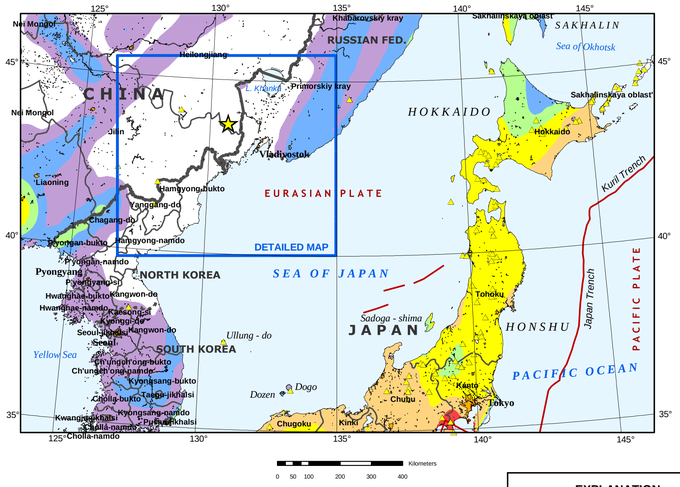
U.S. Department of the Interior
U.S. Geological Survey

General Interest Product xxx

Heilongjiang, China Earthquake of 28 June 2002

Generalized Seismic Hazard



EXPLANATION

Main Shock — Peak Ground Acceleration

- 28 June 2002
- 0 - 0.2 m/sec**2
- 0.2 - 0.4
- 0.4 - 0.8
- 0.8 - 1.6
- 1.6 - 3.2
- 3.2 - 6.4
- 6.4 - 9.4

Volcanoes

Plate Boundaries

RELATIVE PLATE MOTIONS

The relative motion of adjacent tectonic plates is depicted on the map by short vectors located at selected locations on the plate boundary. In this presentation, one plate is assumed to be rigid and fixed. The vector therefore represents the direction of the moving plate relative to the fixed plate. The rate of relative motion is labelled next to the vector.

The components of the vector perpendicular and parallel to the plate margin approximate convergent/divergent and transverse direction of motion between the plates,respectively. As viewed from the fixed plate, an inward directed component suggests compression at and near the plate boundary that may be expressed as crustal folding, uplift, thrust faulting, or plate subduction. Similarly, an outward directed component suggests plate divergence such as would be expected at a zone of crustal spreading. Transcurrent or transform faulting would be expected when the predominant vector component is parallel to the plate margin.

Seismic hazard is expressed as peak ground acceleration (PGA) in meters/sec**2 expected in a 50-yr period with a probability of 10 percent.

Epicentral Area

NORTHEASTERN CHINA
28 June 2002 17:29:30.30 UTC
43.747 N., 130.701 E.
566 km depth (Geophysicist)
mb = 6.8 (USGS), Mw = 7.30 (USGS, HRV)

A major earthquake occurred 65 miles (105 km) W of Ussuriysk, Russia and 75 miles (115 km) SE of Mudanjiang, Heilongjiang, China at 1:19 AM local time in China. There have been no reports of damage.

Felt in Heilongjiang, Jilin and Liaoning Provinces. Felt in parts of Hebei, Henan and Shandong Provinces. Also felt at Beijing and in the Vladivostok area, Russia.

