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In Situ Characterization of ASR Damage in Concrete Using Contactless Ultrasonic Measurements

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ABSTRACT

In this paper, work to characterize cracking damage in concrete caused by alkali-silica reactivity distress is presented. We apply contactless ultrasonic scan inspection using a multi-channel MEMS microphone array system to collect ultrasonic wavefield data from concrete subjected to ASR-promoting environments. Then, a wavefield data processing approach is presented to extract damage-sensitive wave scattering components and characterize the extent of ASR damage. The location and extent of ASR damage are established by internal expansion measurements from embedded strain gauges, scanning electron microscope images of cored samples, and expansion measurements from companion samples. The results demonstrate the feasibility and accuracy of the presented approach to characterize ASR damage in concrete. The fully contactless ultrasonic measurement system does not require separate concrete samples and enables *in situ* characterization of ASR damage within concrete structures.

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