A shaky future for Hispaniola

2010 Haiti quake may portend increased seismic activity in coming decades.

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Patrick Farrell / PHOTOSHOT

The earthquake that devastated Haiti in January 2010 could herald the beginning of a more seismically active period in the region.

The magnitude-7 quake that devastated Haiti in January 2010 may have been the opening salvo in a decades-long period of increased seismicity, a study suggests.

The warning arises from an analysis of historical records. Hispaniola — a Caribbean island now split between Haiti in the west and the Dominican Republic in the east — was one of the first places in the Western Hemisphere to be colonized by Europeans in the fifteenth century, so records of seismic activity there are arguably some of the longest in the region, says William Bakun, a seismologist with the US Geological Survey in Menlo Park, California.

That long history makes Hispaniola's strongest spate of seismic activity, a seven-decade-long cluster of four major quakes in the eighteenth century, stand out between two lengthy quiet periods. Because the population then was so sparse, however, researchers have been unsure about the strength and location of those shocks. So Bakun and his colleagues developed a mathematical technique to compare damage reports and other data gathered during the 2010 quake and its aftershocks with historical damage reports to improve those estimates.

Historical data included descriptions of quake damage to cathedrals and government buildings — taken from reports made by colonial officials in order to receive funding for repairs — as well as accounts from letters and personal journals describing the intensity of ground motions. Data gathered during the 2010 quake and its aftershocks allowed Bakun and his team to determine how efficiently seismic energy is transmitted through rocks in the region, which, in turn, enabled the researchers to better interpret the patterns of damage and shaking reported during the eighteenth-century quakes.

Their work is published in the February *Bulletin of the Seismological Society of America*[1].

The first quake in the 70-year-long cluster along the Enriquillo Fault System, in November 1701, was a magnitude-6.6 event that struck western parts of the island, the team estimates. The trembler that struck in October 1751, hit eastern parts of the island and probably measured between 7.4 and 7.5. That was quickly followed by a magnitude-6.6 quake near Port-au-Prince about a month later. The final quake in the sequence struck west of Port-au-Prince in June 1770. From then until January 2010, says Bakun, the fault system had almost 240 years of seismic quiescence.

“Most of the people living there had forgotten that they had a seismic hazard,” he says.

Quakes to come

Bakun and his team suggest that the three major quakes that struck the island in 1751 and 1770 covered the entire length of the Enriquillo Fault System — the same set of faults that spawned the January 2010 quake. And because the 1701 quake happened in almost the same place as the 2010 temblor, Bakun and his colleagues suggest that the latest event may be the first in a new series that could, over the course of the next few decades, once again unzip the fault system.

“I’m not saying that we’ll have an earthquake there in the next five years,” says Bakun. “But if history is a guide, there will be large, damaging quakes along that fault system in the next few decades.”

But Eric Calais, a geophysicist at Purdue University in West Lafayette, Indiana, is cautious about making predictions about future seismic activity on the basis of historical patterns. “We don’t know when the next earthquake will happen,” he says. So rather than worry about when it will occur, people in the region should prepare for it and construct better, stronger buildings, he says.

Calais says that the most important result of the study is the development of a rigorous technique for assessing the magnitude of historical quakes. “This really reduces the uncertainty” inherent in historical assessments, he notes.

Susan Hough, a seismologist with the US Geological Survey in Pasadena, California, agrees. “There’s no question that the island of Hispaniola needs to take earthquake hazard seriously,” she says. “The next big earthquake could happen tomorrow, or 100 years from now.”

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References

1. Bakun, W. H., Flores, C. H. & ten Brink, U. S. *Bull. Seismol. Soc. Am.* **102**, 18–30 (2012).