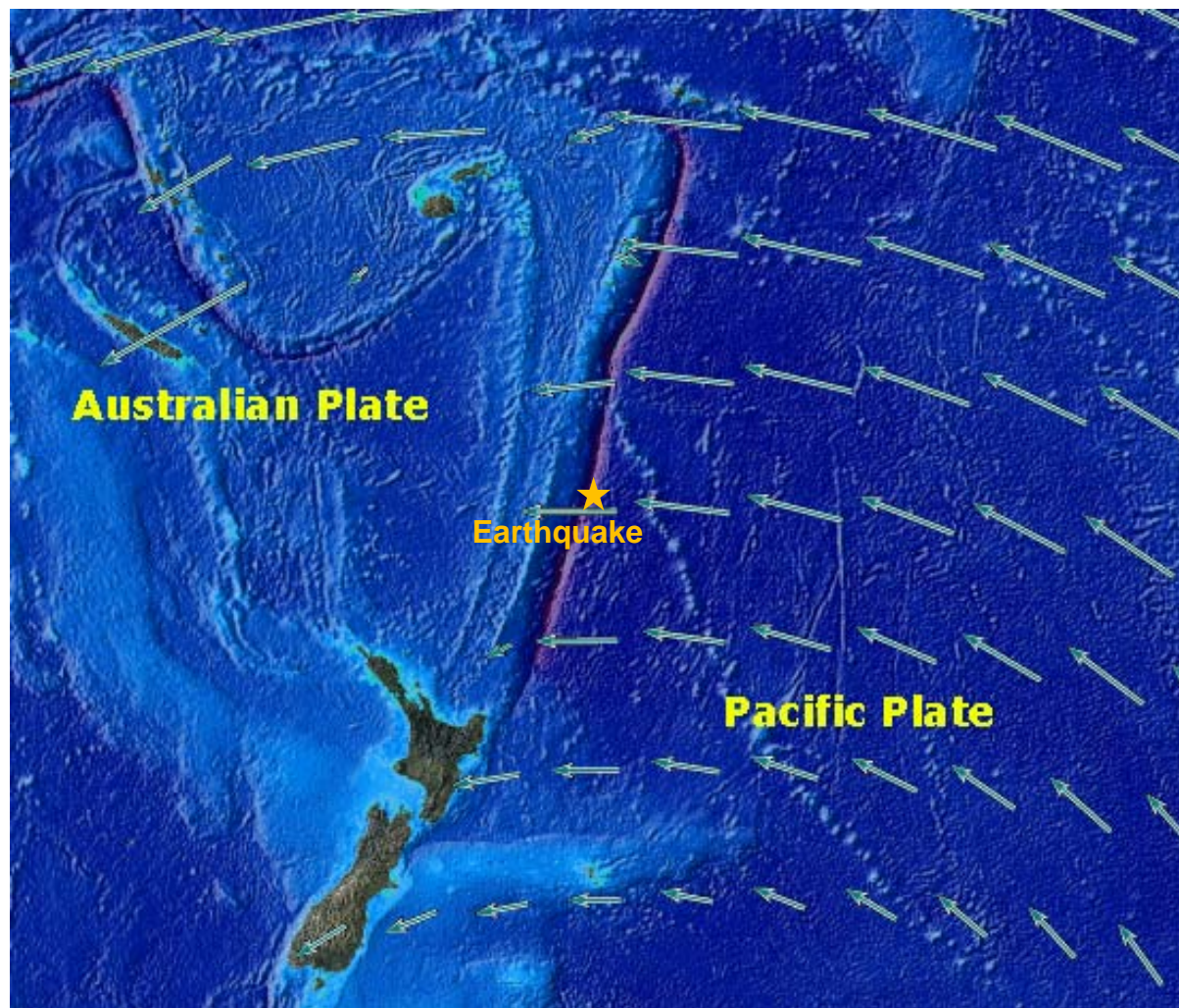


Image courtesy of the US Geological Survey

Plate Tectonics:

