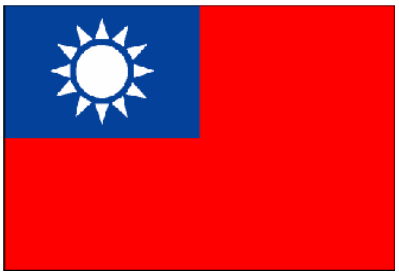
Taiwan Earthquake by Tom Irvine



.

Introduction

A strong earthquake shook Taiwan on Friday, October 15. The quake forced the Taipei subway system to shut down during the lunchtime rush. No serious injuries were reported.

The tremor gently rocked buildings for about one minute and was felt on Japan's southern coast. On Taipei's streets, the quake caused sidewalks to shake slightly.

Fires were reported in Taipei City, an Internet café in Koashiung as well as a transponder box right across the street from the Koashiung's City Hall. Otherwise, no serious property damage occurred.

This was the strongest quake in Taiwan since the Chi-Chi quake in September 1999 that killed more than 2,100 people and destroyed or damaged thousands of buildings. The Chi-Chi quake had a magnitude of 7.7.

Plate Tectonics

Taiwan is located above a subduction zone, where the Philippine Plate is being subducted under the Eurasian Plate. It is part of the "Pacific Ring of Fire."

Seismic Time History

I recorded the Taiwan earthquake on my Lehman seismometer, located in my home in Mesa, Arizona. This seismometer is a horizontal pendulum design. The resulting time history plots are given in Figures 1 and 2. Reference data from the USGS is given after these seismograms.

.

