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ON THE STUDY FOR ABNORMAL INTENSITIES AT THE SAKAIMINATO CITY RECOGNIZED ON THE TOTTRI-KEN SEIBU EARTHQUAKE (2000, M7.3 JMA)

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SUMMARY

On the occurrence of the Tottori-ken Seibu Earthquake (2000, M7.3, JMA), we recognized the abnormal intensity region in and around the Sakaiminato city, Tottori Prefecture, Japan. The region, observed high intensity, appeared at the central part of the Sakaiminato City. We send out the detail questionnaire about the intensity. From that result, the region shape was zone (0.5〜1.0×3.0km). The intensity at this zone was lager by about 1 of JMA scale. To elucidate the mechanism of appearance of this zone, we studied the underground structure below the Sakaiminato City. We used the 3DFDM method for our study. As the result, we concluded that the abnormal intensity zone had been caused by the amplification of seismic wave at its shallow underground.

INTRODUCTION

The strong ground motion was observed at the ground surface on the occurrence of the shallow large earthquake. It was pointed out that thrown boulders were recognized around the epicentral region. On the Hyogo-ken Nanbu Earthquake (1995, M7.3), the "heavily damaged zone" with seismic intensity 7 (JMA scale) appeared from Kobe City to Ashia City, Hyogo Prefecture, Japan. That was caused by the underground structure [1. A. Pitarka et al., 1996]. Recently, Tottori-ken Seibu Earthquake (2000, M7.3) occurred. The abnormal intensity zone (large intensity area) appeared at the central part of the Sakaiminato City, Tottori Prefecture, Japan. Sakaimimato City was apart from the epicenter of the Tottori-ken Sebu Earthquake (about 30km). So, the cause of appearance of that zone was not seismic source effect. We estimated that the zone was caused by seismic wave generated at the underground of Sakaiminato City. A seismic observation study was carried out by Tottori government at Yumigahama Peninsula, 2002 (Tottori-ken, 2002). 1D sub-ground structure was elucidated by that observation. We discussed the detailed underground structure by 3DFDM [2. A. Pitarka, 1999] by using the Tottori-ken's structure. As the result, we concluded that the ground motion amplified just at the under ground structure caused the high intensity zone at Sakaminato City.

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METHOD

We simulated the seismic waveform of an aftershock of Tottori-ken Seibu Earthquake (2000 11 03). Waveforms were calculated by 3DFDM [2. A. Pitarka, 1999]. We succeeded in estimating the 3D sub-ground structure by this method in detail. We reproduced the differences of intensities at Sakaiminato City with synthetic waveforms [3. Okamoto et al. 2003].

QUESTIONNAIRE OF INTENSITY

We send out the questionnaire of intensity at Sakaiminato City. Fig.1 shows the seismic intensity map by the questionnaire [4. Nishida et al., 2002]. We recognize the high intensity zone running parallel to the coastal line (Sakaiminato harbor). The width of this zone was 0.5〜1km and length was about 3km. Observed intensities varied with small scales.

