Evaluation of crack depth in concrete using amplitude distribution function of Rayleigh wave

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In Japan, some infrastructure built during the period of high growth after World War II is beginning to manifest changes in condition due to deterioration. However, the reality is that issues remain in terms of lack of engineers and the need to secure a budget for inspection and diagnosis. Therefore, there is still a strong need to develop, and socially implement, more efficient and effective diagnosis techniques. Rayleigh wave technique is one of the non-destructive inspection technique applied to estimate the crack depth of concrete. This technique is based on the attenuation behavior of Rayleigh wave and applicable to deep cracks for estimating. However, this method has not been theoretically explained but empirically explained. The purpose of this study is to clarify the attenuation behavior defined with the amplitude distribution function of Rayleigh wave. In this study, concrete specimens with simulated surface-opening crack several depth was fabricated. Two AE sensors were attached to surface of the concrete specimen, at same distance away from the surface-opening crack. Elastic waves with various frequencies were generated at a point on the extension of line connecting those sensors. Waveforms of the elastic wave before and after passing through the crack was recorded and the amount of attenuation was confirmed. As a result, it is confirmed that the attenuation of Rayleigh wave at the crack can be precisely described with using its amplitude distribution function.