Estimating maximum seismic accelerations with micro-tremors - A basic idea and three examples -

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   We propose a basic idea for estimating maximum seismic accelerations due to the amplification in soft sediment layers by using microtremors, which we can observe easily.The main part of data analysis of our proposal is the Fourier transform of data in the frequency range from 2.0 to 4.0Hz. We calculate the sum of spectral amplitudes in the range from 2.0 to 4.0Hz, call it as spectral amplitude sum, and use it as an amplitude parameter of seismic vibrations. This range is not disturbed by artificial disturbances or predominant seismic waves with such frequencies around 1Hz or lower, from three large earthquakes in the present research; namely Noto Peninsula Earthquake (Mj6.9) occurred on Mar.25, 2007,fore- and Main-shock (Mj7.1 and 7.4) occurred off the Kii Peninsula on Sep.5, 2004. The spectral amplitude sums mentioned above of the three micro-tremor datasets for a period of about 10 sec just before the three earthquakes show sufficient stability of micro-tremors at different times on the same positions. The correlation coefficients between spectral amplitude sums of the three large earthquakes and the micro-tremors just before these earthquakes are 0.59 (0.74 without one outlier) on NS component of Noto Peninsula event, 0.30 on the NS component of the foreshock, and 0.85 on the NS component of the main shock. These high correlation coefficients indicate realization of reliable estimates of maximum seismic accelerations caused by large earthquakes with micro-tremor data and the source mechanism.