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For immediate release

Media Tip Sheet for the Seismological Society of America (SSA) Annual Meeting April 11-13, in Memphis, Tennessee
New Madrid Seismic Zone and March 2011 Japan Quake among featured topics

*** Special sessions on the Japan and Christchurch earthquakes will focus on preliminary data, observations and analyses. A separate tip sheet and schedule of audio briefings will be available in early April. ***

This tip sheet highlights presentations at the upcoming international meeting of SSA, which is an international scientific society devoted to the advancement of seismology and its applications in understanding and mitigating earthquake hazards and in imaging the structure of the Earth.

These summaries reflect submitted abstracts and the actual presentations will include additional data and analysis. We are available to assist you should need to contact speakers at the annual meeting.

Please cite the Seismological Society of America as the source of this information.

All abstracts can be found at http://www.seismosoc.org/meetings/2011/abstracts/

WEDNESDAY, APRIL 13, 2011

New Madrid Seismic Zone: Our Understanding on the 200th Anniversary of the New Madrid Earthquake Sequence
Ballroom C, 8:30 a.m. – Noon

On the Bicentennial of the New Madrid Seismic Zone (NMSZ) earthquakes, experts examine the state of knowledge about one of the most enigmatic regions of earthquake hazard in the world. The New Madrid region, which stretches some 150 miles from near Memphis to Paducah, Kentucky, is an active seismic zone with 15 earthquakes between M4.0 and M5.0 in the last 36 years. The region has experienced multiple sequences of large M7-M8 earthquakes three times in the last 1,200 years. Most scientists believe the region is vulnerable to future strong earthquake ground shaking generated from M7-M8 earthquakes, but there is debate about how big future earthquakes might be and whether they would repeat in the same region as the 1811-12 sequence. This session reports the latest research on these topics:

- What do 19th century historical accounts and reporting of the 1811-12 sequence tell us about the history and people of the time?
  [C. Bolton Valencius, Harvard University, cvalenc@fas.harvard.edu]

- Spectacular ground failure in 1811-12 resulted in liquefaction, sand blows, landslides, riverbank collapse and disappearing islands. How does this information and other pre-historic evidence help seismologist determine the size and recurrence of large earthquake sequences? (E. Schweig, U.S. Geological Survey (USGS), schweig@usgs.gov]

- Were the three main 1811-12 earthquakes as large as the 2010 M7.0 Haiti quake or were they much larger and closer to the size of the M7.9 1906 San Francisco earthquake? [Several speakers weigh in on the debate: Susan Hough, U.S. Geological Survey, hough@usgs.gov; Chris Cramer, University of Memphis, ccramer@memphis.edu; Tom Holzer, U.S. Geological Survey, tholzer@usgs.gov; and Kent Moran, University of Memphis, nkmoran@memphis.edu]

- Hot spots or Ice Age crustal loading/unloading and episodes of fluvial erosion have led to theories on causes of central and eastern U.S. earthquakes and the seismic potential of the area. [Several speakers share their latest findings and observations: Roy Van Arsdale, University of Memphis, rvanrsdl@memhis.edu; Eric Calais, Purdue University, ecalais@purdue.edu; Walter Mooney, U.S. Geological Survey, mooney@usgs.gov; and Tom Pratt, U.S. Geological Survey, tpratt@ocean.washington.edu]

- It's not just the New Madrid faults -- other nearby faults show evidence of earthquakes in the past 50,000 years. Long-term deformation caused by earthquakes encompasses a wider region than previously considered, and the interaction among faults, rather than by the activity along one isolated fault, might play a key role in intracontinental deformation. [M. B. Magnani, University of Memphis, mmagnani@memphis.edu]

- Computer simulations of earthquake ground motion have been extensively used to understand and anticipate earthquakes along the San Andreas Fault in California. Now L. Ramirez-Guzman and colleagues will report the results of computer simulations of earthquake ground motion in the NMSZ, exploring the variability of ground motion patterns, amplitude and duration of 1811-12 shaking. [L. Ramirez-Guzman, U.S. Geological Survey, lramirezguzman@usgs.gov]

- What kind of economic losses can we expect from future New Madrid region earthquakes? Analysis by Mary Lou Zoback and colleagues at Risk Management Solutions demonstrates high-expected losses for future moderate earthquakes throughout the region. For example, magnitude 6.4-6.9 earthquakes near

