

Seismic listening system offers new look at Old Faithful geyser

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After deploying hundreds of seismometers around the Old Faithful Geyser in 2015 and 2016, scientists have a clearer picture of how the geyser erupts and what may lie beneath the popular tourist attraction in Yellowstone National Park.

At the 2017 Seismological Society of America's (SSA) Annual Meeting, Jamey Farrell of the University of Utah will describe how this seismic ear to the ground is helping the national park plan for its future infrastructure needs around the [geyser](#). The data also offer a unique glimpse at the active hydrothermal system below the geyser, and how its activity could be used to monitor the eruption of less predictable geysers.

Farrell and his colleagues created a more complete map of the active hydrothermal features under Old Faithful, and in the area called Geyser Hill. The seismic noise captured by their instruments works similarly to sonar, explained Farrell, allowing the researchers to reconstruct "what these geothermal structures look like under the ground, what's happening underground when they're getting ready for an eruption, and how these things are related to each other and how they react to outside stresses, even earthquakes from around the world."

The researchers were able to fill in more details about the underground tremor signal connected to Old Faithful, which starts about 45 minutes before eruption, building up to a peak about 25 minutes before eruption, and slowly dying down until the eruption occurs. "We found that the amplitudes of those tremor signals are much higher than the actual

eruption of Old Faithful itself," said Farrell.

For the first time, the scientists also saw this tremor signal disappear in an area west and northwest of the geyser. Seismic signals don't travel well through ground saturated with hydrothermal fluids, Farrell explained, " so what we think that's telling us is that we have this shallow, very saturated body of ground there, and it's probably the reservoir that Old Faithful is pulling water from when it erupts."

Studying the tremor pattern of Old Faithful could help narrow down its exact eruption times; right now, its eruptions can be predicted within a window of ten minutes or so. Farrell said seismologists want to study other geysers to determine whether there might be a regular signal pattern before eruption. This could help pinpoint [eruption](#) times for unpredictable geysers like Steamboat Geyser in Yellowstone's Norris Geyser Basin, which is the tallest active geyser in the world.

Farrell and his colleagues have only a few weeks each November to make their observations, between the time Yellowstone closes to the public and the arrival of winter weather. When the park is open, he said, "cultural noise" like the trudge of feet on the park's boardwalks drowns out natural seismic signals.

Provided by Seismological Society of America

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