

05 Apr 1995, 6:30 pm - 6:45 pm

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Pradhan, T. B. S., "Acceleration Distribution and Fault Location During Kobe Earthquake" (1995). *International Conferences on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics*. 4.

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Acceleration Distribution and Fault Location During Kobe Earthquake

T.B.S. Pradhan
Japan

ABSTRACT: An earthquake of magnitude 7.2 struck Kobe area at 5:46:51 am, on 17th January, 1995. The earthquake was named "South Hyogo Prefecture Earthquake" by Japan Meteorological Agency (JMA) and also named "The great Hanshin Earthquake" by the government. The epicenter of the main shock was located by Kyoto Univ. and Nagoya Univ. to be at latitude 34.641°N, longitude 135.179°E, and depth 13.3km. The seismic intensity at the center of Kobe city was announced to be 7 in Japanese scale (by JMA) which was the highest ever experienced in Japan.

The locations of epicenters of the main shock and the after shocks together with the active faults are shown in Fig.1. The earthquake is believed to be caused by the movement of the Nojima fault (active fault) which runs below Awaji Island and Kobe. The after shocks were mainly located along Nojima fault and also along some other active faults like Suma fault, Suwayama fault and Ashiya fault. A fault rupture of about 9 km in length was observed on the ground surface in Awaji Island. The fault seemed to move about 1m in up-down direction and about 1.2 m in horizontal direction.

Strong motion data were recorded around the area by many organizations including Japan Railway Company (JR), Osaka Gas, JMA,

the Committee of Earthquake Observation and Research in Kansai Area (CEORKA). Fig.2 shows the distributions of peak ground acceleration (PGA) recorded. The nearest site to the faulting zone is Kobe Univ. which is situated on Mesozoic granite rock. At this site, a maximum horizontal velocity of 55.1 cm/s was recorded in NS direction and the PGA in UD direction was about 1.7 times of that recorded in NS direction. One of the main characteristics of this earthquake is that the PGA in UD direction is relatively higher than that on horizontal direction at many places. The maximum horizontal PGA was 833 gal by Osaka gas and 818 gal by JMA at the center of Kobe on the middle Pleistocene deposits. It seems that relatively high PGA was recorded on the Pleistocene or Holocene deposits along the fault. In a reclaimed Port Island, where a large area of liquefaction was observed, PGA in UD direction was 555 gal while NS component was 341 gal.

Acceleration wave forms differentiated from velocity records and also integrated displacement waveforms at JMA Kobe site are shown in Fig.3. This site didn't suffer from severe damage, however it is located just 2 km from heavily damaged area. At this site UD component (332 gal) is relatively smaller as compared to NS component (818 gal). Pseudo velocity response spectra are also shown in Fig.3. Peaks of spectra are around a period of 1 sec. It should be noticed that peak acceleration response of horizontal components are greater than 2000 gal.

Lastly, Dr. Yashima (Gifu Univ.) and Mr. Kagawa (Geo Research Inst.) are acknowledged for providing data.

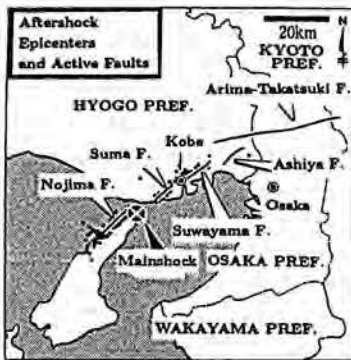


Fig.1 Main and after shocks locations and active faults (Jan.19,95)

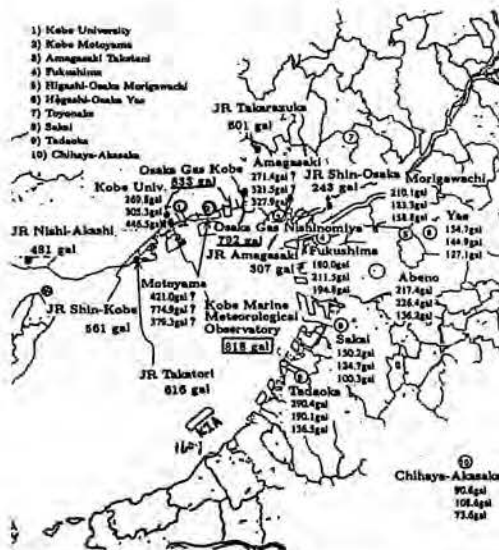


Fig.2 Distributions of PGA by different organizations

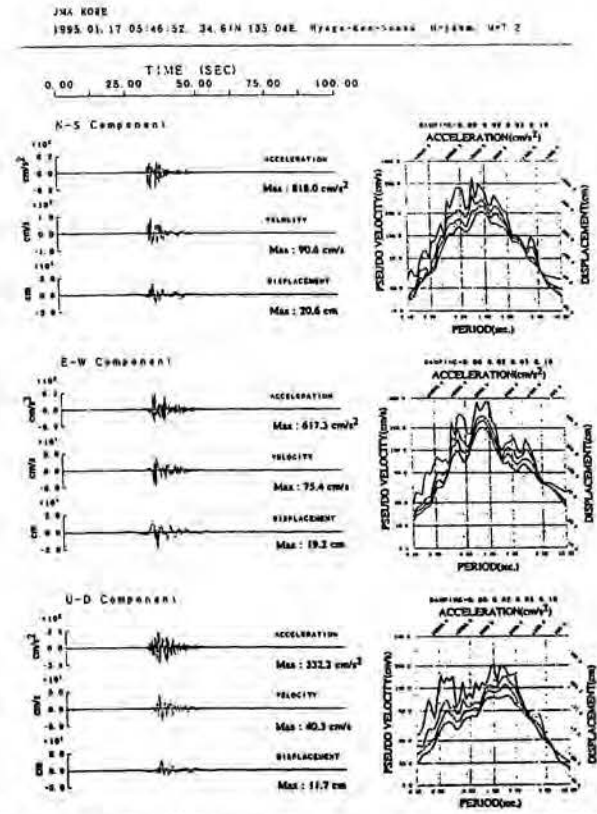


Fig.3 Acceleration, Velocity and Displacement waveforms at JMA Kobe site and response spectra