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Hazard Zone For Strike-Slip Earthquakes

Everything from bridges to pipelines to railroads and buildings could be at risk from fault ruptures near active strike-slip faults, but the hazards of building along or near such ruptures are poorly understood. Now, Mark Petersen and colleagues use information from 22 major earthquakes worldwide to define the potential dangers of building along or near these faults. Knowing more about possible horizontal and vertical movements along a fault, the researchers say, can aid engineers in their designs and help urban planners understand the financial, environmental, and health risks of building in this hazard zone.

In their study, Petersen and colleagues offer a method for calculating rupture hazards at sites near steeply-dipping, strike-slip faults. For active faults where large earthquakes occur repeatedly over a few hundred years, engineers should consider the design of structures near the main fault; within 150 meters of well-mapped active faults with a simple ground surface trace; and within 300 meters of faults that have poorly defined or complex surface traces.

"Fault Displacement Hazard for Strike-Slip Faults"

Authors: Mark D. Petersen, David P. Schwartz and Arthur D. Frankel of the U.S. Geological Survey; Tim E. Dawson, Rui Chen, Chris J. Wills and Tianqing Cao of the California Geological Survey.

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Predicting Quake Shaking in Southern California

Data from last April's El Mayor-Cucapah earthquake offer a unique way to test how well large-scale 3D simulations predict ground shaking for future large magnitude earthquakes. For Southern California, say Robert Graves and Brad Aagaard, the models generally provide good predictions, with a few exceptions that highlight areas needing further study. The models tend to over-predict the intensity of shaking in the San Diego region and under-predict motion in the Mojave Desert. The predictions have mixed success in the greater Los Angeles basin. Altogether, the simulations could prove useful in modeling the ground motions expected in future large earthquakes in the region.
To see how well simulations are able to reproduce the ground motions observed in an actual earthquake, the researchers compared simulated ground motion with actual ground

motion data collected throughout Southern California during the 7.2 magnitude El Mayor quake, which occurred in Baja California. In ten different models examined, the predictions match reasonably well with the El Mayor data. The predictions vary less widely for earthquake ruptures that have slip concentrated primarily at shallow depth—less than 5 kilometers below the ground surface—compared to those with slip concentrated at depths below 10 kilometers.

"Testing Long-Period Ground-Motion Simulations of Scenario Earthquakes using the Mw 7.2 El Mayor-Cucapah Mainshock: Evaluation of Finite-Fault Rupture Characterization and 3D Seismic Velocity Models"

Authors: Robert Graves and Brad Aagaard of U.S. Geological Survey.
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Seismically "Noisy" Wind Farms

At the Virgo gravitational wave observatory south of Pisa, Italy, scientists are investigating the tiny space-time ripples created by events like a supernova explosion or a spinning neutron star. But signals from these distant events could be muffled by a seismically noisy and Earth bound neighbor -- a nearby wind farm. Gilberto Saccorotti and colleagues analyzed the seismic noise wavefield near Virgo, and traced the source of some intense low-frequency ground vibrations to the farm's wind turbines.

The researchers examined the pattern of the turbine vibrations, following how the vibrations spread and weaken over time and space. Their analysis provides important observations that could help other observatories and seismograph stations account for the impact of wind farms on their data collection. Wind farm "noise" could present a particular challenge in parts of seismically active parts of the United States, such as California, where the construction of new wind farms is on the rise.

"Seismic Noise by Wind Farms: a Case Study from the VIRGO Gravitational Wave Observatory, Italy"
Authors: Gilberto Saccorotti and Davide Piccinini, of Institute Nazionale di Geofisica e Vulcanologia (Italy); Lena Cauchie of University College of Dublin, School of Geological Sciences (Ireland); and Irene Fiori of European Gravitational Observatory (Italy).

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