

Possible link found between earthquakes along the Cascadia and San Andreas faults

April 3 2008

Seismic activity on the southern Cascadia Subduction fault may have triggered major earthquakes along the northern San Andreas Fault, according to new research published by the *Bulletin of Seismological Society of America*. The research refines the recurrence rate for the southern portion of the Cascadia fault to approximately every 220 years for the last 3000 years.

Chris Goldfinger, associate professor of marine geology and geophysics at Oregon State University, and colleagues published their results in the April issue of BSSA as part of a special section on the 1906 San Francisco earthquake. BSSA is published by the Seismological Society of America (SSA), which was created in response to the 1906 earthquake.

Using marine sediment cores collected along the northern California seabed, researchers identified 15 turbidites, which are sediment deposits generated by submarine landslides and commonly triggered by earthquakes. The 15 turbidites, including one associated with the great 1906 earthquake, and the corresponding land paleoseismic record establish an average recurrence rate of approximately 200 – 240 years for the San Andreas Fault.

In a parallel study, they found that during the same period, 13 of these 15 San Andreas earthquakes occurred at almost the same time as earthquakes along the southern Cascadia Subduction Zone, which stretches from northern Vancouver Island to northern California.

The marine and land paleoseismic record suggest a recurrence rate of approximately 220 years for the southern Cascadia fault, which is substantially shorter than the 600-year cycle suggested by previous research for full ruptures in Cascadia.

The Cascadia earthquakes also preceded the San Andreas earthquakes by an average of 25 to 45 years. “It’s either an amazing coincidence or one fault triggered the other,” said Goldfinger. The generally larger size of the Cascadia earthquakes, and the timing evidence suggests Cascadia may trigger the San Andreas Two seismic events on the San Andreas were apparently not associated with Cascadia, including the 1906 earthquake which followed the previous Cascadia earthquake by approximately 200 years.

Goldfinger and his colleagues collected core samples that cover the past 10,000 years, and the next step involves analyzing this data for further evidence of a corollary relationship between the plate boundary faults for earlier periods of time. “This type of relationship doesn’t just happen accidentally. We expect the temporal relationship, if correct, to show itself over the longer period of time,” said Goldfinger.

Perhaps the most thoroughly studied seismic event, the 1906 quake continues to fascinate seismologists. BSSA’s special section considers the landmark event, which was initiated along the San Andreas Fault just off the San Francisco coast on April 18, 1906. The strong shaking caused widespread damage along the 300 miles of the fault in northern California, reducing much of San Francisco to rubble.

“The directivity of the ruptures, north to south, which is implied by this study, will have significant meaning for seismic hazard models for San Francisco,” said Goldfinger. The 1906 earthquake, which is an exception to the pattern over the past 3000 years, ruptured in both directions, but mostly from south to north.

“Lessons from the 1906 earthquake should apply to similar faults and earthquakes elsewhere,” writes Brad T. Aagaard, a research geophysicist at the USGS Menlo Park and co-author of the introduction to the special section and two papers that focus on ground motion. “As our understanding of earthquakes evolves and the technology to increase our knowledge develops, there is much to be gained by revisiting older events.

In 1906, approximately 600,000 people lived in the greater Bay Area, about 10 percent of today’s population. Today’s cities have high rise buildings, people travel by car, and five major bridges connect the major cities around the San Francisco Bay.

The special section features new research that characterizes the earthquake source, refines assessments of ground shaking that support higher intensities, and explores the possible effects of a repeat of the 1906 earthquake, or similar-sized earthquakes on the San Andreas Fault.

Research by Aagaard et al., demonstrates how the variability in strong shaking over the San Francisco Bay area observed in 1906 can be attributed to the geologic structure and rupture characteristics. More importantly, by considering other possible rupture scenarios, the Aagaard et al., conclude that future large earthquakes along the San Andreas Fault may subject the San Francisco Bay Area to stronger shaking than occurred in the 1906 earthquake.

Source: Seismological Society of America

Citation: Possible link found between earthquakes along the Cascadia and San Andreas faults (2008, April 3) retrieved 4 October 2023 from <https://phys.org/news/2008-04-link-earthquakes->

cascadia-san-andreas.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.