Memphis could generate total economic losses to private property and businesses between $80-130B, while a M6.5 earthquake in the Wabash Valley could cause between $20-65B in losses, depending on the proximity of the event to major population centers. In contrast, researchers estimate in excess of $250B in private property and business coverage losses for a M7.7 earthquake on the New Madrid seismic zone (considered an upper bound magnitude by some). Their analyses also indicate that a significant fraction of earthquake losses in the greater New Madrid region (65-80 percent) will be covered by earthquake insurance, exceeding the experience in Hurricane Katrina in 2005, in which only 55 percent of the $125B loss was covered by insurance. [Mary Lou Zoback, Risk Management Solutions, Marylou.zoback@rms.com]

Seismotectonics and Hazards of Active Margins in the Circum-Caribbean Sea and Eastern Pacific Ocean
Ballroom D, 8:30 a.m. - Noon

Seismic Hazard in the Northeast Caribbean
Historical earthquake data, seafloor mapping and GPS data are combined to examine the full suite of seismic hazards in the northern Caribbean. The researchers' analysis points to places where future tsunamis and earthquakes are likely, shows where strain has accumulated or been relieved as the North American tectonic plate slides under the Caribbean plate, and suggests that the 2010 Haiti earthquake may mark the start of a series of quakes on the main fault in the area. [Uri Ten Brink, U.S. Geological Survey, utenbrink@usgs.gov]

Broadband Ground-Motion Time Series Generation
Ballroom E, 8:30 a.m. – Noon

Seismologists have made significant progress in both observation and theoretical modeling of earthquake strong-ground motion.

Very near-fault ground motion simulation (poster)
Very near-fault ground motions --distances of less than 100 meters-- are of interest to engineers who work on designing or retrofitting bridges, freeways, railways and other structures that span faults or lie closely to one side of the fault. But there are few useful direct observations of ground shaking at these near-fault distances. The researchers build models to assess the hazards of very-near-fault shaking. [D. S. Dreger, UC Berkeley, dreger@seismo.berkeley.edu]

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Earthquake Triggering and Induced Seismicity

Ballroom D, 2 – 3:45 p.m.

Earthquake by injection in Central Arkansas?

Seismologists have noticed an increase in the rate of earthquakes greater than magnitude 2.5 in central Arkansas (near the towns of Greenbrier and Guy) since April 2009 when waste water from natural gas drilling was injected into seven saltwater disposal wells in the area. But are the two events connected? Stephen Horton and Scott Ausbrooks say the evidence for the water injections triggering earthquakes is "circumstantial" at this time, but suggest the area around the wells is seismically active and needs close monitoring. The waste water comes from a drilling technique called hydraulic fracturing or "fracking," where fluids are injected under pressure into rock layers, breaking them open and allowing for easier recovery of natural gas or petroleum inside the rock. Horton and colleagues began monitoring the area around two wastewater wells installed in July and August 2010; intense earthquake activity (hundreds of earthquakes) within several kilometers of the wells began in September 2010. The earthquakes helped reveal a previously undetected 13 kilometer-long vertical fault in the area, which may be capable of producing a potentially damaging earthquake if the entire fault ruptured at once. The Arkansas Oil and Gas Commission (AOGC) ordered an emergency shutdown of these wells on March 4, 2011. The shutdown is scheduled to be reconsidered at the AOGC April meeting. [S. Horton, CERI, University of Memphis, shorton@memphis.edu]

Seismic Sources and Parameters

Ballroom E, 2:15 – 5:45 p.m.

Surface icequakes from the Gornergletscher in Switzerland

This study looked at more than 14,000 surface icequakes (driven by surface crack openings) on Gornergletscher, Switzerland's second-largest glacier. The research shows that the icequakes occur in distinct time clusters, but vary spatially over the glacier. The icequake activity is stronger during the day when there is more melt water and glacier flow is more rapid. Individual crevasses or ruptures often show a preferred "time of day" for rupture. The regions of "daytime" rupture tend to be spatially separated from those of "nighttime" rupture. [D. Kilb, Scripps Institute of Oceanography, dkilb@ucsd.edu]

Seismic Imaging: Recent Advancement and Future Direction

Ballroom D, 4:15 – 5:45 p.m.

Seismic imaging is a powerful tool for geophysicists to probe the Earth's interior. This session includes presentations on seismic imaging in various scales and application arenas, with special emphasis on recent advances and future directions.

