

Kobe Earthquake



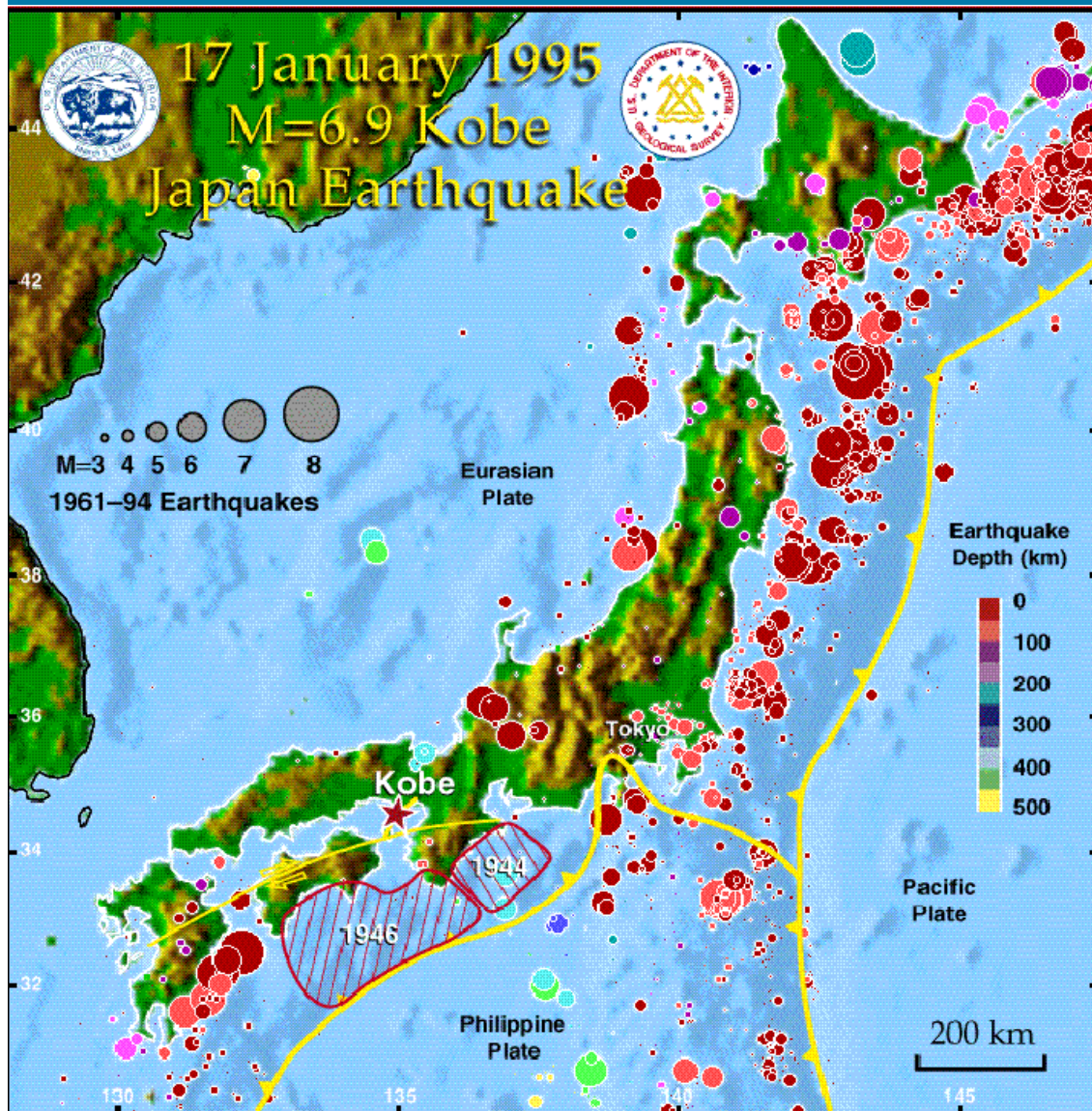
January 17, 1995

5:46 A.M.

