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understanding and managing extremes

Negev Precariously Balanced Rocks – stability analysis of in-situ rock pillars and initial implications for seismic hazard studies

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Precariously Balanced Rocks cannot withstand strong ground motion. When a strong earthquake occurs in their vicinity, they are likely to break or topple. By evaluating the stability of PBRs and determining their age, it is possible to constrain the maximum PGA that has occurred at PBR sites during their lifetime. This methodology has been proven as effective in determining the maximal earthquake magnitude of faults around the world, and has been applied to improve both deterministic and probabilistic seismic hazard analysis. In the Negev, slender, in situ rock pillars constitute a particularly important subset of PBRs as their seismically induced motion may be amplified if their natural frequency is within the range of seismic wave frequency (1-10 Hz). The motion of such pillars may be complex with an initial stage of resonance swaying followed by toppling or failure of a weak layer or crack.

An analysis of plausible pillar motion based on its dimensions and structural characteristics indicates that certain slender pillars are likely to experience resonance motion leading to toppling or failure. Non-slender pillars have a high natural frequency and therefore are not likely to experience resonance motion, and on the other hand, extremely slender pillars are more likely to topple before experiencing resonance motion.

In the Negev, several pillars that were found to be ~10,000 years old were used to explore potential implications for constraining the maximum magnitude of earthquakes along the Negev-Sinai Sear Zone faults and the Arava Fault.

We show that assuming a plausible amplification of motion, the pillar analysis may yield strong constraints on fault seismicity parameters and may indicate a need to re-evaluate ground acceleration maps. Dating and stability analysis of PBR and pillars provides important new insights for regional seismic hazard studies.

**Tuesday, February 12th 2019, 16:30 Sala del Camino
Palazzo del Broletto Piazza della Vittoria 15 – Pavia**