EXPLANATION

Main Shock — Magnitude

- 28 June 2002
- M < 4.0
- 4.0 - 5.0
- 5.0 - 6.0
- 6.0 - 7.0
- M > 7.0

Volcanoes

Boundaries
- International
- Province

Urbanized Areas

Vladivostok

Populated Places — Depth

- Luchki
- 0 - 70 km
- 71 - 300
- 301 - 700

Railroads

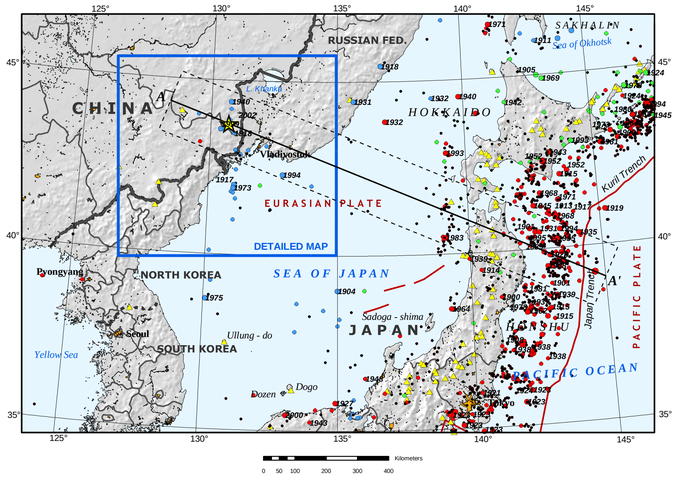
Roads

Airports

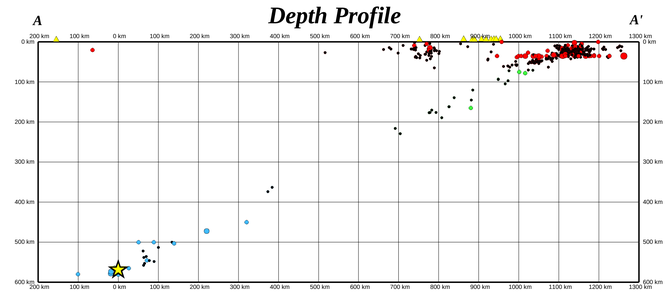
SCALE 1:2,000,000

Albers Equal - Area Projection

Seismic History



Depth Profile



EXPLANATION

Main Shock

- 28 June 2002

Depth of Focus

- 0 - 70 km
- 71 - 300
- 301 - 700

Magnitude

- 5.0 - 6.0
- 6.0 - 7.0
- 7.0 - 8.0
- M > 8.0

Plate Boundaries

Volcanoes

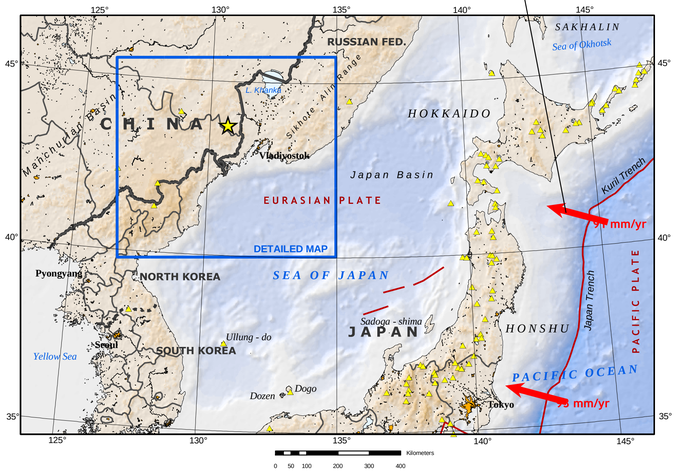
LARGEST EARTHQUAKES 1900 - 2002 (M >= 7.0)

YR	MO	DY	LAT	LON	DEPTH	MAG
1900	5	11	38.700	141.100	5	7.00
1900	12	25	43.000	146.000	35	7.10
1901	6	15	39.000	143.000	35	7.00
1901	8	9	40.600	142.300	35	7.50
1901	8	9	40.500	142.500	35	7.20
1902	5	2	39.000	144.000	35	7.00
1904	6	7	39.000	135.000	350	7.40
1905	7	6	37.400	141.800	35	7.10
1905	9	1	45.000	143.000	250	7.30
1908	1	15	37.300	141.800	35	7.10
1911	9	6	46.000	143.000	350	7.00
1913	2	20	41.000	144.000	0	7.00
1914	3	14	39.500	140.400	5	7.00
1915	3	17	42.100	143.600	35	7.20
1915	11	1	38.300	142.900	35	7.50
1915	11	1	38.000	143.000	35	7.00
1915	11	18	37.700	143.100	35	7.00
1917	7	29	41.000	144.000	0	7.00
1917	7	31	42.000	131.000	500	7.40
1918	1	30	45.447	136.741	330	7.40
1918	4	10	43.476	130.919	565	7.00
1919	5	3	41.007	145.233	35	7.30
1921	12	8	36.000	140.200	35	7.00
1923	6	1	36.000	142.000	35	7.10
1923	6	1	35.674	141.767	35	7.10
1923	9	1	35.400	139.800	35	7.00
1923	9	1	35.405	139.804	35	7.90
1923	9	1	35.100	139.500	35	7.30
1923	9	2	34.900	140.500	35	7.10
1923	9	2	34.900	140.200	35	7.60
1924	1	14	35.500	139.200	5	7.30
1924	6	30	44.737	147.416	140	7.20
1924	8	14	36.133	141.892	35	7.00
1924	12	27	44.159	146.370	35	7.00
1924	12	28	43.397	146.579	35	7.00
1927	3	7	35.802	134.924	10	7.10
1927	8	5	37.873	142.191	35	7.10
1928	5	27	39.813	142.999	35	7.10
1931	2	20	44.430	135.642	357	7.40
1931	3	9	40.484	142.664	35	7.70
1932	9	23	44.486	138.722	350	7.00
1932	11	13	43.841	136.881	35	7.10
1933	3	2	39.224	144.622	35	8.40
1933	6	18	38.280	142.510	35	7.20
1933	12	4	46.192	144.592	353	7.10
1935	9	11	43.290	146.634	35	7.20
1935	10	12	40.266	143.318	35	7.10
1935	10	18	40.394	144.156	35	7.10
1936	11	2	38.337	142.151	35	7.10
1937	7	26	38.396	142.170	35	7.10
1938	5	23	36.458	141.755	35	7.70
1938	11	5	37.108	142.081	35	7.80
1938	11	5	37.009	142.045	35	7.90

LARGEST EARTHQUAKES 1900 - 2002 (M >= 7.0) (CONT.)