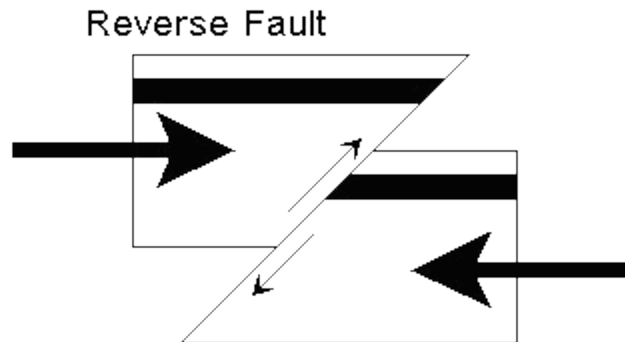
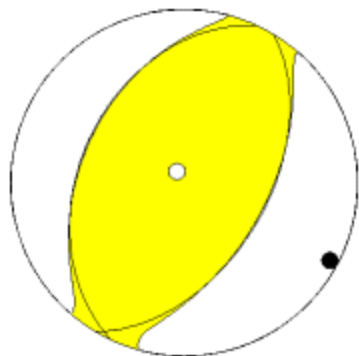
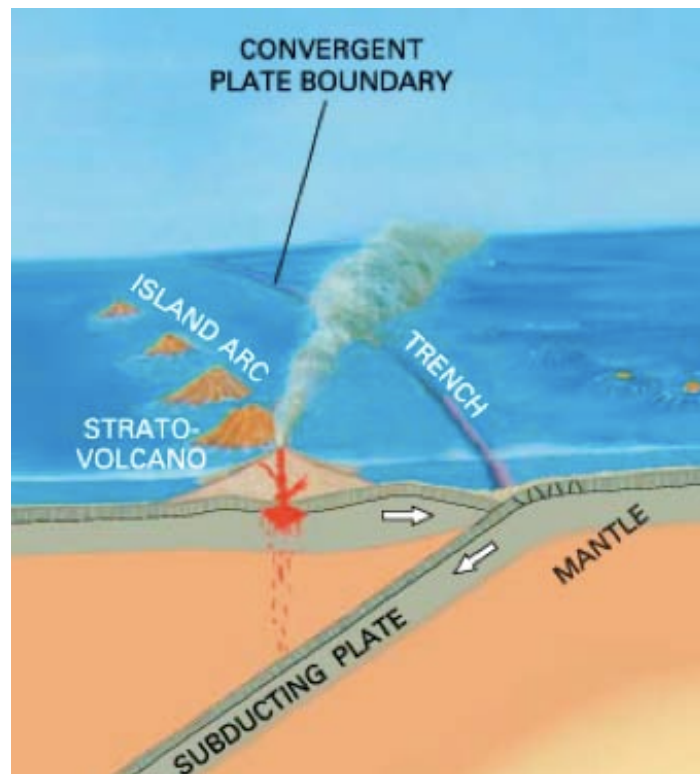
- Pacific Plate subducts below Australia Plate at Tonga – Kermadec Trench
- Rate of convergence at the location of October 21 earthquake is about 6 cm/yr.



Arrows show motion of the Pacific Plate relative to the Australian Plate.

