Research Topic: (1) structural safety under near-fault and/or multiple hazards (earthquake, wind, flood, fire, etc.) threat, and disaster mitigation strategies for improving resilience

Understanding Near-Fault Ground Motions from Recent Large Earthquakes

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In 2016, Taiwan, Japan, and New Zealand were struck by Meinong (Mw 6.4), Kumamoto (Mw 7.0), and Kaikoura (Mw 7.8) earthquakes in sequence. We looked the strong motions of the three significant earthquakes and proposed three major issues.

1. BLIND FAULTS IS AN SIGNIFICANT ISSUE IN TAIWAN

Several moderate to large earthquakes (2010 Jiashin, 2012 Wutai, 2013 Nantou sequence, 2013 Ruisui, and 2016 Meinong) occurred in Taiwan recently were caused by the so-called blind faults. Complex tectonophysics makes deeper seismogenic zones for crustal earthquakes in Taiwan compared with California, and thus lots of blind faults in the subsurface were produced. Buried faults are believed able to cause larger ground motions than which rupture to the surface. Meinong earthquake further verified that a blind fault may generate pulse-like velocities, which is a critical menace to buildings. Blind faults in Taiwan are worth more attention.

2. VERTICAL MOTION SHOULD BE CONSIDERED CAUTIOUSLY

Stations close to epicenter or fault recorded relatively strong vertical motions which may exceed horizontal motions at significant frequencies during both Kumamoto and Kaikoura earthquakes. Vertical motions have to be considered with cautions rather than just treat as 2/3 of horizontal motions.

3. EFFECT OF MULTIPLE VELOCITY PULSES ON STRUCUTRES

Multiple velocity pulses were observed during all the three earthquakes; however, the causes may be different. Multiple velocity pulses may caused by complex fault ruptures (Kaikoura), site effects (Kumamoto), topographic effects (Meinong), etc. We have to figure out the effect of multiple velocity pulses on structures.