An examination of the relation between the distribution of microtremor
Horizontal-to-Vertical spectral ratios and the F distribution

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The distributions of microtremor Horizontal-to-Vertical Spectral Ratios (HVSR) have been
investigated, with a special attention to the relation with the F distribution, on the basis of
three types of microtremor waves: simple stationary waves numerically calculated with random
phases, realistic waves numerically simulated based on an elastic theory and a subsurface velocity
structure, and observed microtremor waves. The statistics D of the Kolmogorov-Smirnov (KS) test is
used as a measure of the discrepancy between the distributions. Our simulations estimating HVSR of
stationary waves with random phases indicated that the larger the circular variance of the
propagating directions of microtremor waves becomes, the more a distribution of HVSR approaches the
F distribution. Thus, the degree of the discrepancy from the F distribution depends on a
microtremor wavefield. The analyses of realistic-simulated waves and observed microtremor waves
revealed that the realizations of D took values between 1.5 and 6 % when the sample size was 3000.
Since a critical value of the test lied in this range, the results of the KS test could be changed
by incidental scattering. The above results indicate that the lower limit of D can be a several
percent or less when the sample size is adequately large, and that a concrete value of D, as well
as the results of the goodness of fit test, can depend on either biases or fluctuations in the
propagating directions of microtremor waves.

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