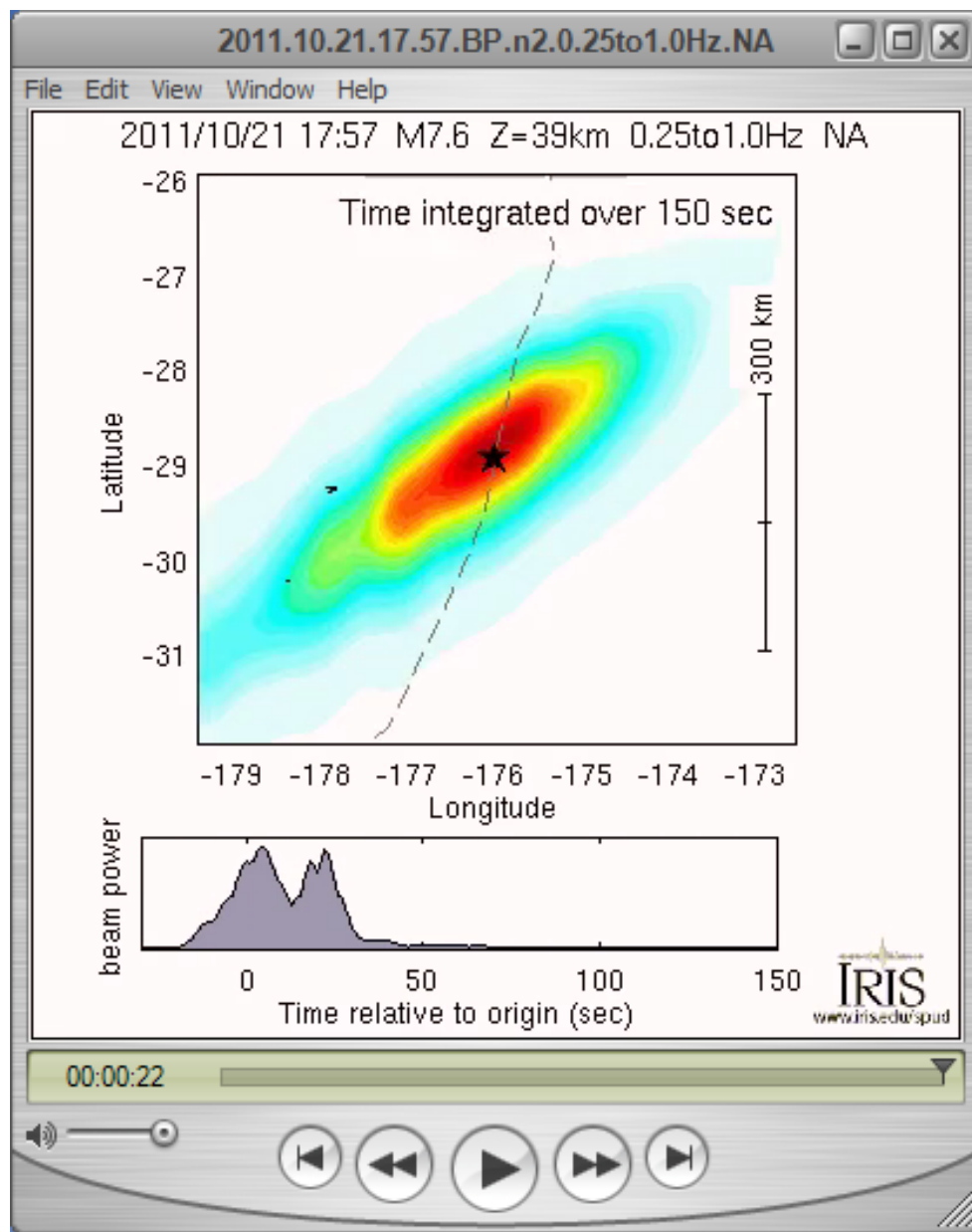
Earthquake Mechanism:

- First-motion solution and depth indicate the earthquake resulted from reverse (thrust) faulting on the subduction zone boundary between the oceanic Pacific Plate and the eastern (oceanic) part of the Australia Plate



