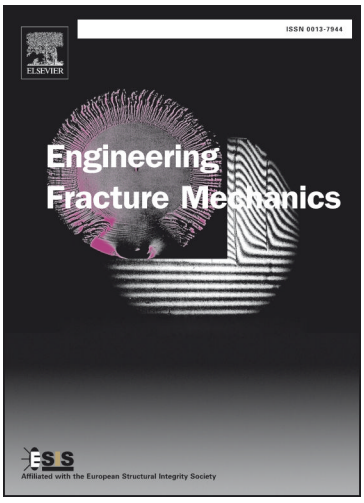

Model uncertainty in discrete and smeared crack prediction in RC beams under flexural loads

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MODEL UNCERTAINTY IN DISCRETE AND SMEARED CRACK PREDICTION IN RC BEAMS UNDER FLEXURAL LOADS

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Abstract

Advanced non-linear finite element models are currently available to perform the design of concrete structures. The development and calibration of the safety factors for the next generation of design guidelines will require a deep understanding of the uncertainty associated with such models. This paper presents a first study focusing on the assessment of the uncertainty of discrete and smeared crack models applied to the simulation of the behavior of RC beams under flexural loads. The discrete strong discontinuity approach (DSDA) and the smeared crack model available in ATENA were chosen for this purpose. Experimental data for mean and maximum crack widths, and average crack spacing for four beams were used as reference. The mesh size dependency and its relation with the uncertainty in the prediction of deflections, crack openings and spacing was investigated. The model uncertainty of mean and maximum crack widths was evaluated for progressive load stages of serviceability conditions for the two crack models considering subsets of data based on the reinforcement ratios and concrete cover.

Keywords: Discrete crack models, smeared crack models, numerical simulation, model uncertainty