Towards a 3D reflectivity model of Erebus Volcano, Antarctica (poster)
Researchers want to use scattered seismic wave readings to gain a better understanding of the structure and changes inside Antarctica's Mount Erebus, the world's southernmost active volcano. Their models aren't complete, but early results put scientists closer to a 3D picture of the shallow magma chamber inside the volcano and showing how magma system changes during low-level eruptions. [J.A. Chaput, New Mexico Institute of Mining and Technology, Socorro, N.M., jchaput@ees.nmt.edu]

Seismic structure of the crust and uppermost mantle of South America and the surrounding ocean basins (Poster)
The researchers present new maps of the seismic structure of the crust and uppermost mantle under South America and the surrounding ocean floor. Highlights of the maps include: a crust apparently slightly thinner than the global average underneath South America; thicker sediments on the Atlantic than on the Pacific seafloor; crustal parameter signatures of the subducted Nazca plate "flat slab" under the continent; and thinning of the crust along the western edge of the Amazon basin, possibly because of crustal stretching. [G. S. Chulick, Pennsylvania State University and U.S. Geological Survey, gsc13@psu.edu]

THURSDAY, APRIL 14, 2011

Integrating Geodynamic, Structure and Deformation Studies of the Seismogenic and Transition Zones in Subduction Zones and Other Margins
Ballroom D, 8:30 a.m. – Noon

Subduction zones have produced the largest earthquakes in the historic record. Despite the significant hazard posed by subduction zones, the processes that control where they occur remains largely unknown. The growth of observational networks and computational capabilities provides new insights.

Outer-rise earthquakes in the Mariana Subduction Zone
The researchers look at extensional faults at the Mariana subduction zone to see the kinds of stresses occurring between the Philippines and Pacific tectonic plates. They will present data on the plate materials there and whether they are dragging in seawater, possibly affecting stresses on the plate boundaries. [E. L. Emry, Washington University in St. Louis, ericae@seismo.wustl.edu]

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Long-term Behavior of Faults and Earthquake Hazards in Intraplate Continental Regions
Ballroom C, 8:30 a.m. – Noon

Large intraplate earthquakes -- those occurring far from a tectonic plate boundary – are poorly understood and not accounted for in the current plate tectonic theory. Scientists seek to understand the long-term behavior of intraplate faults in order to assess seismic hazard risk.

Active Fault Zones in the Nation's Capital
In 1828, President John Quincy Adams recorded in his diary impressions of an earthquake he experienced at the White House. Although earthquakes are a rare event in the nation's capital, the mid-Atlantic region does have its share of seismic hazards. At least 90 earthquakes have been recorded in the region over the past 20 years, including the July 2010 magnitude 3.4 earthquake that struck near Germantown, Maryland shaking Washington, DC, last summer. In light of the Germantown earthquake, Lisa Walsh and colleagues have revisited the seismic potential in the nation's capital. They detail a series of faults in the area, most notably the DC Fault Zone, which runs from the National Zoo to the East Wing of the White House. The Germantown quake may have ruptured on an extension of this fault zone, a new unmapped fault zone, or reactivated an old fault zone. Some maps of stress change induced by the Germantown earthquake suggest a very slight increase in the risk of future seismicity near Washington, DC, the researchers say. [L. S. Walsh, University of Maryland, lsschlei@umd.edu]

New Look at the Jones, Oklahoma Earthquake Swarm (poster)
The Jones, Oklahoma earthquake swarm began in late 2008, with two earthquakes felt by the community. Another 35 earthquakes were felt in the area in 2009 -- a surprise, given that the Oklahoma Geological Survey had reported only seven earthquakes in the county prior to 2008. Austin Holland and colleagues now present a detailed look at the unusual swarm, based on data from a local network of seismic detectors installed in the area in 2010. The network located more than 660 earthquakes in Oklahoma County ranging in magnitude from 0.1 to 4.0. Local residents felt more than 64 of these earthquakes. Most of the earthquakes were strike-slip quakes, occurring at depths ranging from 3 to 6 kilometers below the ground surface. [A. A. Holland, Oklahoma Geological Survey, austin.holland@ou.edu]