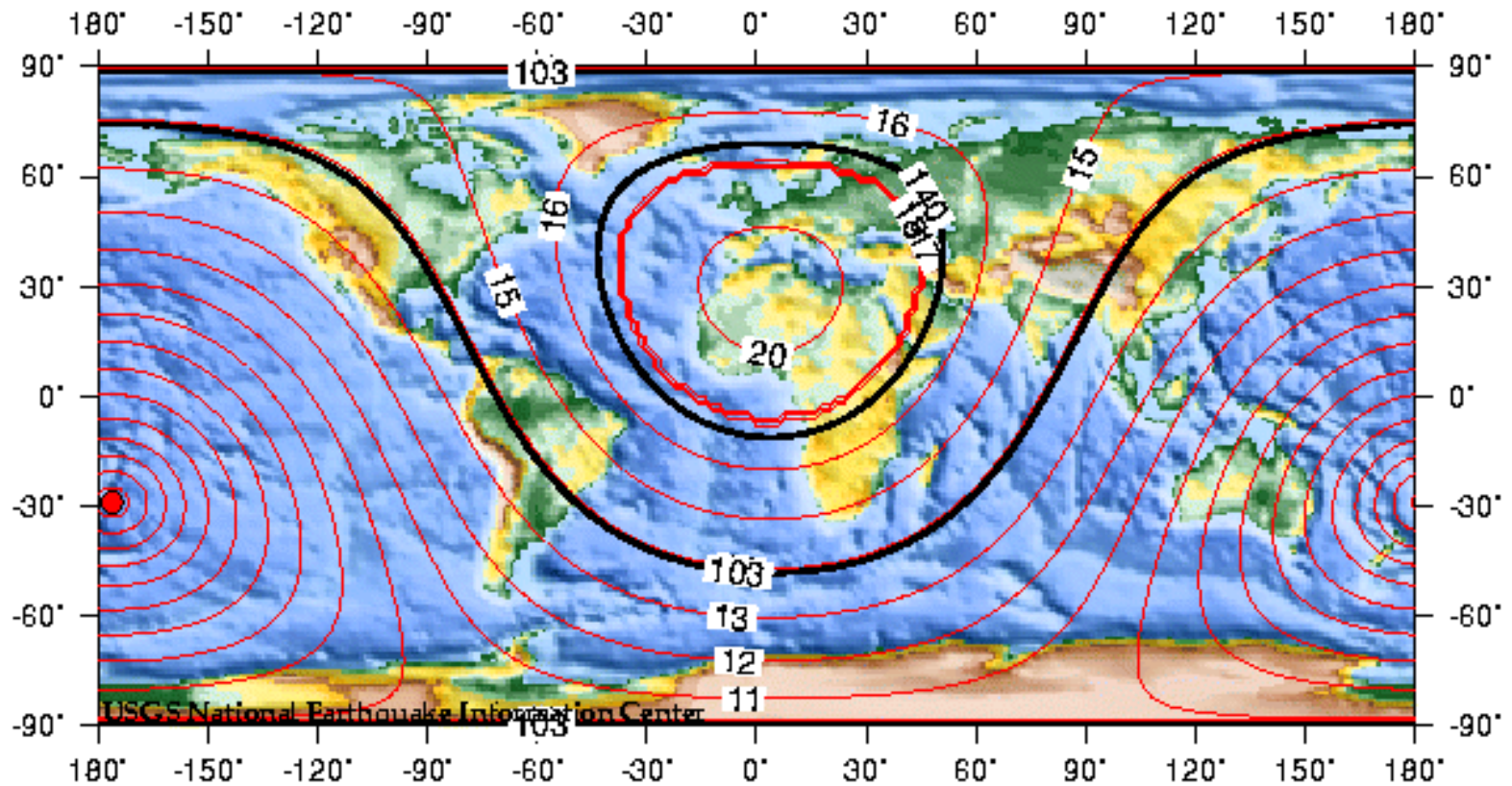
Back Projection:

- From P waves recorded at many seismometers, the time and amount of displacement on the fault that produced the earthquake can be determined.



