

Microtremor Survey in Sagaing City, Myanmar for Future Seismic Hazard Mitigation

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1. Introduction

This study mainly focuses on site characteristics of the Sagaing city and along the Sagaing Fault based on microtremor Horizontal-to-Vertical spectral ratios (HVRs) as a part of the seismic hazard assessment. Through the MHVRs, we are expecting to output the site amplification map which will be used to make a seismic hazard map as well as a damage potential map for Sagaing City. Our final goal is to put site amplifications into Myanmar National Building Code (MNBC), which will lead to safer building construction in Myanmar.

2. Seismicity around the Sagaing area

Sagaing City is a historically important city in Myanmar and its socio-economic condition has a great effect over the whole country. Moreover, this city is rich of religious and cultural heritage. The historical records indicate that the Sagaing area have experienced several destructive earthquakes in the past which were generated on the Sagaing Fault as revealed in Figure 1. According to the records from 1429 to 1956, a total of 18 major events had occurred around the Sagaing area. Although Sagaing city is located in highly seismically highly active region, no systematic and detailed studied for seismic hazard analysis have been done yet. This study intends to fulfill the requirement of Myanmar seismic hazard mitigation program as current and future investigation.

3. Microtremor Observation

The single station microtremor surveys have been conducted at over 100 sites with the sampling rate of 100 Hz including along the eastern and western sites

of the Sagiang Fault (see Figure 2). Moreover, array measurement was also conducted to identify the subsurface soil profile including the thickness of underlying soil layers, their density and shear wave velocity.

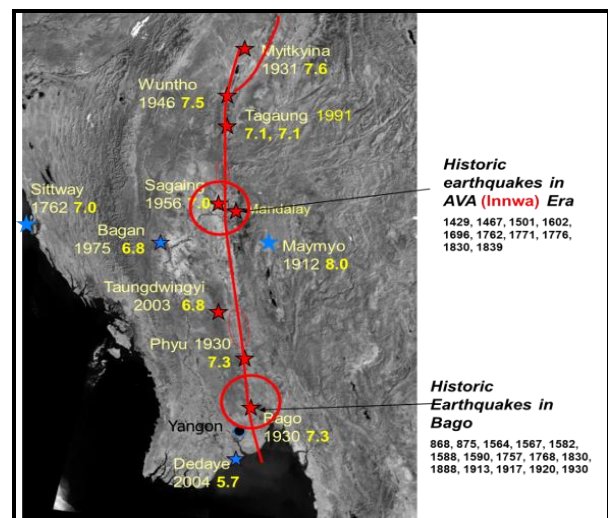


Figure 1 Historical earthquake along Sagaing fault and Sagaing City

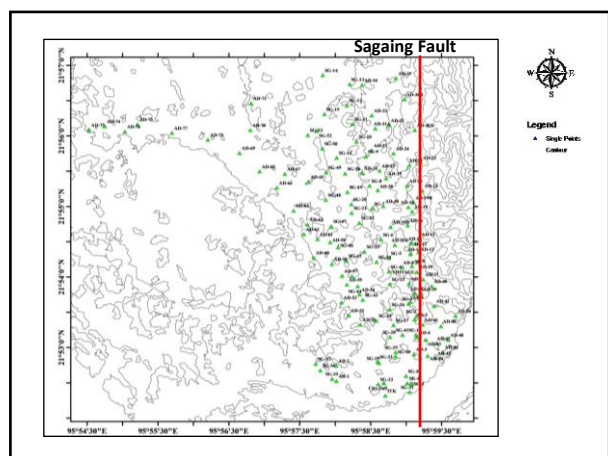


Figure 2 Single measurement sites for Sagaing city

4. HVRs of Microtremors at Sagaing City

The HVRs for Sagaing City shows two prominent peaks, one for deep structure at low frequency generally around 1Hz to 3Hz and another one is for

shallow structure at high frequency generally between 20Hz to 40Hz as shown in Figure 3.