Vienna (Austria) Basin: its paleoseismological history, producing the largest earthquake north of the Alps
In an effort to determine which faults should be considered when assessing hazard risk to the area, scientists documented the seismic history of the Vienna Basin in Central Europe between the Alps and the Carpathians, identifying five major surface-breaking earthquakes during the last 104,000 years along one single fault that seems seismically

inactive during historical times. Evaluation of displacements caused by single events suggests magnitude estimates between magnitude 6.3 and 7.0, the latter being the largest magnitude documented in any paleoseismological investigation in Central Europe north of the Alps. This research results indicate that very slow faults in the Vienna Basin cannot be excluded from seismic hazard assessment. [E. Hintersberger, University of Vienna, Austria, esther.hintersberger@univie.ac.at] A related talk by Kurt Decker of the University of Vienna explores the maximum credible magnitude for the region. His data suggest a maximum magnitude of 6.3 to 7.0 at recurrence intervals of about 20,000 years. [kurt.decker@univie.ac.at]

Damage to cave formations may help identify timing of past earthquakes in New Madrid Seismic Zone

Scientists examined 15 caves in the Ozarks of southeast Missouri, discovering seven caves that appeared to show repeated episodic breakage of delicate cave formations. While mining and vandalism posed challenges to the identification of good samples, potential earthquake-related breakage was observed from 75 to 105 miles from New Madrid, Missouri. The dated samples coincided with the timing of seismically-induced liquefaction in the Mississippi Valley and the initiation of new mineral deposit growth, suggesting cave formations offer potential to identifying past major seismic events in the central United States. [J. C. Tinsley, U.S. Geological Survey, jtinsley@usgs.gov]

Regional Seismic Hazard Evaluation: Updates, Policy and the Public
Ballroom E, 1:30 – 5 p.m.

Seismic Assessment for U.S. Eastern Nuclear Facilities

Proposed nuclear power facilities must take into account local and regional seismic hazards. But data can be difficult to obtain in areas with relatively few seismic events, such as the region east of the Rocky Mountains. Stephen McDuffie and colleagues now outline a model for regional seismic activity near proposed nuclear sites in the region, sponsored by the commercial nuclear industry, the U.S. Department of Energy and the Nuclear Regulatory Commission. The project, called CEUS SSC (Central and Eastern United States Seismic Source Characterization), will include a comprehensive catalog of historical and instrument-measured seismic events, along with an assessment of the size and recurrence of repeated large-magnitude earthquake sources in the area. The project's final report and models will be available in late 2011. [S. M. McDuffie, U.S. Department of Energy, Stephen.mcduffie@rl.doe.gov]

Seismic Source Zones in the Central and Eastern U.S.

The CEUS Seismic Source Zone is a regional-scale seismic source characterization for use in hazard analyses that should guide the placement and construction of proposed nuclear power sites in the central and eastern United States. Geologists, seismologists, geophysicists and engineers have worked together to describe the region's seismicity and its underlying geology. As Ross Hartleb and colleagues discuss, the CEUS project team's approach resulted in three types of seismic zones for the area: magnitude max zones, which divide the region by expected maximum magnitude earthquakes in the area; seismotectonic zones, which are defined by expected differences in earthquake characteristics (e.g., style of earthquake fault, rupture orientation); and repeated large magnitude earthquake zones, based on the prehistoric and historic occurrence of repeated large earthquakes. Since seismic activity is rare in the region compared to the more active western United States, the scientists also discuss the challenges of developing seismic source characterizations based on data from paleo-earthquakes. [R. Hartleb, Fugro William Lettis & Assoc., r.hartleb@fugro.com]

How Do Eastern Seismic Events Measure Up?
One of the key components of the Central and Eastern United States (CEUS) Seismic Source Characterization (SSC) for Nuclear Facilities project is an earthquake catalog for the region in which all earthquakes can be compared using the same size scale. This uniform size catalog will be useful in defining the conditions that could help predict future seismic hazards in the central and eastern United States, say Robert Youngs and colleagues. The CEUS catalog, which will use the modern moment magnitude scale, was compiled from national seismic hazard mapping catalogs developed by the U.S. Geological Survey and the Geological Survey of Canada. Researchers also used regional catalogs and special studies of historical quake records to create a more complete record. When the catalog is released at the end of 2011, its extensive database will also list non-tectonic (seismic activity unrelated to geological motion) and false seismic signals that have been identified in the past. [R. R. Youngs, Amec Geomatrix, bob.youngs@amec.com] (Other Questions regarding the CEUS SSC Project may be addressed to Larry Salomone, CEUS SSC Project Manager, lawrence.salomone@srs.gov)

