Estimation of underground S-wave velocity structure in Oita basin using array observations of microtremor

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Long-period ground motions in the period range of 5-10s were observed during the 2000 Tottori-ken Seibu earthquake in Oita basin, about 200km far from the epicenter (Nagawa et al., 2002). They pointed this long-period ground motion generation is related to the deep basin structure in this area. This shows that there is a potential of long-period ground motion excitation in Oita basin during huge earthquakes such as the hypothetical Nankai earthquake. As there are few S-wave velocity information in this area, we conducted array observations of microtremor in this area. Three observation sites were selected in Oita and Minami Oita area. Seven portable, long-period, vertical component seismometers arranged in a suitable triangular array whose station distance is from 200 to 1300m. The recording sampling frequency was set to be 100 Hz and duration of observation was about 60minutes for each array. The spatial autocorrelation (SPAC) method (Aki, 1957) was applied to microtremor array data to obtain the frequency-dependent phase velocity. S-wave velocity models are derived from modeling of phase velocity, assuming the fundamental-mode of Rayleigh waves, by the genetic algorithm. The observed phase velocities are dispersive from 0.2 to 2 Hz at each observation site. The S-wave velocities of the basement in the north and south sides in Oita city were 2.9 and 2.7 km/s at depths of 1.9 and 1.7 km, respectively. The S-wave velocity of the basement was 2.8 km/s at depth of 1.7 km in Minami Oita. A soft layer of the S-wave velocity of 0.3 km/s is observed near the surface in the north side and south sides of urban area in Oita city, while the S-wave velocity of the surface layer is 0.65 km/s in Minami Oita.