Magnitude 7.4 KERMADEC ISLANDS REGION

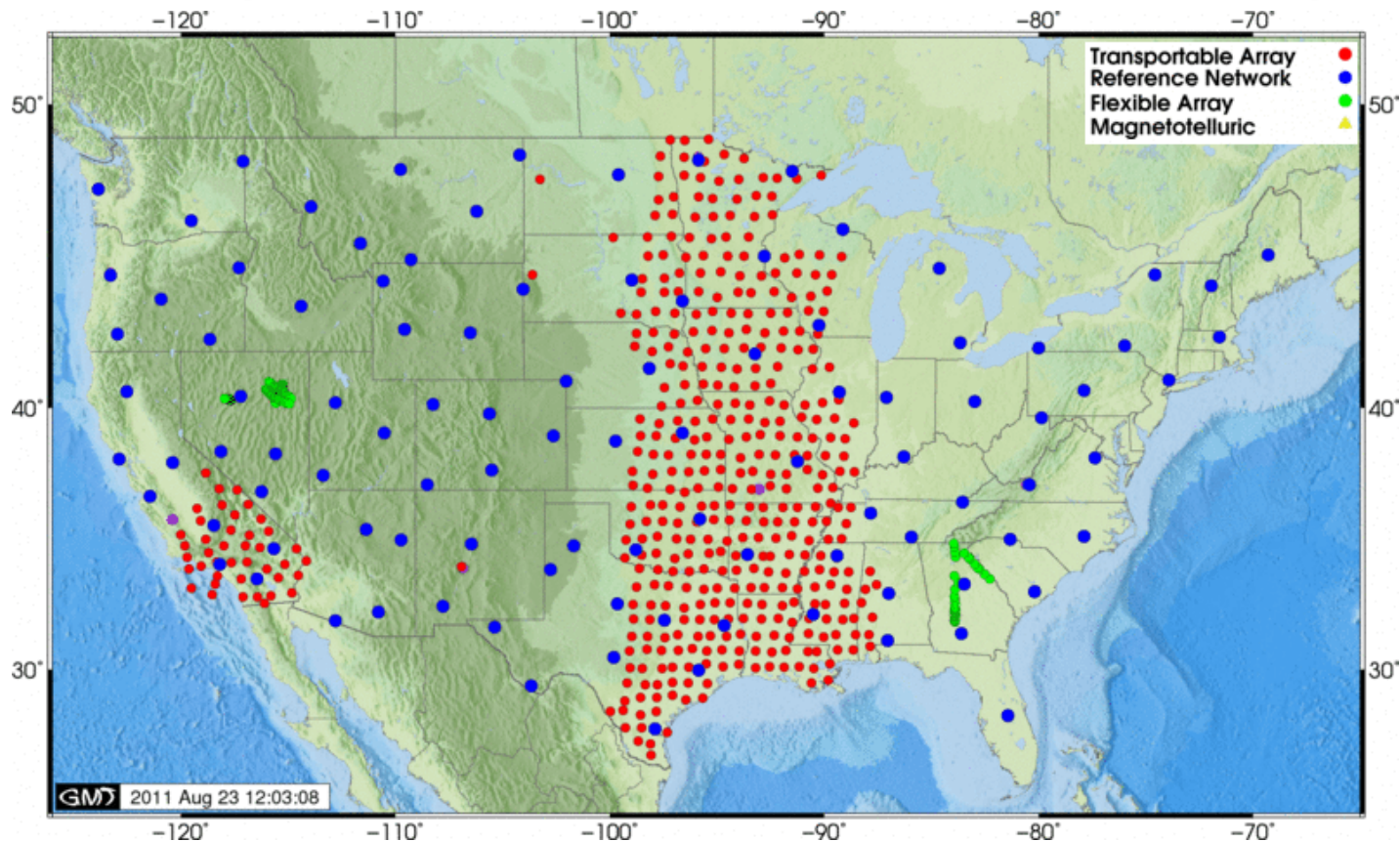
Friday, October 21, 2011 at 17:57:16 UTC



Predicted (theoretical) travel times, in minutes, of first compressional (P) waves from October 21 earthquake.

Heavy black lines shown distances to P-wave shadow zone between 103 and 140 degrees.

