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Operational assessment of time-varying of seismic vulnerability of reinforced concrete buildings during aftershock sequences based on period elongation

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Post-seismic decision-making relies, amongst others, on safety assessment of structures and/or critical infrastructures. In this context, we present a performance-based framework, which models the variation with time of the vulnerability of reinforced concrete buildings during aftershock sequences. The measurement of eigenperiod elongation, which is a performance metric and has been associated with structural damage, can complement visual inspection and assessment of structural health as a post-seismic operative tool. The proposed framework is applied in the case of simplified reinforced concrete building models during two real aftershock sequences. Thresholds of period elongation are used to define damage states. Probabilistic seismic demand assessment is performed using models of the buildings in the damage states in order to compute their fragility curves. The time-variant vulnerability is modeled with Markov chain as a function of the characteristics of the aftershocks sequence. Finally, the probabilities of the damage states are computed as a function of time during two real aftershock sequences.