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Rupture Directivity Effect on Seismic Vulnerability of Reinforced Concrete Bridge

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Earthquake catastrophes menace humans‘ lives and assets. Although earthquakes are inevitable, damage is not. To remedy this situation, significant amount of research is conducted in order to assess the performance of existent man-made structures, particularly infrastructures such as bridges which play a vital role in post earthquake services. The results can be used for assessing retrofit prioritization for structures and as a basis for economic loss estimations.
The research presented here determines the vulnerability of a common typical two-span reinforced concrete bridge by generating fragility curves. Near-fault ground motions are different from ordinary ground motions, often containing strong coherent dynamic long-period pulses and permanent ground displacements. Here special attention is given to this type of ground motions, and their effects on the seismic behavior of structure are compared with ordinary motions. The results show near-fault ground motions exacerbate the seismic vulnerability of a bridge by about 68% in comparison with near-field ground motions. In other words, near-source ground motions with forward directivity effect are more dangerous.