USArray: A Continental-Scale Seismic Observatory



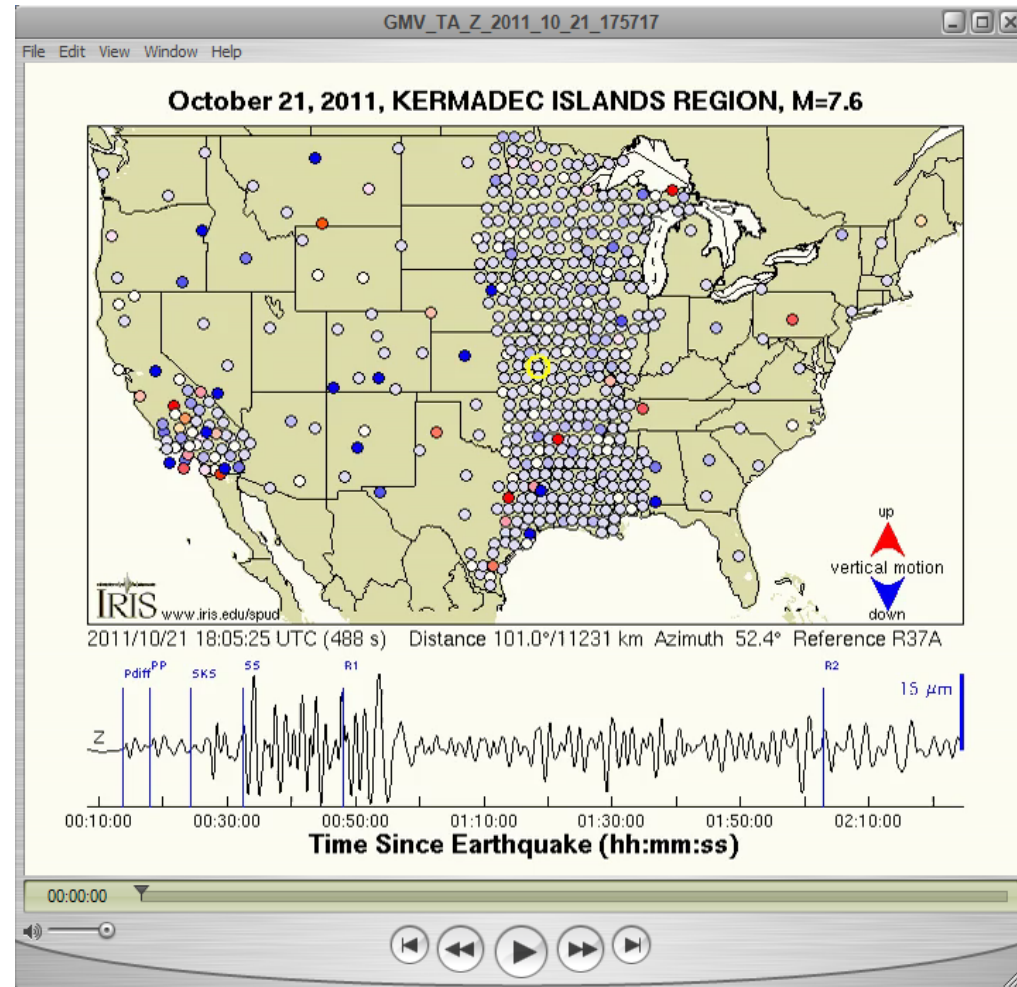
400 transportable seismometers (red dots) are moving west to east across the US as a network with ~70 km distance between instruments. Resulting data are used to image the structure of the North American continent and the underlying mantle.

Circles are seismometers

- red- moving up
- blue- moving down

The seismogram along the bottom is from the station at the yellow circle.

As seismic waves sweep across USArray, the relative velocities of the fast P, slower S, and slowest surface waves can be observed.

