Gas-charged fluids creating seismicity associated with a Louisiana sinkhole

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Natural earthquakes and nuclear explosions produce seismic waves that register on seismic monitoring networks around the globe, allowing the scientific community to pinpoint the location of the events. In order to distinguish seismic waves produced by a variety of activities – from traffic to mining to explosions – scientists study the seismic waves generated by as many types of events as possible.

In August 2012, the emergence of a very large sinkhole at the Napoleonville Salt Dome in Louisiana offered University of California, Berkeley scientists the opportunity to detect, locate and analyze a rich sequence of 62 seismic events that occurred one day prior to its discovery.

In June 2012, residents of Bayou Corne reported frequent tremors and unusual gas bubbling in local surface water. The U.S. Geological Survey installed a temporary network of seismic stations, and on August 3, a large sinkhole was discovered close to the western edge of the salt dome.

In this study published by the *Bulletin of the Seismological Society of America (BSSA)*, co-authors Douglas Dreger and Avinash Nayak, evaluated the data recorded by the seismic network during the 24 hours prior to the discovery of the sinkhole. They implemented a waveform scanning approach to continuously detect, locate and analyze the source of the seismic events at the sinkhole, which are located to the edge of the salt dome and above and to the west of the cavern near the sinkhole.

The point-source equivalent force system describing the motions at the seismic source (called moment tensor) showed similarities to seismic events produced by explosions and active geothermal and volcanic environments. But at the sinkhole, an influx of natural gas rather than hot magma may be responsible for elevating the pore pressure enough to destabilize pre-existing zones of weakness, such as fractures or faults at the edge of the salt dome.

More information: The paper, "Moment Tensor Inversion of Seismic Events Associated with the Sinkhole at Napoleonville Salt Dome, Louisiana," will be published online July 1, 2014, and published in the August print edition of *BSSA*.

Provided by Seismological Society of America

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