

Near-Source Earthquakes: Recent Seismological Progress and Structural Impact

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Near-source earthquakes, occurring in close proximity to fault rupture zones, generate intense ground motions that can severely damage the structures, as shown also by recent earthquakes in Turkey and Central Italy.

To comprehensively address this issue, a multidisciplinary approach within the framework of probabilistic seismic hazard assessment (PSHA) is essential, integrating both seismological and engineering perspectives. Near-fault earthquakes produce distinct effects such as directivity pulses, high-frequency shaking, and permanent ground deformation. In dip-slip faults, vertical slip generates intense vertical motion, sometimes exceeding horizontal motion, especially in soft soil. At short spectral periods, the vertical-to-horizontal spectral ratio (V/H) can surpass unity, increasing risks for vertical-sensitive structures like masonry buildings, low-rise buildings, and long-span bridges. Additionally, near-fault pulse-like ground motions impose significantly higher seismic demands on structures compared to non-pulse-like motions. Therefore, studying near-source earthquakes is crucial for improving building codes, designing resilient structures, and minimizing damage in earthquake-prone regions.

In view of the foregoing, the proposed mini-symposium has been devised to emphasise and discuss novel advancements in the characterisation of near-fault earthquakes and the evaluation of structural risk in near-fault areas. To this end, high-quality contributions are invited, focusing on the investigation of the current state-of-the-art, recent advancements, practical applications, and future perspectives. Review, methodological, numerical and experimental papers are invited for consideration on the following topics (though not limited to):

- advances in near-fault earthquake characterisation;
- development of ground motion models for near-fault earthquakes;
- numerical investigation on structural behaviour under near-fault earthquakes;
- experimental tests of structures subjected to near-fault earthquakes;
- investigations on the effects of the vertical component on structural vulnerability;
- risk assessment of structures in near-fault site.