Updates to the Eastern Seismic Hazard Maps
The U.S. Geological Survey National Seismic Hazard Maps are updated about every six years by incorporating the latest science on earthquakes and ground motions. The 2008 maps for the central and eastern U.S. were recently updated using new models of the New Madrid and Charleston seismic zones -- two of the most historically active seismic zones in the region. The 2008 updates have already been incorporated into national and international building standards, and Mark Petersen and colleagues say the next update will be presented to standards commissions in 2013. The next set of maps will consider new models of repeating seismic activity in the New Madrid region, new earthquake sources considered by models used by nuclear industry planners, new ground motion models for the region, and an updated catalog of the area's earthquakes. [M. D. Petersen, U.S. Geological Survey, mpetersen@usgs.gov]

What We Don't Know About Los Angeles Faults
Most seismic hazard studies focus on estimating the average earthquake hazard for a particular region. Researchers are less likely to explore the uncertainty surrounding these estimates. Now, Nilesh Shome and colleagues estimate the uncertainty in the earthquake hazard for "B faults" in the Los Angeles area. B faults are the faults for which the detailed information of occurrence history is not available and the rate of slip parameter required for hazard calculations is only approximate. (B faults can potentially cause earthquakes in the range of magnitude 6.5 to 7.0, with varying occurence rates) B faults, however, contribute significantly to seismic hazard in the Los Angeles area, the researchers note, so it is important to understand how much uncertainty is involved in calculating these hazards. [N. Shome, Risk Management Solutions, Inc., nilesh@stanfordalumni.org and David M. Perkins, United States Geological Survey, perkins@usgs.gov]

Shaking Sites Add Up in California
Seismic hazard models estimate the probabilities of intense ground shaking at individual locations -- but they don't usually provide a complete picture of the total number of locations that are experiencing the same (or higher) intensity shaking. But as Praveen Malhotra points out, the effect of damaging ground shaking at a single location is very different from the effect of damaging shaking at many locations occupied by 1 million or more people. Malhotra discusses the importance of creating an aggregate ground shaking measure that can capture the full effect of shaking and its potential damage, and provides some preliminary aggregate measures for regions of California. [P.K. Malhotra, StrongMotions Inc., Praveen.Malhotra@StrongMotions.com]

Seismic Hazard Maps for Haiti
In the wake of Haiti's devastating 2010 earthquake, Arthur Frankel and colleagues from the USGS and Purdue University have produced seismic hazard maps that can be used as the scientific basis for new building codes for the country. The maps include data from the major faults in the region, subduction zones where tectonic plates collide, and background earthquakes. They used fault slip rates constrained by GPS data to estimate recurrence rates of earthquakes on the Enriquillo-Plantain Garden, Septentrional, and Matheux Neiba faults, as well as the subduction zones. The researchers say there is substantial seismic hazard throughout Haiti, with the highest hazards along the Enriquillo-Plantain Garden and Septentrional faults and the western end of the Muertos Trough. [A. Frankel, U.S. Geological Survey, afrankel@usgs.gov]

Seismic Hazard Map for Peninsular Malaysia
A new seismic hazard map created by Azlan Adnan and colleagues for Peninsular Malaysia shows a slight increase in seismic hazard for Kuala Lumpur -- Malaysia's capital and largest city -- over a 500-year period. The map includes newly available data

on historical earthquakes in the region, including more than 700 earthquakes recorded from 1900 to 2009. Using the latest methods for estimating seismic hazard, the researchers developed several maps of possible ground motion hazards for Malaysia's east and west coasts. [A. Adnan, University of Technology Malaysia, azelan_fka_utm@yahoo.com]

Earthquake Model of the Middle East

The Earthquake Model of the Middle East (EMME) Project, offers a unique and dynamic look at the past, present and future of seismic activity in the Middle East. The project includes data from Turkey, Georgia, Armenia, Azerbaijan, Syria, Lebanon, Jordan, Iran, Pakistan and Afghanistan, and its databases and analyses will be continually updated and refined as new seismic data is acquired, according to Levent Gulen and colleagues. EMME's users will find a map of the Middle East's active faults, including information about their physical characteristics and rates of movement. The database will also detail the characteristics of faults that appear to be capable of generating earthquakes of magnitude 5.5 and larger. So far, 6,991 fault sections (about 83,402 kilometers) have been analyzed in detail for the Middle East region. EMME will also feature a database that includes information on the timing and ground displacement for the region's ancient earthquakes. [L. Gulen, Sakarya University (Turkey), lgulen@sakarya.edu.tr]

