DEVELOPMENT OF CLOUD-TYPE MICROTREMOR OBSERVATION SYSTEM

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1. Introduction

In order to sophisticate seismic hazard maps, it is essential to construct highly accurate subsurface structure models. However, in addition that it costs immensely on boring surveys and seismic reflection surveys, it is very difficult to collect subsurface structure data in wide area although those efforts have ever been made. On the other hand, microtremor observations have been conducted in recent years, by which seismic period characteristics and subsurface velocity structure can be estimated in accuracy to some extent except earthquake observations. A microtremor observation is a greatly useful geophysical exploration method to construct subsurface structure models for earthquake ground motion prediction. For the purpose of obtaining dynamic characteristics on ground, it is necessary to make observations of microtremor, PS logging and surface wave. However, on especially PS loggings and surface wave surveys, it is not expectable to make a lot of observations due to a lot of costs, observers skills and difficulty of interpretation for analysis results. To get over these problems, we have ever developed an analysis method, equipment and a system with which we can make a great number of observations with quality of microtremor data kept.

2. Development of the Observation System

We made a system of a process from observation to analysis so that we can efficiently make use of the analysis methods described above. The system consists of ① a microtremor meter as an observation instrument, ② a mobile device, mainly a tablet device, which can transfer data from the spot to analysis system, ③ a cloud-type analysis system which can analyze data in real-time and can deliver analysis results, ④ a database and a data format which can manage data and analysis results etc.

3. Cloud-type Analysis System

Data registered in a database need to be automatically quality checked and analyzed, and then S wave velocity structure obtained from analysis results need to be delivered and checked with map information by using WEBGIS etc. Also, in order to confirm data quality check and analysis results on sites, it is necessary to analyze data transferred to a database in nearly real time and to make it possible to browse analysis results.

For realizing these requirements, it is our challenge to create an application for a smartphone and a &sbquocloud-type analysis system&sbquo which can rapidly conduct quality check and analysis of microtremor data. An application for a smartphone enables us to receive data in real time and to conduct quality check of data such as wave, spectra check and simple SN ratio management of microtremor, by using functions of &sbquoiBidou&sbquo. While, a cloud analysis system enables to conduct detailed analysis and quality check for received data, to estimate S wave velocity structure using the conventional analysis method almost automatically and to deliver analysis results within a few minutes. It is expected that this cloud system enables us to obtain analysis results from twenty to ten hundred times more rapidly than the normal system.

4. Conclusion

This system has a mechanism that human errors decrease on registration of location information, photos,

observation data, raw observed records and analyzed results because data registration and analysis etc. are completed on sites. By the mechanism, we can lend most of national institutes, which cannot conduct a research in spite of their willingness to observations due to expensive seismometers and beginners in the observation. In the future, increase of observer base, homogenization of data and acquisition of so many data can be the basis to create more accurate seismic hazard maps or earthquake susceptibility maps across the country.

Keywords: Microtremors, S wave velocity structure, Cloud system, Array observation