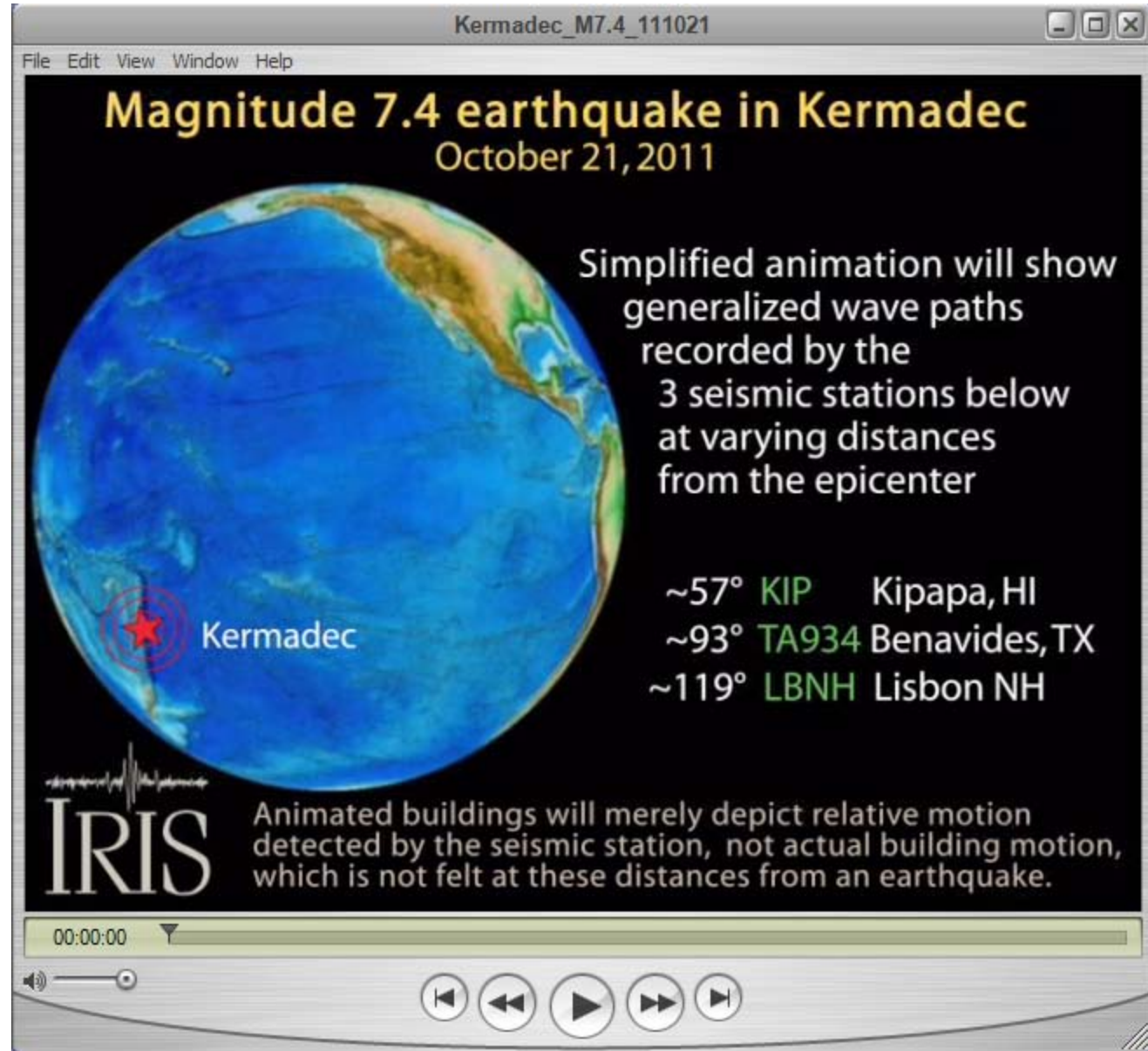


Ground motions detected by 400 seismic stations in USArray displayed as a movie.

Quick Time Required

Animation of the
generalized
paths of seismic
waves

*Seismic Wave
Propagation*

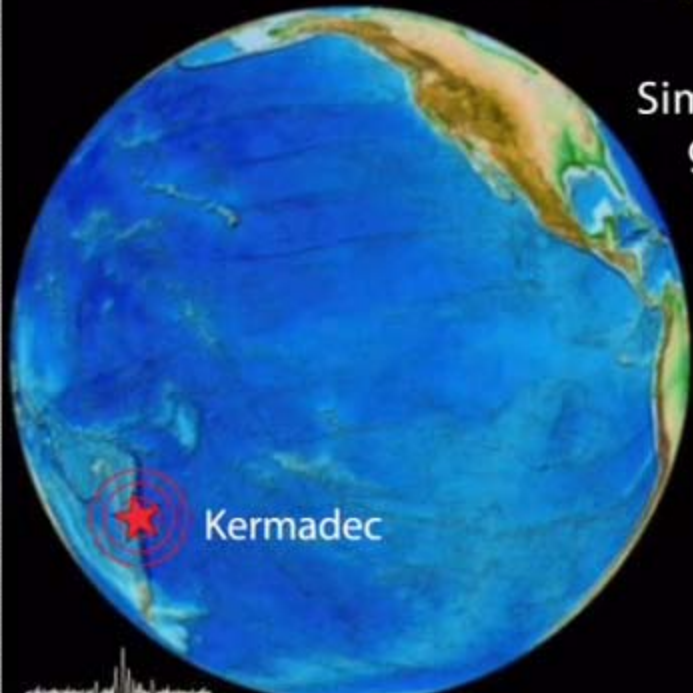


Kermadec_M7.4_111021

File Edit View Window Help

Magnitude 7.4 earthquake in Kermadec


October 21, 2011



Kermadec

Simplified animation will show generalized wave paths recorded by the 3 seismic stations below at varying distances from the epicenter