Seismic Site Response at the Regional Scale

Site response is the amplification of ground motions at a specific site determined by the soils beneath the site. It's an important measure in predicting seismic hazard for an area, since more intense shaking can mean more damage, but it's also a measure that's hard to determine accurately over a large area. Eric Thompson and colleagues now compare several methods of creating regional-scale site response maps, using the densely spaced, strong motions recorded for the Parkfield, California, area, and propose a new mapping technique that takes advantage of the advantages of the different mapping methods. [E. M. Thompson, Tufts University, eric.thompson@tufts.edu]

Watch for Falling Rocks

Precariously balanced rocks and such fragile geological features as natural rock bridges may be casualties -- or agents of destruction -- in seismically active regions. But they can also help researchers refine seismic hazard models for a particular area. A fault previously considered active may be downgraded, for instance, if fragile geological features in the area remain unchanged. John Anderson and colleagues report findings from the Workshop on the Application of Precarious Rocks and Related Fragile Geological Features, with the goal of developing recommendations that the U.S. Geological Survey can use in their preparation of U.S. National Hazard Maps. The workshop also suggested specific research that could help fragile geological features become more useful hazard guides in the future, along with guidelines for archiving the data collected from these features. [J.G. Anderson, Nevada Seismological Laboratory, jga@unr.edu]

Recent Advances in Understanding Scaling Characteristics: How Similar are Small and Large Earthquakes?
Room 204/205, 1:30 – 3 p.m.

Why stress drops and apparent stresses do not depend on seismic moment
Does the magnitude of an earthquake depend on the apparent stresses in the quake area? The researchers looked at several quakes, varying in magnitude from 2 to 7.9, to better understand this connection. They conclude that apparent stresses are independent of seismic magnitude because they are controlled by the strength of the fault, which is itself independent of earthquake magnitude. [A. McGarr, U.S. Geological Survey, mcgarr@usgs.gov]

A multi-frequency back-projection analysis of recent large earthquakes
Are the physics different in small and large earthquakes? Studying data from large earthquakes around the world that occurred in the last decade, the researchers suggest the answer is yes. There are differences in high-frequency radiation of seismic waves, thermal processes and fault lubrication that appear to lead to different mechanics in large (greater than 5.5 magnitude) and small quakes. [E. Kiser, Harvard University, kiser@fas.harvard.edu]

FRIDAY, APRIL 15, 2011

Archeoseismology: Learning About Ancient Earthquakes from the Archaeological Record
Ballroom D, 8:30 – 10 a.m.

Evidence of large earthquakes before the advent of modern seismometers is derived from historical, geological and archaeological records:

Late-Holocene fault rupture characteristics of the North Anatolian Fault, Turkey
The Hersek Peninsula is archaeologically rich with information from Roman, Byzantine and Ottoman Empire sites, and encompasses a key area of the ancient Spice Road -- it's also seismically active. The Peninsula was the western endpoint of the major 1999 Izmit earthquake. Excavations in the area turned up a 6th century Byzantine aqueduct that was offset in an earthquake. Data from the aqueduct's break can help characterize the fault's activity during the past 1,500 years. [O. Kozaci, Fugro William Lettis & Associates, o.kozaci@fugro.com]

New excavations at early Islamic Ayla on the Gulf Coast of Aqaba along the Southern Dead Sea Transform, Jordan
The early Islamic city of Ayla (near present day Aqaba, Jordan) is situated at the northern

end of the Gulf of Aqaba. The city was damaged by earthquakes in 749 and 757 A.D., rebuilt, and then devastated in a 1068 A.D. quake that destroyed the city. Analyses of pottery shards from the ancient city walls trace how the walls were shored up after seismic events, and show a long quiet period since the last major quake, which could mean the area is due for another big event. [A.J. Allison, University of Missouri, ajad36@mail.umkc.edu]

Earthquake versus rockfall, testing two damaging scenarios for a Roman mausoleum
A Roman mausoleum located in the ancient city of Pinara in southwest Turkey shows signs of damage (large blocks fallen off its walls), but is mostly intact. The relatively intact structure of the city makes it a good place to test 3D models that determine whether archaeological damage of this type was caused by earthquake shaking or from rock falls from a nearby cliff. The researchers' 3D models are consistent with earthquake shaking. [K.G. Hinzen, Cologne University, hinzen@uni-koeln.de]

