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SHANNON WAVELET ENTROPY AND ACOUSTIC EMISSION APPLIED TO ASSESS DAMAGE IN CONCRETE IN DYNAMICAL TESTS

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Abstract. Shannon wavelet entropy (SWE), a powerful mathematical tool for transient signal analysis, is applied to acoustic emission signals originated in crack like damages. In previous work, the complex Morlet Continuous Wavelet Transform (CWT) was applied to acoustic emission (AE) signals from dynamic tests conducted on a reinforced concrete slab with a shaking table. Comparison of the evolution of the scale position of maximum values of CWT coefficients and the histories of response acceleration obtained in different seismic simulations allowed us to identify the frequency band corresponding to the fracture of concrete, which is the main failure mechanism. In the present work, the same frequency band, assigned to fracture, was considered. The discrete dyadic wavelet transform (DDWT), a faster transform algorithm, is first used as a filter to obtain the coefficients in the desired frequency band, and then SWE is calculated. SWE is extracted from each AE hit, which allows us to obtain the SWE evolution over the test duration and connect sharp transitions of entropy values with the occurrence of dangerous macro cracks.