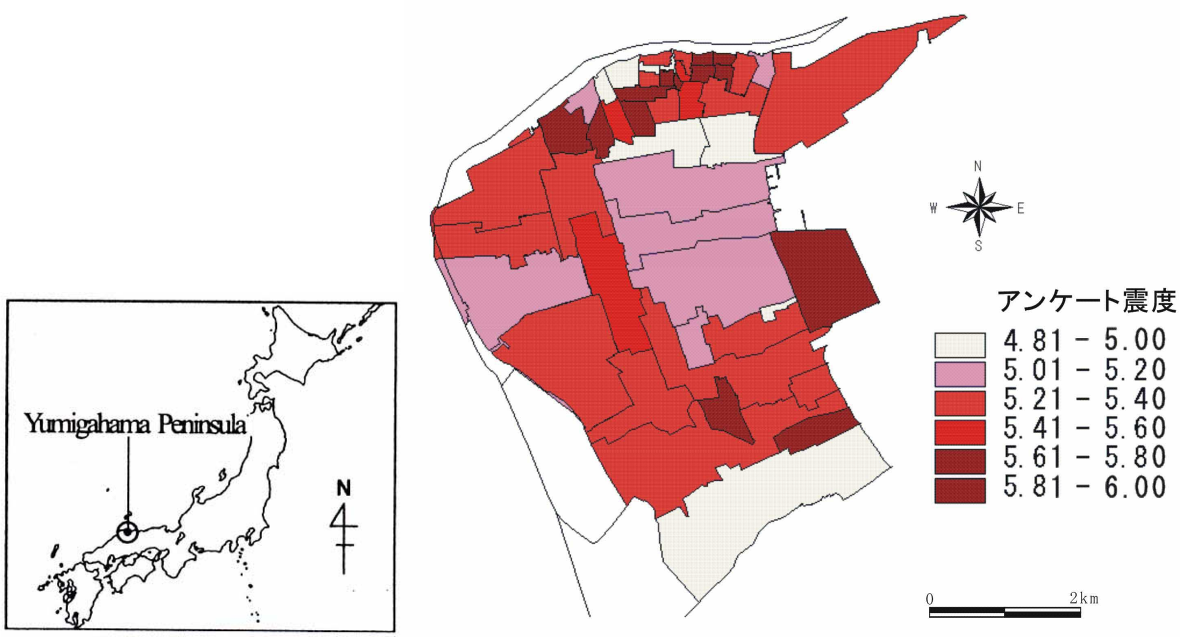

Fig.1, Seismic intensity map by the questionnaire in and around the Sakaiminato City, Tottori Prefecture, Japan.

SEISMIC OBSERVATION

We set the seismic observation system to record the waveform at high intensity zone, 2003 08 20. Observation systems were Akashi GPL-6A3P and Kinemetrics ALTAS K2 with 100Hz (sampling rate). Fig.2 shows the waveforms of an aftershock of Tottori-ken Seibu Earthquake (2003 12 13 M3.8). Waveforms of HGJ (observation station in high intensity zone) are larger than those of other observation stations. This means that waveform of HGJ was amplified by some mechanisms.

