Seismological Society of America
201 Plaza Professional Building
El Cerrito, California 94530
(510) 524-5474 • Fax (510) 525-7204

News Release News Release News Release News Release News Release News Release

BSSA Tip Sheet for October 2010
For Immediate Release
Contact: Nan Broadbent, 408-431-9885,
press@seismosoc.org

Please cite the Bulletin of the Seismological Society of America (BSSA) as the source of this information.

Relationship between rainwater and earthquakes explored; Two studies focus on seismic hazard in San Francisco Bay Area

Causal relationship between rainfall and earthquakes detailed

This review article explores natural crustal earthquakes associated with the elements of the hydrologic cycle, which describes the continuous movement of water on, above and below the surface of the Earth, including hurricanes and typhoons. The theory of hydroseismicity, first articulated in 1987, attributes most intraplate and near-intraplate earthquakes, to the dynamics of the hydrological cycle.

The Hydroseismicity hypothesis suggests variations in rainfall affect pore-fluid pressure at depth and can trigger earthquakes in areas already under stress and near failure. This report cites documentation of metrological events -- rainfall, stream flow, hurricanes – and observed seismic activity by more than 20 research teams across five continents, providing thorough testing and support of the Hydroseismicity hypothesis.

The authors suggest that the reported correlations between meteorological events and seismicity indicate the need for more local and regional earthquake monitoring networks as well as additional stream gauging stations. In the future it should be possible to discover and quantify causal relationships between earthquakes and meteorological parameters when better focal depths and more stream gauging stations become available. Groundwater hydrology measurements and earthquake monitoring and forecasting might eventually complement each other.

Corresponding author: John K. Costain, Virginia Tech, costain@vt.edu
"An Overview of Hydroseismicity Research Results from 1987 to 2009," by John K Costain, Ph.D. and G. A Bollinger of Virginia Tech.

Seismological Society of America
201 Plaza Professional Building
El Cerrito, California 94530
(510) 524-5474 • Fax (510) 525-7204

New evidence identifies 12th large earthquake on southern Hayward Fault

Scientists have identified a 12th large earthquake on the Hayward Fault at the Tyson Lagoon site near Fremont, California (north of San Jose) further defining the continuous historical record in the San Francisco Bay Area. The rapid recurrence rate, a large earthquake once every 160 years on average, makes the determination of earthquake recurrence from geological evidence of past large earthquakes especially critical to regional seismic hazard analysis.

The seismic record for southern Hayward Fault has been well documented. A review of all trench logs suggested the existence of an overlooked seismic event between two previously identified events, approximately 660 AD and 247 AD. The complete sequence of earthquakes, which now includes 11 paleoearthquakes since AD 92 prior to the last large earthquake in 1868, suggests considerable regularity of large earthquakes on the southern Hayward Fault.

Corresponding author: James J. Lienkaemper, U.S. Geological Survey, jlienk@usgs.gov

"Evidence for a 12th Large Earthquake on the Southern Hayward Fault in the Past 1900 Years." Authors: James J. Lienkaemper of U.S. Geological Survey; Patrick L. Williams of San Diego State University; and Thomas P. Guildersen of Lawrence Livermore National Lab.

Santa Clara Valley's complex geology seen in varying ground motion

Underlying geological structures throughout the Bay Area result in important differences in ground motion during earthquakes. Santa Clara Valley serves as laboratory for studying the pattern of ground motion in sedimentary basins found around the world. This paper, authored by researchers at U.S. Geological Survey and the U.S. Bureau of Reclamation in Denver, looks at four sites in the Bay Area to understand how particular features, such the edges of a sedimentary basin, influence the propagation and amplification of seismic waves. This study shows how different wave propagation can occur in different areas of a single sediment-filled valley, reflecting the complexity of observed ground motion in the Bay Area.

The introduction of the San Jose portable seismic array of some 50 instruments in

1999 expanded the database of ground motion observations in the Santa Clara Valley. Each of the four sites studied presents different aspects of ground motion that are related to the underlying geologic structure: Blossom Hill, Cupertino and Evergreen basins in Santa Clara Valley, and a line perpendicular to the trace of the Hayward Fault.

Corresponding author: Stephen Hartzell, U.S. Geological Survey in Denver, shartzell@usgs.gov.

"Short Baseline Variations in Site Response and Wave Propagation Effects and Their Structural Causes: Four Examples in and around the Santa Clara Valley, California," by Stephen Hartzell, Leonardo Ramirez-Guzman, David Carver of U.S. Geological Survey in Denver; and Pengcheng Liu of U.S. Bureau of Reclamation in Denver.

###