Bombay beach event demonstrates difficulties in earthquake swarm forecasting

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In September 2016, about 100 small earthquakes between magnitude 2 and 4.3 took place in Bombay Beach, rattling the region in Southern California and raising questions about whether the swarm's location near the southern end of the San Andreas Fault would trigger a larger earthquake.

In a presentation at the 2017 Seismological Society of America's (SSA) Annual Meeting, U.S. Geological Survey seismologist Andreas Llenos will discuss lessons learned from the 2016 Bombay Beach swarm, in particular the challenges in modeling swarms and communicating their risk to the public.

Earthquake swarms are triggered by short-term processes such as fluid flow in rock layers or aseismic fault creeping. Unlike earthquake aftershocks, which decrease their rate over time in predictable ways, it can be difficult to forecast how long a swarm may last once it begins, Llenos says. "For example, there are swarms that only last for a couple of days, and there are swarms that go on for months. Even in just the Bombay Beach area, the 2001 swarm lasted a day or two, the 2009 swarm lasted more like a week, and the 2016 swarm lasted several days. And the swarm-driving process might itself vary over time as well."

In her SSA presentation, LLenos will discuss how seismologists are exploring different models to determine how earthquake swarms should be viewed in terms of raising the normal or background rate of seismic activity in an area, and how this can affect the probabilities and

magnitudes of larger earthquakes on faults in the region.

Better models will help seismologists as they discuss the risks of these swarms with the public, Llenos notes.

"One of the issues we ran into [with the 2016 swarm] was how to convey to the public in our online statements what the probabilities were likely to do over the next week. For a typical mainshock, this is relatively straightforward. Since the number of aftershocks decrease over time, the likelihood of a larger event will also decrease over time," says Llenos. "But for swarms, because we didn't know how long the higher background rate would last, we needed to think a bit more about how to convey that the probabilities over the next week may change depending on if the swarm activity increases or decreases."

More information: "Forecasting the 2016 Bombay Beach CA Swarm" will be presented at the SSA Annual Meeting on Tuesday, April 18. All presentation abstracts for the 2017 SSA Annual Meeting can be accessed at meetings.seismosoc.org/abstracts

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