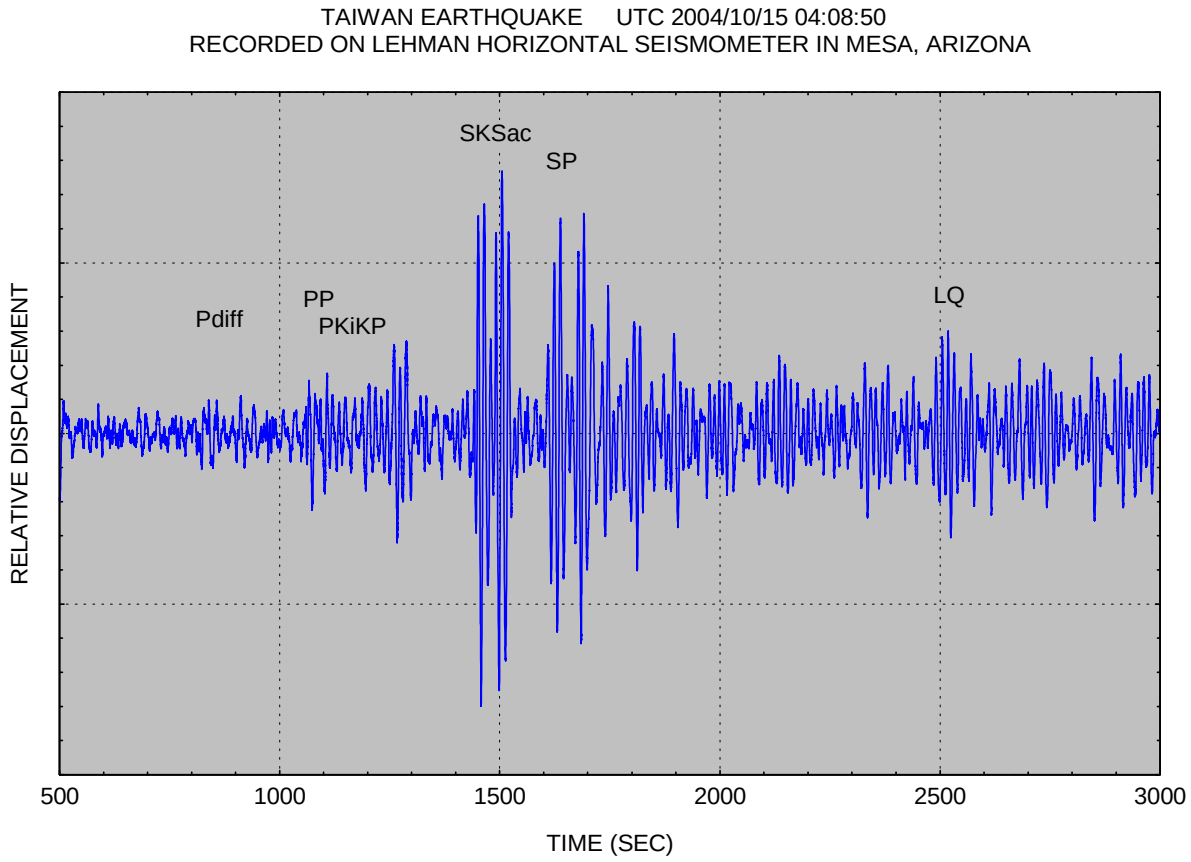


Figure 1.

Pdiff is a P-wave that has diffracted around the Earth's core.

Mesa Arizona is on the edge of the "Shadow zone" for the Taiwan earthquake.

The shadow zone is the area of the earth from angular distances of 103 to 140 degrees that, for a