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Assessment of micro-scale damage near concrete anchors using non-destructive method

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ABSTRACT

The integrity of concrete surrounding anchors is critical, as undetected micro-cracks may compromise structural performance. This study presents a novel non-destructive testing that utilizes mechanical wave energy to identify micro-scale damage near anchors—damage often undetectable by conventional NDT methods. A non-contact ultrasonic sensing system was employed, enabling analysis of wave propagation in the frequency–wavenumber (f–k) domain. The method was validated through numerical simulations and experiments on five specimens subjected to varying loads to induce realistic cracking. Results demonstrate that this approach enables accurate detection and localization of micro-damage, even when structural behavior remains largely unaffected.

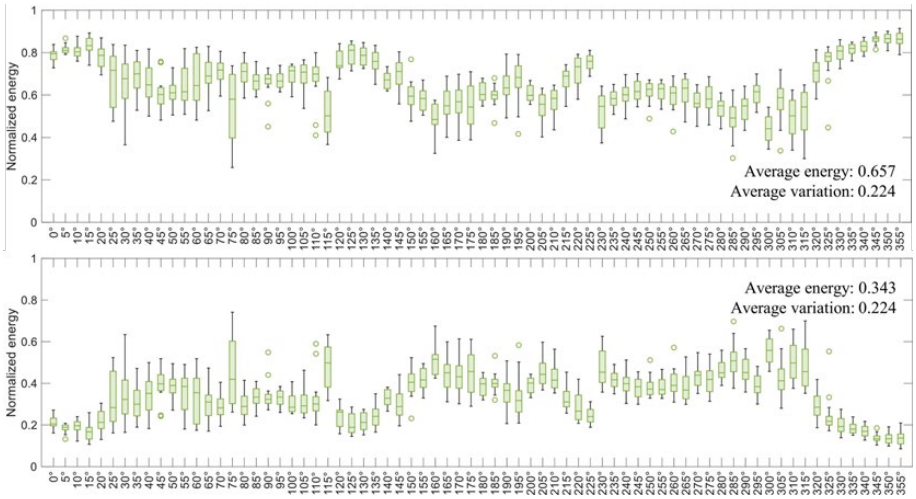

Fig. 1 Normalized energy results of (a)propagating waves and (b)scattering waves

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