YR	MO	DY	LAT	LON	DEPTH	MAG
1938	11	6	37.287	142.283	35	7.70
1938	11	6	36.867	142.625	35	7.00
1938	11	13	36.727	142.360	35	7.00
1939	5	1	39.839	139.969	35	7.00
1939	10	10	38.666	143.151	35	7.20
1940	7	10	44.386	130.777	578	7.30
1940	8	1	44.508	139.829	35	7.50
1942	3	5	44.272	141.632	259	7.00
1943	6	13	42.750	143.250	60	7.10
1943	9	10	35.250	134.000	0	7.00
1945	2	10	41.250	142.500	50	7.10
1945	10	9	43.500	147.500	80	7.00
1947	11	4	44.000	140.500	0	7.10
1948	6	28	36.500	136.000	0	7.00
1950	2	28	46.000	144.000	340	7.50
1952	3	4	42.500	143.000	0	8.10
1952	3	4	42.200	143.900	0	7.10
1952	3	9	42.500	143.000	0	7.20
1959	1	22	37.560	142.483	35	7.20
1960	3	20	39.871	143.435	2	7.80
1961	8	11	42.913	145.304	35	7.20
1962	4	12	38.073	142.741	25	7.20
1964	4	16	38.434	139.226	13	7.60
1964	6	23	43.270	146.151	75	7.20
1968	1	29	43.586	146.701	40	7.30
1968	5	16	41.593	142.786	12	7.80
1968	5	16	40.903	143.346	26	8.30
1968	5	16	39.881	143.223	8	7.00
1968	6	12	39.501	142.893	31	7.10
1969	1	19	44.891	143.207	237	7.30
1973	6	24	43.356	146.422	33	7.30
1973	9	29	41.907	130.975	570	7.80
1975	6	29	38.731	130.085	555	7.10
1978	6	12	38.224	142.009	53	7.70
1978	12	6	44.455	146.475	181	7.80
1980	2	23	43.591	146.678	38	7.10
1981	1	18	38.708	142.788	47	7.00
1982	7	23	36.307	141.763	27	7.00
1983	5	26	40.476	139.094	14	7.70
1989	11	1	39.910	142.783	32	7.40
1993	1	15	43.027	144.154	100	7.60
1993	7	12	42.898	139.242	12	7.70
1994	7	21	42.314	132.870	472	7.30
1994	10	4	43.829	147.329	35	8.30
1994	12	28	40.537	143.441	16	7.80
1995	1	6	40.347	142.219	27	7.00
1999	4	8	43.595	130.398	573	7.10
2000	10	6	35.456	133.134	10	7.40
2002	6	28	43.747	130.701	566	7.30

Plate Tectonic Setting



DATA SOURCES

EARTHQUAKES AND SEISMIC HAZARD
USGS, National Earthquake Information Center
NOAA, National Geophysical Data Center
IASPEI, Int'l Handbook of Seismology and Earthquake Engineering
Global Seismic Hazard Assessment Program

PLATE TECTONICS
Smithsonian Institution, Global Volcano Program
University of Texas

BASE MAP
NIMA and ESRI, Digital Chart of the World
USGS, EROS Data Center

DISCLAIMER
This map is preliminary and has not been edited for conformity with U.S. Geological Survey standards. Base map data, such as place names and political boundaries, are the best available but may not be current or may contain inaccuracies and therefore should not be regarded as having official significance.

DISCUSSION

This deep earthquake occurred within the subducted Pacific plate, about 1300 km (about 800 miles) west of the JapanTrench, where the oceanic Pacific plate begins its descent into the mantle. As the plate subducts beneath Asia at a rate of about 9 cm (about 3 inches) per year, it generates earthquakes. The positions of these earthquakes form features known as Wadati-Benioff zones that image the tectonic plate's decent into the mantle. This earthquake occurred near the base of its particularly long and straight Wadati-Benioff zone that is well imaged in the accompanying cross-section.

Since 1972, this segment of the subducted Pacific plate has produced 11 earthquakes with focal-depths between 400 km and 600 km, and with magnitudes of 6 or greater. Worldwide, the deepest reliably located earthquakes occurred about 680 km beneath the Earth's surface.