given earthquake, does not receive any direct P waves.

The shadow zone results from the P-waves being bent or diffracted by the liquid core. In addition, the S-waves are stopped entirely by the liquid core.

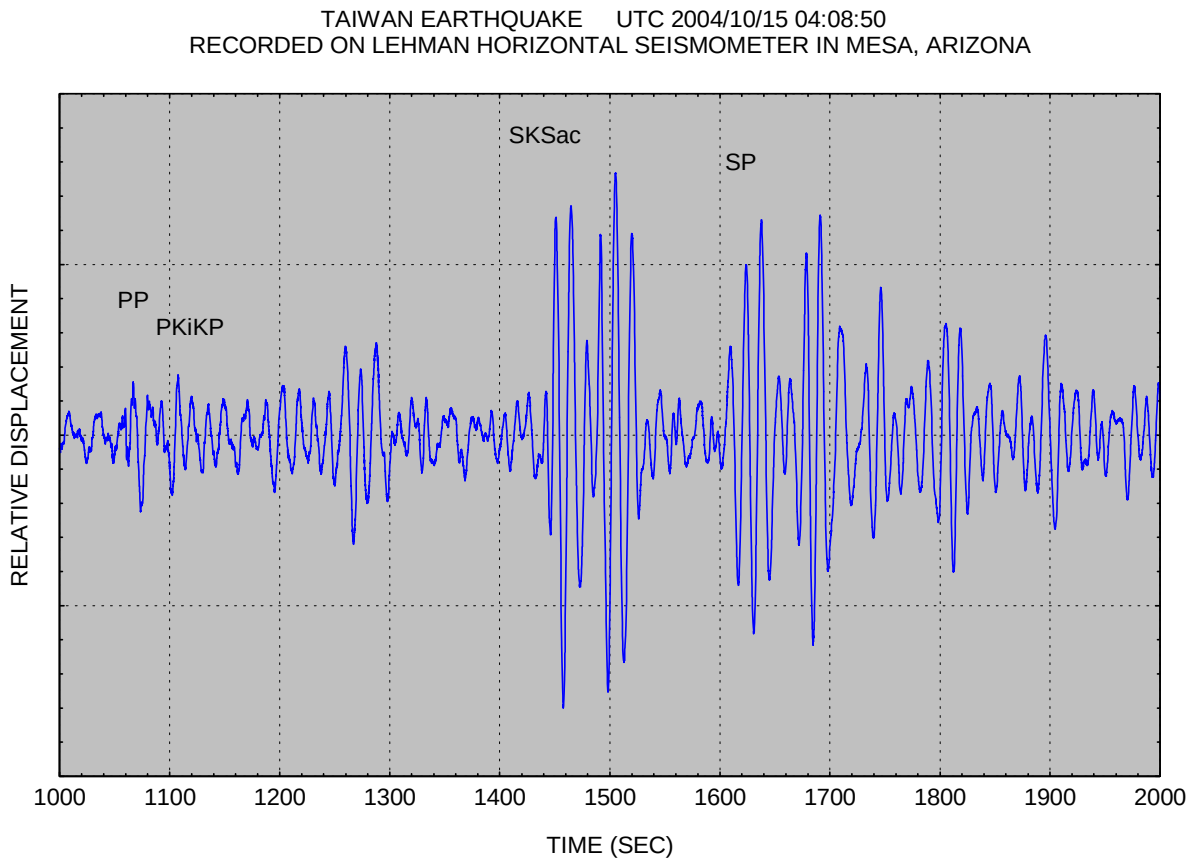
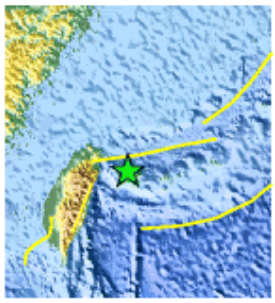