STRUCTURE

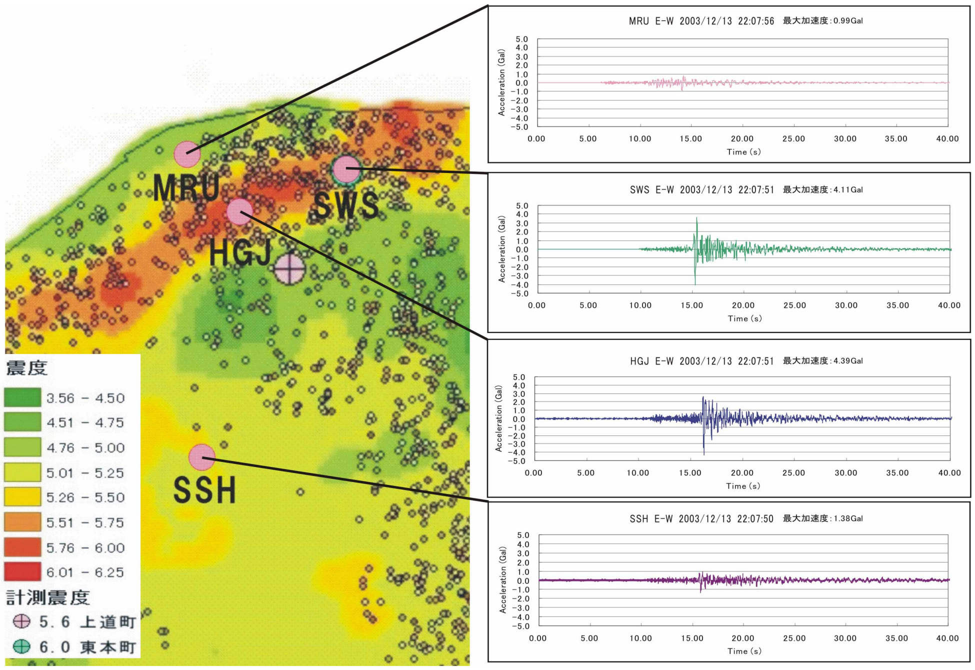

Fig.2, Waveforms of an aftershock of the Tottori-ken Seibu Earthquake (2003 12 13).

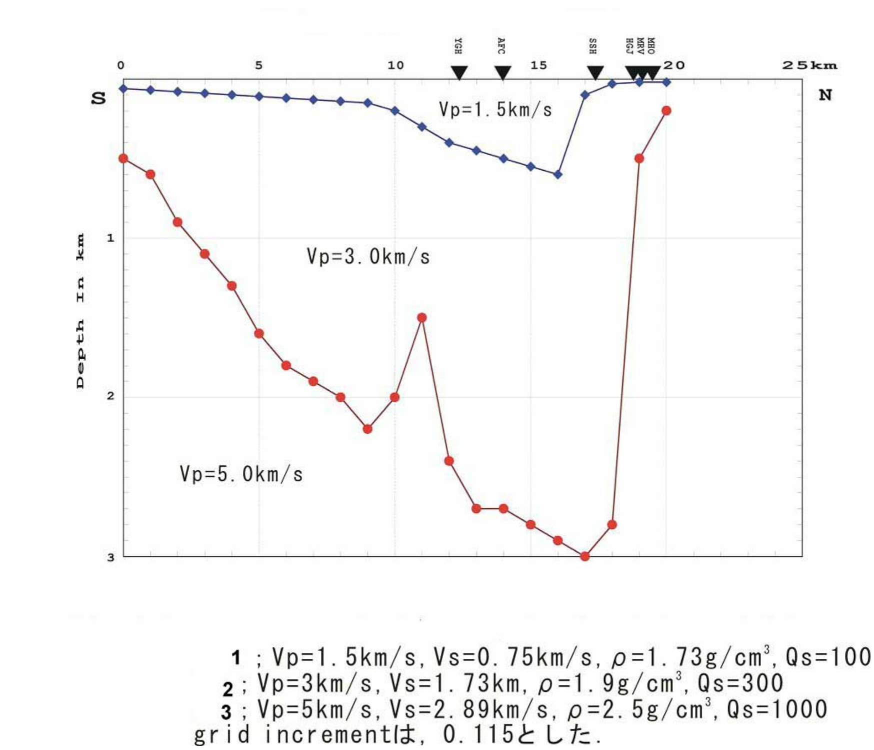

Fig.3, Cross-section of N-S structure under Yumigahama Peninsula

We estimated a detailed structure, which explains well the waveforms of an aftershock of Tottori-ken Seibu Earthquake (2000 11 03). Fig.3 is a cross section of the best structure in our study. The characteristics of this structure were that the basin structure was descending from Yonago City (south) to

Sakaiminato City (north) and ascending at Shimane Peninsula immediately. For the ground structure, the surface layer was thinning from south to north at Sakaiminato City. In calculation, we used 3D structure which that structure (N-S direction) continued 6km for E-W direction.

SIMULATION

We simulated the seismic waveform of an aftershock of Tottori-ken Seibu Earthquake (2000 11 03). Simulated seismic waveform was the supposition point distributed on Yumigahama Peninsula. Fig.4 shows the synthetic waveform calculated by 3DFDM method using the above-mentioned structure. We recognized the variation of waveforms at every point. The point in the high intensity zone (18km〜18.5km) showed the large amplitude (pulse waveform). We concluded that the high intensity had been caused by this pulse waveform.