Duration 20 seconds

Christopher Silvernale

Tectonic Setting



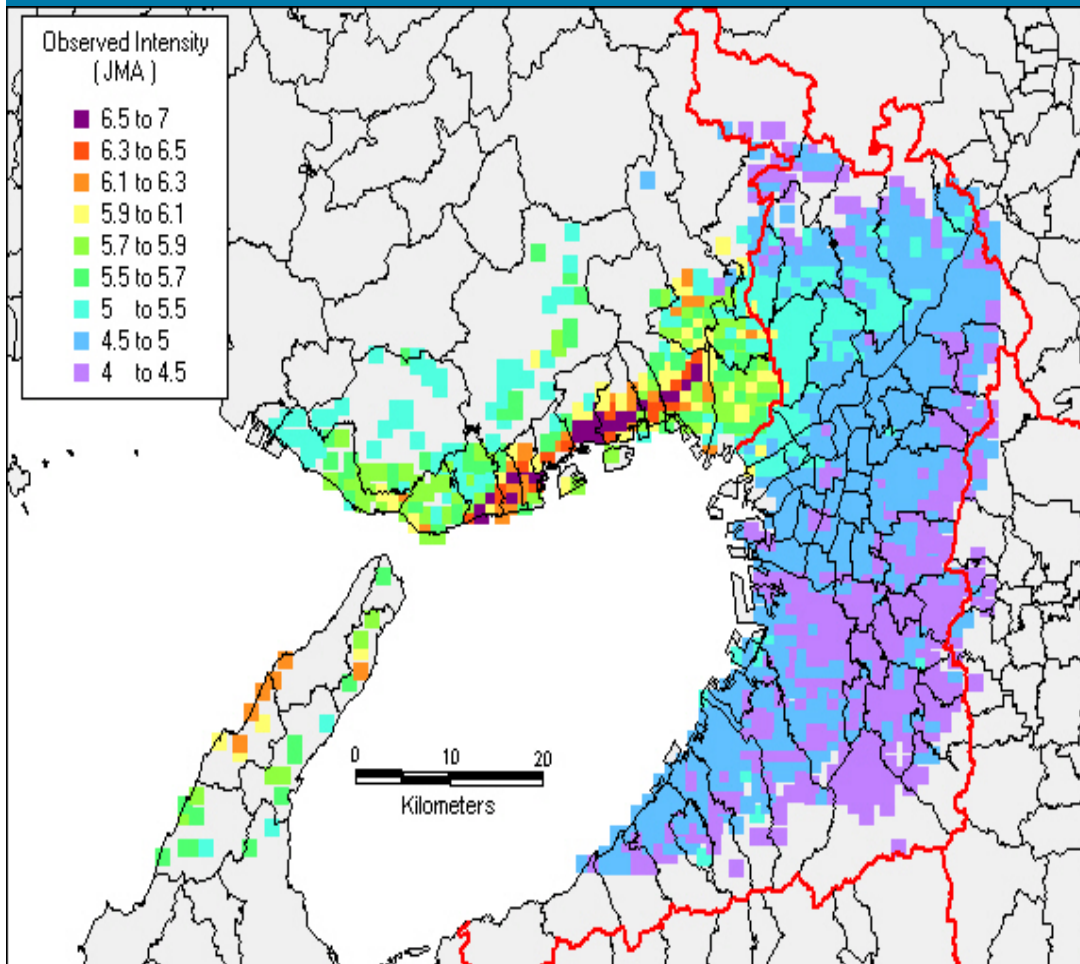
Nojima fault ruptured 40 km (25 miles) from the northern end of Awaji Island northeast through the city of Kobe

Strike Slip motion (Nojima fault) –
The average horizontal displacement 1.5 m

Depth of Focus: 16 km (10 miles)

Magnitude: 6.9 to 7.2

Fault Motion



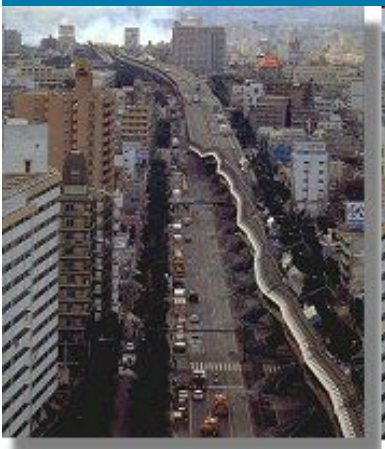
High ground motion and liquefaction occurred in the large deposits of soft alluvial soil and fill at Kobe Port and around the margins of Osaka Bay

Soil Liquefaction: When soils go from a solid state to a liquid state.

