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## **October Tipsheet for Bulletin of the Seismological Society of America**

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Highlights from the issue:

### **Strong ground motions – what is the potential maximum?**

Engineers construct structures to endure large ground motion caused by earthquakes, based on empirical data and theoretical models. With only a 75-year instrumental record, the sparsely arranged seismic networks are unlikely to have captured the most extreme ground motion possible. In this review article, authors Fleur O. Strasser and Julian J. Bommer address the question of how much greater than the largest observation to date could future ground motions be? With a thorough review of past observations and an overview of current theoretical models of possible ground motion, the authors suggest that the current global record of strong motion data reflects only a very small sample of what is physically possible. However, past observations have influenced, perhaps falsely, the perception of the upper limit of ground motions, particularly given the typical recurrence interval for large earthquakes exceeds the brief instrumental history. It is therefore improbable, say the authors, that the "worst" possible ground motion has been recorded – even if it had, it would be impossible to prove that this was the worst. The continued accumulation of empirical data will inform the field, most likely through use in constraining theoretical models.

“Review: Strong Ground Motions – Have We Seen the Worst?” by Fleur O. Strasser of Council for Geoscience, South Africa, and Julian J. Bommer of Imperial College, UK.

### **Archaeoseismology: Simulating toppled columns**

New research looks at whether toppled columns of ancient ruins can reveal the source of the earthquake that caused the damage. Ever since man-made structures were first erected, earthquakes have left their mark on them, giving seismologists clues to past seismic activity. Toppled single block artifacts, such as tombstones, can point to the severity of ground motion after an earthquake. This research considers more complex artifacts, a monolithic column and one consisting of seven drums, to determine whether there is a correlation between how these objects fell and the direction to the earthquake and the type of fault motion that occurred during the event. Research by Klaus-G Hinzen



of the University of Cologne shows that calculating the downfall of objects is not so straightforward due to the complexity of ground motions.

The electronic supplements

([http://www.seismosoc.org/publications/BSSA\\_html/bssa\\_99-5/2008241-esupp/index.html](http://www.seismosoc.org/publications/BSSA_html/bssa_99-5/2008241-esupp/index.html)) show the simulations discussed in the article.

“Simulation of Toppling Columns in Archaeoseismology” by Klaus-G. Hinzen, Institute for Geology and Mineralogy at the University of Cologne, Germany.

### **Filling in the historical record of large quakes along the North Anatolian Fault (NAF) in Turkey**

The Northern Anatolian Fault in northern Turkey produced several large earthquakes in the 20th century that caused significant loss of life and extensive damage to the population centers located near the fault. The earthquakes, beginning in 1939 and culminating in 1999, are a well documented sequence whereby the strain from one rupture brings the adjacent fault strand to a near critical stress, leading to propagation of strain along the fault. The authors of this study sought to expand the past incomplete record of major earthquake activity to determine whether the sequence of earthquakes experienced in the 1900s reflects an historical pattern. Authors identified the timing of seven large earthquakes over the past 3000 years prior to the 1943 Tosya earthquake, with an average inter-event time of 385(+166 years).

“A 3,000-Year Record of Ground-Rupturing Earthquakes along the Central North Anatolian Fault near Late Ladik, Turkey” by J. Fraser, A. Hubert-Ferrari, K. Vanneste and U. Avsar of Royal Observatory of Belgium; J.S. Pigati of U.S. Geological Survey; and S. Altinok of Osmangazi University in Turkey.

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