Seismic surveillance of Cologne Cathedral
Five seismic stations operate within Cologne Cathedral, one of the largest Gothic cathedrals in the world and a World Heritage Site since 1996. This study shows how wind, rain and the ringing of the bells within the cathedral affect movement of the tower. [K.G. Hinzen, Cologne University, hinzen@uni-koeln.de]

Guide to Sustainable Seismographic Networks
Ballroom C, 8:30 a.m. – Noon

Volcano Monitoring: Keep it Simple–Less can be more during Volcano Crises; 25 years of VDAP Experience
Most volcanoes around the world are not continuously monitored, but the Volcano Disaster Assistance Program at the U.S. Geological Survey has helped countries establish these monitoring systems for 25 years. This speaker suggests that most volcanoes don't need an elaborate or expensive monitoring system -- two small seismic stations are enough. It's more important, they say, to have the stations located in the right places where they won't be damaged in ashfall or other eruption hazards, and to have them working and staffed 24/7 by trained seismologists. [R. A. White, U.S. Geological Survey, rwhite@usgs.gov]

Geotechnical Lessons Learned from Recent EQ: Haiti, Chile, Baja CA, New Zealand
Room 204/205, 8:30 – 10 a.m.

Observations and simulations of topography effects during the M7.0 Haiti earthquake
Estimates of seismic hazards are increasingly calculated by using models of ground shaking during an earthquake event, but most of these models assume the ground is flat. The researchers here use data from the 2010 Haiti earthquake to show how changes in topography (how hilly an area is) can affect the damage done by ground shaking. In general, damage can be worse in hilly areas. [S. Jeong, Georgia Institute of Technology, s.jeong@gatech.edu]

Seismic Siting for Nuclear Power Plants
Ballroom D, 1:30 – 3 p.m.

Developing and implementing a real-time earthquake notification system for nuclear power plant site using ShakeCast (Poster)
The International Atomic Energy Agency (IAEA) International Seismic Safety Centre and the U. S. Nuclear Regulatory Commission, in collaboration with the U. S. Geological Survey, are developing and implementing a custom ShakeCast system for discovery, processing and notification of real-time ground shaking information at nuclear power plant sites. ShakeCast takes post-earthquake ShakeMap data and compares intensity measures against locations of nuclear power plants, sends notifications of potential damage to responsible parties and generates facility damage assessment maps. [K. Lin, U.S. Geological Survey, klin@usgs.gov]

Geomorphic assessment of past extreme ground motion on Yucca Mountain, Southern Nevada (poster)
Analysis of rock fall along the cliffs near Yucca Mountain, Nevada, a long-proposed nuclear waste storage site, helps to date past extreme ground motions in the area. The researchers say the rock fall data show no evidence that Yucca Mountain cliffs have been shattered in response to extreme ground motions for at least 250,000 years. [J.W. Whitney, U.S. Geological Survey, jwhitney@usgs.gov]

Improving Inventory and Vulnerability Data for Earthquake Loss Modeling
Ballroom D, 3:30 – 5 p.m.

Identifying Hazardous Buildings in U.S. Seismic Zones
Unreinforced masonry buildings -- built of bricks, hollow clay tiles, stone, concrete blocks, or adobe -- are the source of the vast majority of fatalities and severe injuries in earthquakes, according to Federal Emergency Management Agency (FEMA) data. Douglas Bausch says improvements in the agency's HAZUS models (which estimate losses from earthquakes, hurricanes and floods) show some 185,000 of these buildings in Utah and 450,000 in the New Madrid seismic zones. Continual updates to the HAZUS

database, including new data from the U.S. Department of Homeland Security's national inventories of critical facilities and infrastructure, can help refine the models of where most earthquake losses should be expected and where more work needs to be done to repair or remodel buildings. In communities where resources for building inventory are scarce, Bausch says, experts should focus on identifying the unreinforced masonry buildings. [D. B. Bausch, FEMA, douglas.bausch@dhs.gov]

Verification Science
Room 204/205, 3:30 – 5 p.m.

Parameter selection in waveform correlation (poster)
Major earthquake aftershocks can sometimes obscure seismic data from nuclear testing. These researchers present a method to process these aftershock seismic signals more quickly by comparing incoming waveform data to a continuously updating library of known seismic events. [M. Slinkard, Sandia National Laboratory, meresor@sandia.gov]

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