TAIWAN EARTHQUAKE UTC 2004/10/15 04:08:50
RECORDED ON LEHMAN HORIZONTAL SEISMOMETER IN MESA, ARIZONA
SKSac
SP
PP
PKiKP
RELATIVE DISPLACEMENT
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
TIME (SEC)

Figure 2.

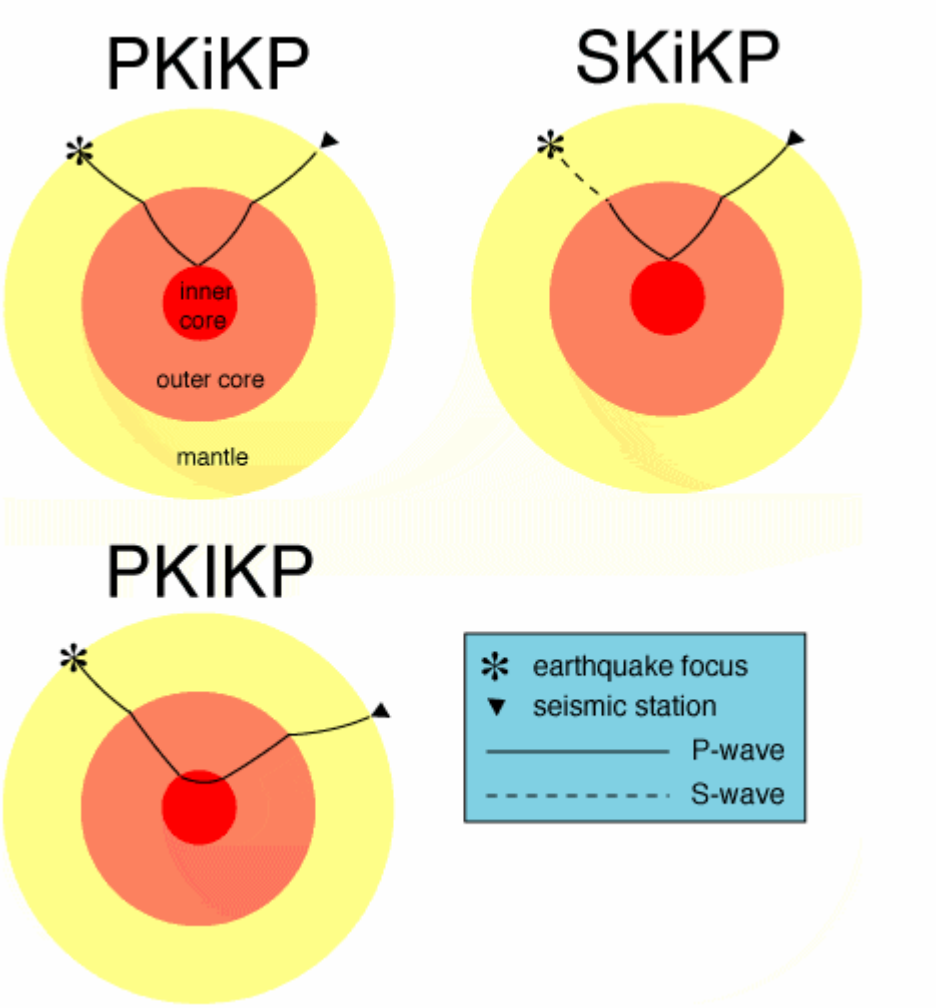


Magnitude	**6.7**
Date-Time	**Friday, October 15, 2004 at 04:08:50 (UTC)** = Coordinated Universal Time **Friday, October 15, 2004 at 12:08:50 PM** = local time at epicenter Time of Earthquake in other Time Zones
Location	24.515°N, 122.670°E
Depth	95 km (59.0 miles)
Region	**TAIWAN REGION**
Distances	85 km (50 miles) E of **Su-ao, Taiwan** 125 km (80 miles) ENE of **Hua-lien, Taiwan** 130 km (80 miles) ESE of **T'AI-PEI, Taiwan** 155 km (95 miles) W of **Ishigaki-jima, Ryukyu Islands, Japan**
Location Uncertainty	horizontal +/- 6.9 km (4.3 miles); depth +/- 7.5 km (4.7 miles)
Parameters	Nst=156, Nph=156, Dmin=130.1 km, Rmss=0.97 sec, Gp= 54°, M-type=teleseismic moment magnitude (Mw), Version=8
Source	USGS NEIC (WDCS-D)
Event ID	uspqan

DATE-(UTC)-TIME LAT LON DEPTH MAG Q COMMENTS
2004/10/15 04:08:50 24.51N 122.67E 95.0 6.7 US:
TAIWAN REGION
Expected 1s period body wave amplitude [1.45E-01 μm]
[9.09E-01 μm/s]

delta (deg)	azimuth (degrees clockwise from north) eq-to-station	station-to-eq
102.49	44.3	310.5

#	code	travel time(s)	arrival time dy	hr	mn	sec
1	Pdiff	825.20	0	4	22	35
2	pPdiff	850.47	0	4	23	0
3	sPdiff	860.86	0	4	23	10
4	PP	1079.13	0	4	26	49
5	PKiKP	1086.20	0	4	26	56
6	pPKiKP	1112.44	0	4	27	22
7	sPKiKP	1122.61	0	4	27	32
8	SKiKP	1292.40	0	4	30	22
9	SKSac	1455.82	0	4	33	5
10	pSKSac	1491.36	0	4	33	41
11	SKKSac	1493.84	0	4	33	43
12	sSKSac	1501.78	0	4	33	51
13	Sdiff	1521.08	0	4	34	11
14	pSdiff	1554.32	0	4	34	44
15	sSdiff	1565.48	0	4	34	55
16	SP	1616.59	0	4	35	46
17	PS	1628.61	0	4	35	58
18	PKKPbc	1784.20	0	4	38	34
19	PKKPdf	1791.95	0	4	38	41
20	SS	1951.70	0	4	41	21
21	SKKPbc	1996.80	0	4	42	6
22	SKKPdf	1997.95	0	4	42	7
23	PKKSbc	2007.02	0	4	42	17
24	PKKSdf	2008.12	0	4	42	18
25	SKKSdf	2213.97	0	4	45	43
26	SKKSac	2217.88	0	4	45	47
27	P'P'df	2284.84	0	4	46	54
28	S'S'ac	3132.37	0	5	1	2
29	S'S'df	3140.49	0	5	1	10
30	LQ	2601.36	0	4	52	11
31	LR	2887.14	0	4	56	57



Courtesy of Princeton Earth Physics Project.

An “I” means that a wave goes through the inner core.

An “i” means that the wave reflects off of the inner core.

“K” refers to a P-wave in the fluid outer core.