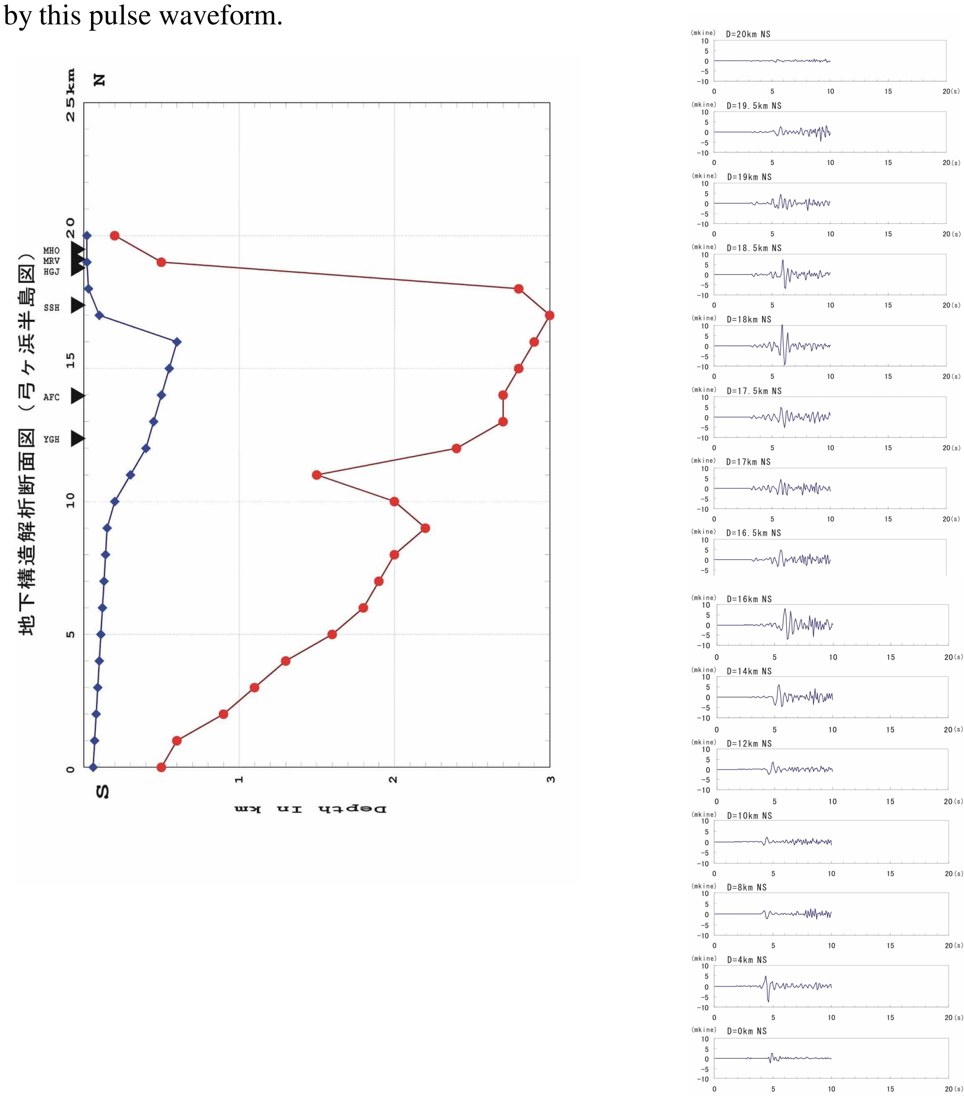

Fig.4, Simulation of waveform for an aftershock of Tottori-ken Seibu Earthquake.
The number (km) is the distance from South points. ▲ is the observation Station in fig.3

CONCLUSION

We studied the mechanism of appearance of the high intensity zone at Sakaiminato City. We concluded that the high intensity zone had been caused by the amplified waveform, basin edge effect under Sakaiminato City.

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