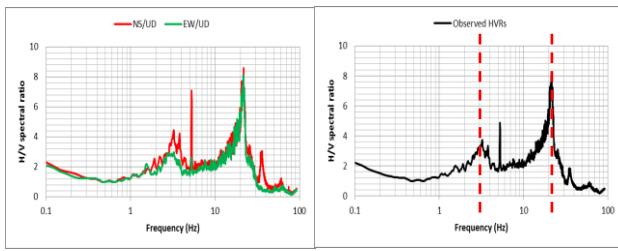


Figure 3 Results of HVRs for central part of Sagaing
The HVRs for sites around Sagaing Fault (eastern and western side of Sagaing Fault) indicate a peak around 5Hz to 10Hz in the lower frequency range, compared to the downtown area of Sagaing and it may reflect the topography and underground geological condition as shown in Figure 4.

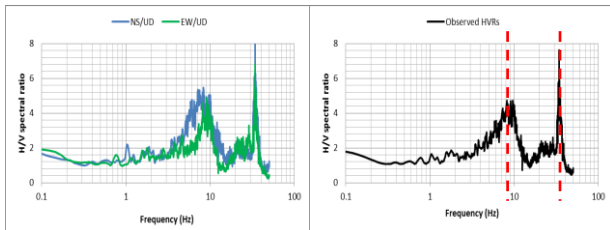


Figure 4 Results of HVRs for sites around Sagaing Fault

Depending on the results from the microtremor single measurement, we attempt to illustrate a map for fundamental frequency and peak amplitude of HVRs for Sagaing city as shown in Figures 5 and 6.

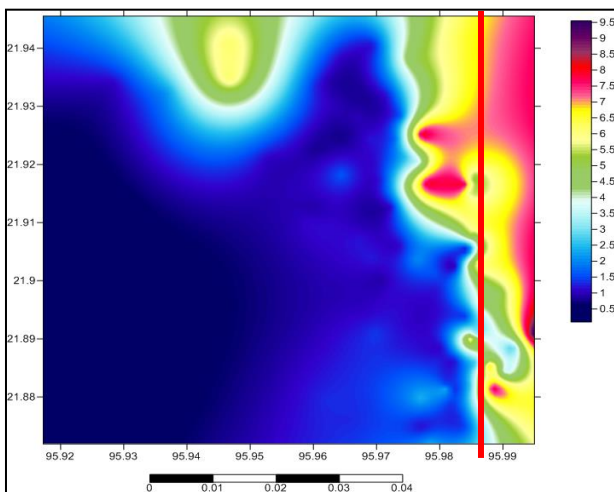


Figure 5 Fundamental frequency map of observed HVRs for Sagaing city

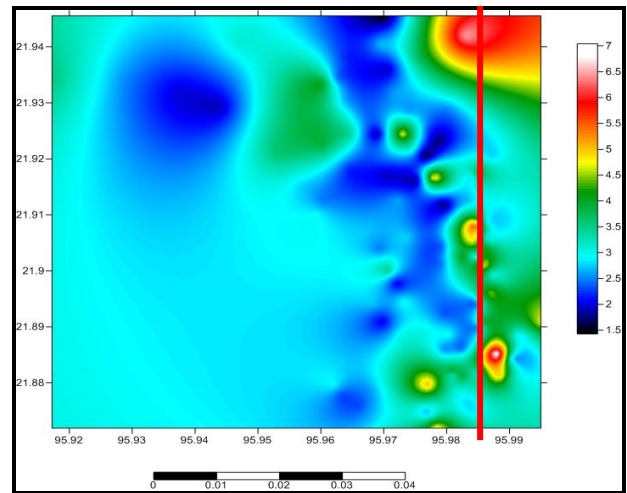


Figure 6 Peak amplitude map of observed HVRs for Sagaing city, the red line denotes the Sagaing Fault

Conclusion

Microtremor measurements have been conducted at about 100 sites in Sagaing city of Myanmar to support the national seismic hazard analysis. The peak amplitude of HVRs mainly related to impedance contrast defined by the density and shear wave velocity of soil layer. On the other hand, the fundamental frequency of HVRs mainly related to thickness and average velocity of soil layer. From MHVRs and the theoretical prediction based on the diffuse field concept, we can estimate the local site condition that is an important part of any seismic hazard assessment and it can generate significant changes in earthquake ground motion producing concentrated damage. The analysis for array measurement is being processed.

Acknowledgement

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