Scientists find records of rare 'earthquake lights'

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Examples of the phenomenon go back centuries and have sometimes been mistaken for UFOs.

(Photo: Jim Conacher)

They've been mistaken for UFOs or dismissed as hallucinations. But geologists have collected a near-definitive list of the rare but fascinating phenomena known as earthquake lights.

Certain types of earthquakes in certain areas can set off blazes of light seconds — sometimes days — before the actual quake. These can manifest as floating balls of light, bluish columns shooting up out of the earth and even reverse lightning, reaching up into the sky from the ground.

A study out Thursday in the journal *Seismological Research Letters* shows such quakes are tied to a specific type of temblor in areas where certain geological formations occur.

Though the lights are rare, researchers were able to document 65 examples from 1600 to the present.

•Seconds before the L'Aquila, Italy, earthquake struck in 2009, pedestrians saw flames of light 4 inches high flickering above the stone-paved Francesco Crispi Avenue in the town's historical city center.

•In Pisco, Peru, a naval officer saw pale-blue columns of light bursting four times in succession out of the water Aug. 15, 2007, as a magnitude-8.0 earthquake struck. Security cameras (http://www.youtube.com/watch?v=f14pQakxXjc) in the city captured images of the lights as well.

•On Nov. 12, 1988, a bright purple-pink globe of light moved through the sky along the St. Lawrence River near the city of Quebec, 11 days before a powerful quake.

•On April 18, 1906, blue flames hovered at the base of foothills west of San Francisco just before the great earthquake hit. South of the city, in San Jose, one street was ablaze with fire in a faint but beautiful rainbow color.

The mechanism that causes the phenomenon occurs only in specific and rare conditions, said Friedemann Freund, a professor of physics at San Jose State University and senior scientist at NASA Ames Research Center in Mountain View, Calif.

Rocks such as basalt and gabbro, created deep in the Earth's mantle, contain tiny defects in their crystals. When such rocks are stressed, those defects momentarily generate electrical charges, said Freund, one of the paper's authors.

"When a powerful seismic wave runs through the ground and hits a layer of such rocks, it compresses the rocks with great pressure and speed, creating conditions under which large amounts of positive and negative electrical charges are generated," he said. These charges can travel together, reaching what's called a plasma state, which can burst out and shoot up into the air.

Another necessary component for earthquake lights to be produced in nature are deep vertical faults in the Earth's crust, some of which can reach down 60 miles and more. Magma that solidifies to become gabbros or basalts has risen along these faults, forming dikes often tens to hundreds of feet thick.

"We speculate that the dikes act as a funnel, focusing the charges until they become an ionized solid-state plasma," said Robert Thériault, lead author on the paper and a geologist with the Quebec Ministry of Natural Resources in Canada.

"When the plasma bursts out into the air, it produces light," he said.

Less than 0.5% of earthquakes worldwide occur in the right places to create earthquake lights. The researchers combed through historical documents, many handwritten and some in Latin, dating back centuries. They also looked at modern scientific papers and surveillance-camera records that recorded earthquake lights in real time.

Earthquake lights are sometimes mistaken for UFOs, Thériault said. In the early 1970s, Jim Conacher was boating on Tagish Lake in Canada's Yukon territory with his wife when they saw seven yellow luminous globes on the nearby flank of a mountain. The nearer orbs slowly drifted up the mountain to join the more distant ones.

Conacher took a photograph of the lights, which made its way to a website (http://www.ufobc.ca/yukon/tagish.htm) listing possible UFO sightings in Canada.

When the researchers looked through seismic reports, they found records of the nearby Cross Sound earthquake of July 1, 1973, which measured 6.7 on the Richter scale. There were also two aftershocks measuring 5.2 and 4.1. Though the exact dating of the trip is uncertain (the boaters have died), the researchers say they believe the lights appeared a few hours before the initial quake.

Areas that contain these specific traits include Italy, Greece and the Rhine rift, which stretches between France and Germany, as well as several areas in South America. Researchers say they exist in China as well.

The lights aren't common enough in earthquake zones to be used as a warning system, Thériault said, but they have functioned that way.

Just before Italy's L'Aquila earthquake, a man in his kitchen saw flashes of brightness outside as intense as daylight. The light lasted for more than a second. Because he had read a paper about earthquake lights, he decided to take his family to a safer structure.

Thériault knows a geologist in Canada who was living in China in 1976. On July 28 that year, he saw earthquake lights, which prompted him to leave his house. Soon thereafter, the devastating Tangshan quake hit, killing hundreds of thousands of people. The geologist survived.

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