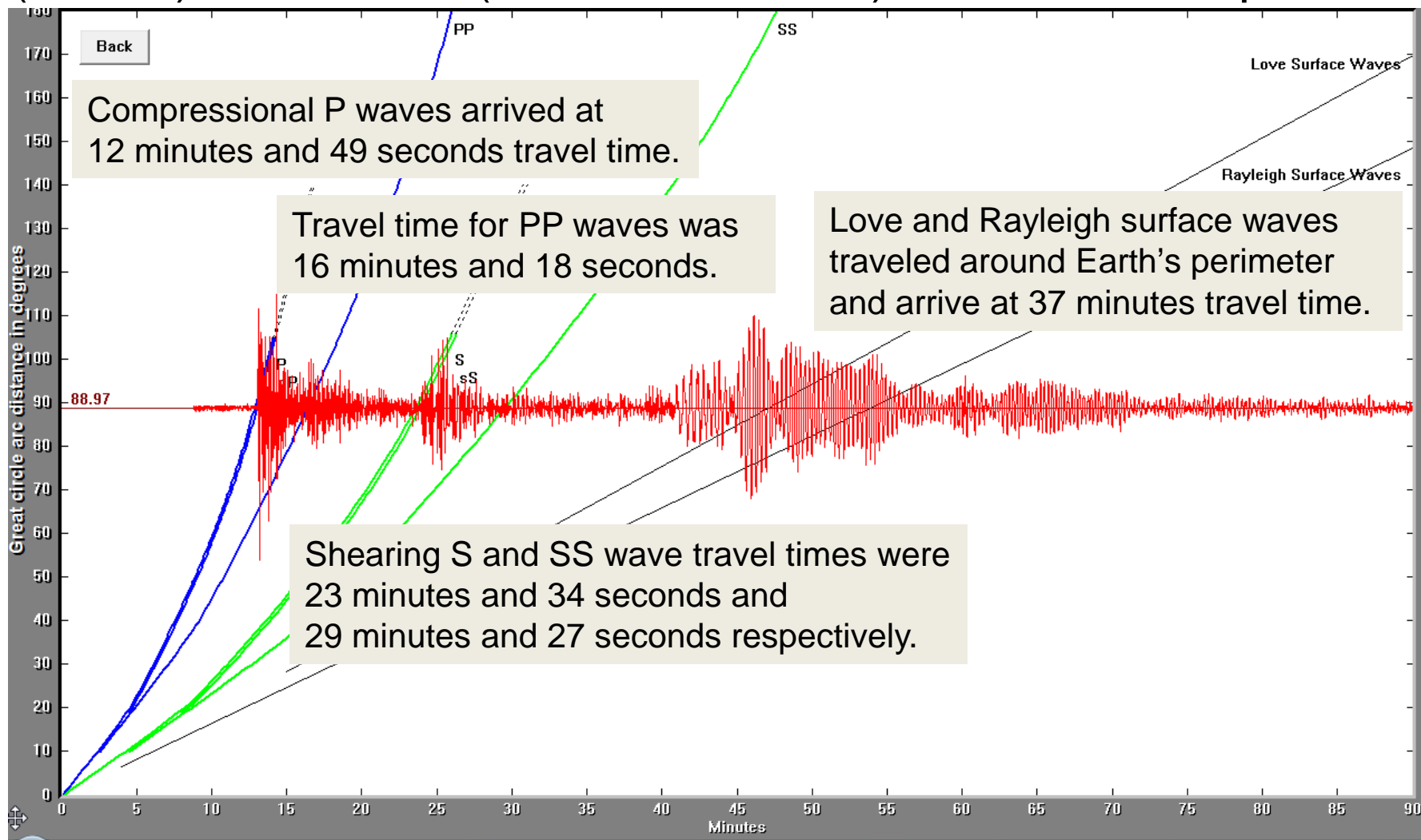
- ~57° **KIP** Kipapa, HI
- ~93° **TA934** Benavides, TX
- ~119° **LBNH** Lisbon NH

 Animated buildings will merely depict relative motion detected by the seismic station, not actual building motion, which is not felt at these distances from an earthquake.

00:00:00

⏪ ⏩ ⏴ ⏵

Example seismogram from University of Portland seismometer (UPOR) at 9844 km (6116 miles, 88°) from the earthquake.



Magnitude 7.4 KERMADEC ISLANDS REGION

Friday, October 21, 2011 at 17:57:16 UTC

SNCC (nearest USArray station) seismogram shows east (top), north (middle), and vertical (bottom) ground motions.

