Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SSS26-P14 Room:Convention Hall Time:May 26 18:15-19:30

Simulation of three-dimensional vibrational characteristics of mountains

SHIMIZU, Shogo[1*] ; YAMANAKA, Hiroaki[1] ; SAGUCHI, Koichiro[1] ; KOJIMA, Kaoru[1]

[1]Interdisciplinary Graduate School of Science and Engineering, Tokyo institute of Technology

Natural frequencies of soil and buildings are controlled by their physical property and regarded as one of fundamental characteristics in their vibration. We usually can identify a natural frequency from a largest peak of spectrum of vibration data. However, identification of a natural period is sometimes difficult for a building with a three-dimensionally complex shape. Kojima (2013) focused on the natural frequency of Mt. Fuji, from an analysis based on microtremor observation data and interpreted the vibration characteristics from finite element analysis[1]. However, many mountains existing in Japan have mountain-range shape such as Tateyama Mountain range and Yatsugatake Mountain. It is considered that their natural frequencies are more complex than a mountain with single-peaked shape such as Mt.Fuji.

In this research, I simulated vibration of various mountains with different shapes using finite element method (FEM). I firstly conducted FEM analysis using an elastic mountain models with simple three-dimensional shapes considering mountain range. Natural frequency for the mountain range model differs from single peak mountain model indicating large effects of three-dimensional shapes. I next conducted FEM analysis for vibration characteristics of mountain model with real shapes of Mt. Yatsugatake based on the digital elevation data. The results show that natural frequencies in long-side and short-side directions are different from each other. And vibration modes are also different between in higher and lower locations. This clearly indicated that sensor direction and installation site must be carefully oriented in a field observation of vibration in Mt. Yatsugatake.

Reference

[1]Kojima K (2013), Study on natural frequency of Mt.Fuji, Graduation thesis, Tokyo Institute of Technology

Keywords: mountains, vibration characteristics, natural frequency, vibration mode, finite element method, Mt.Yatsugatake