Observed intensity (JMA scale) from the Japan Meteorological Agency

Earthquake's Impact Overview

- Death Toll: 6,400, Injuries: 15,000
- Population: Osaka – 1.2 million Kobe – 2.6 million
- Most deaths occurred from collapsing buildings
- Fires consumed 203 acres of urban land
- 400,000 buildings were damaged – 100,000 of which collapsed completely
- Worst Earthquake in Japan since the Great Kanto in Tokyo, 1923 (claimed 140,000)
- The Elevated Highway connecting Osaka to Kobe collapsed



Earthquake Impact continued

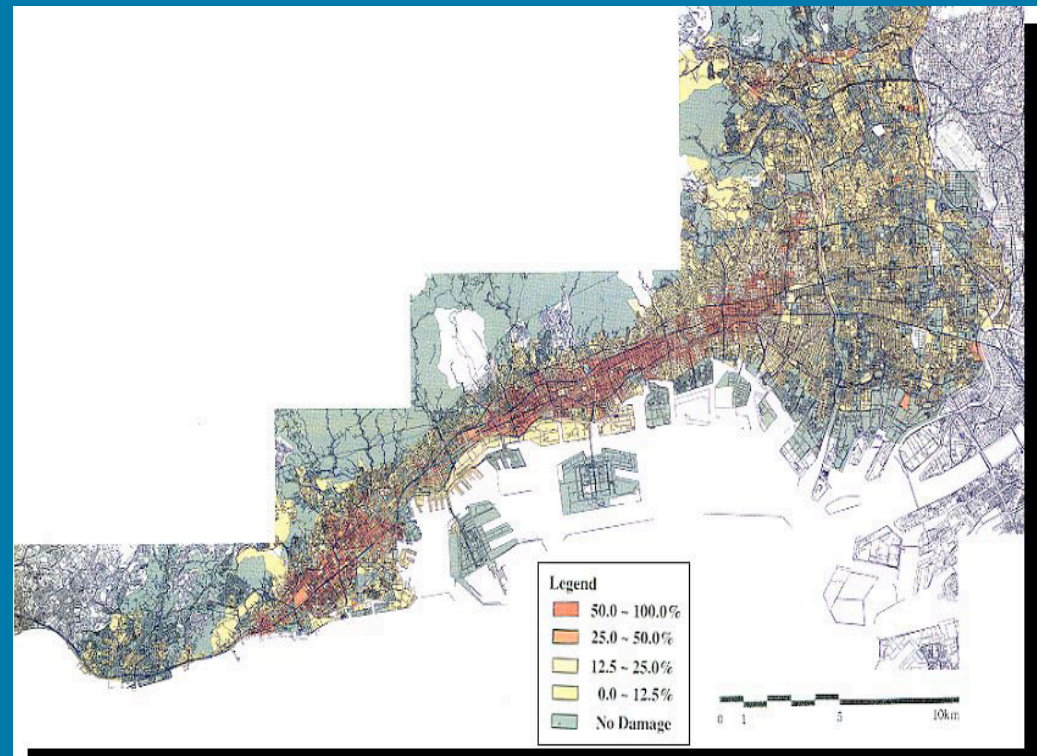
Impact on homes

- Damage was caused by strong shaking and subsequent ground deformation
- Destruction was concentrated in older, densely developed neighborhoods
- Neighborhoods- wooden houses constructed post WWII, but before 1981 when the seismic safety standards was updated
- The region's traditional wooden houses had heavy clay-tiled roofs which collapsed during the earthquake
- Most houses built after 1981 survived with only minor damages

Economic Impact

- 80% of the small businesses failed
- Damages to the City Port, chemical and steel manufacturers, city industrial zone, and 1/2 of the sake breweries were all damaged

Total cost = \$200 billion U.S.



Lessons Learned

Before rebuilding, the city spent 2 months dividing the land into 30 restoration districts to increase the city's growth after the construction was complete.

By seeking to create new growth through the restoration projects and the central government's initial prioritization and infusion of funding for infrastructure rehabilitation, Kobe's economy recovered 75% to 90%, by 1999, of pre-event capacity.



Changes Made

- Residential earthquake insurance scheme
 - If a house has earthquake insurance, any tiered damage is covered.

The Kobe Earthquake instigated new research programs in earthquake engineering, seismology, and disaster management both in Japan and around the world.

The success of the 1981 building code encouraged the use of ductile reinforced concrete structures – this provides a building with flexibility

Improvements to wall designs were implemented in Japan within one year of the Kobe earthquake.

The mapping of Japan's faults, to develop comprehensive seismic hazard maps, was completed and released in Autumn 2005.

Sources Used

1995 Kobe Earthquake 10-year Retrospective, Copyright 2005, Risk Management Solutions, Inc. January 2005

<http://www.ce.washington.edu/>

<http://tokyo5.wordpress.com/2009/11/>