Times Standard

Not My Fault: Please share your earthquake oddities

Lori Dengler for the Times-Standard
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Unusual lights over Mexico City on Sept. 7, 2017 after the M8.2 Chiapas earthquake.

Earthquakes cause fault rupture, displacement of the ground, strong shaking, and tsunamis. These are all fairly well-understood phenomena. But there are other things associated with earthquakes that aren't nearly as well studied. I'm calling these earthquake oddities and, if you've experienced any of them, I would love to hear your stories. I have an ulterior motive in requesting your observations. I am one of the co-convenors of a session of the Seismological Society of America's annual meeting next spring on 'Intriguing Seismic Observations' and your reports will give me fodder for my presentation.

Let's start with an often-mentioned oddity, earthquake lights. These include glowing skies and unusual bursts of light that seem to be closely associated with earthquake vibrations. I first became aware of this phenomena in April 1992 when many people reported lights following two strong nighttime aftershocks. The magnitude 7.2 mainshock occurred in bright daylight, but the M6.5 and 6.6 aftershocks occurred in the wee morning hours of April 26th.

In the days and weeks after the 1992 earthquakes, I talked to many people about their experiences and, when it came to the nocturnal aftershocks, they often mentioned seeing lights. Some mentioned bright flashes of blue-white light, like a giant old-fashioned camera

bulb going off. These flashes are bright enough to be seen in broad daylight and are caused by arcing electrical lines and bursting transformers.

Many of the 1992 reports were from remote areas where there were no transformers to blow. And blueish white wasn't the only color observed. The night was clear, power had been knocked out, and some people opted to sleep outside because of the many aftershocks. Several described a greenish to yellowish glow traveling across the sky that seemed to coincide with the passage of seismic waves.

Seismic waves in the air? Earthquakes are caused by rupture of rock miles below the ground surface, generating the seismic waves that travel out in all directions. P-waves are basically sound waves that push and pull the material as they travel. In a large quake, when those waves reach the ground surface, they transfer some of that push-pull motion into the air. Those P-wave vibrations in the atmosphere can excite visible electrical phenomena. Satellites have detected disturbances in the ionosphere more than 100 miles above the earth's surface immediately following earthquakes that are strong enough to momentarily disrupt communications.

Earthquake lights or luminescence may also be caused by the stress changes in the rock as the seismic waves travel beneath the surface. Quartz is one of the most common minerals in crustal rocks. When stressed in laboratory experiments, quartz exhibits piezoelectric effects changing its electrical state and emitting electrons and ions and sending currents to the surface and into the air.

A greenish glow was not the only 1992 unusual luminescence. A woman in Ferndale described a glowing orange blob pouring out of her backyard during the shaking. Some people saw bursts of orange glows in the distances. The most unusual description came from a fisherman many miles off the coast that night. He felt both the M6.5 and 6.6 aftershocks. P waves travel in water as well as air and he said it felt like the boat had suddenly dropped a foot or two. And then the water began to glow. The glow increased until after a few minutes he was in the midst of a glowing aqua ocean. The glow continued for more than an hour before it slowly began to fade.

I'd argue the orangish colors could be the result of thermoluminescence, visible light emitted due to heating. We know there were many landslides in 1992 and when slopes fail, intense friction is produced on the slide surface. Laboratory studies have replicated reddish glows sometimes called landslide lights. The glowing water has a different source. A number of living organisms emit light. Some algae and bacteria emit a blue-green light when agitated by waves. It's not much of a stretch to think that seismic vibrations could have a similar effect.

In 1992, another oddity was seeing the ground visibly roll. The 1992 mainshock occurred at 11:05 AM on a Saturday when many people were outside. Some people reported seeing the ground move like "waves on the ocean." I became much more interested in ground roll observations while studying the December 21, 1954, M6.5 earthquake. Almost everyone who had been outside during that earthquake described the ground rolling. One person indoors saw their hallway going up and down.

Ground roll has not been taken seriously in the seismology world for many years. In the 1800s and early 1900s, it was considered an indicator of extremely strong ground shaking and is included in the original Modified Mercalli Scale descriptions. But many seismologists in recent times thought it no longer of interest or even a figment of the imagination and I've seen no papers on the topic in the last half century. I think it's time to take a closer look.

We've had many earthquakes on the North Coast and I'm aware of only two with visible ground roll reports. Our most recent large quake was just over a year ago. The M7.0 Mendocino fault earthquake occurred at 10:44 AM when many people were outside. People described trees swaying and rumbling but no one mentioned seeing the ground roll. The 2024 quake was a strike-slip earthquake where the fault slip was entirely horizontal. The 1992 mainshock and the 1954 earthquakes were both shallow earthquakes on thrust faults where the rock on one side was pushed up and over the rock on the other side. I think the type of faulting may be important.

Other earthquakes in the world have produced eyewitness accounts of seeing the ground roll. A good friend of mine was outside on October 17, 1989, and saw ripples on the ground surface during the M6.9 Loma Prieta earthquake. That earthquake also had a large component of thrust faulting. My current working hypothesis is that depth and type of faulting are important. Unfortunately, ground roll observations have not been included in earthquake catalogs for over a half century and I'm having a hard time pulling up a list of other quakes that produced visible ground undulations.

Sounds are also on my earthquake oddity list. There are many different sounds associated with earthquakes. My first North Coast quake experience was in the early morning hours of November 8, 1980, when the crashing of our antique clock occurred nearly simultaneously with the violent shaking that caused our whole house to groan. It's not just toppling items that produce earthquake sounds. Those same P-waves that might trigger earthquake lights can also produce a low audible roar that some have described like a train approaching.

Even gentle P-wave motion can trigger another, generally unpleasant, earthquake effect. Nearly 20% of people report a sense of nausea or dizziness during a widely felt earthquake. Blame your inner ear which is sensing those motions and is out of sync with what your eyes are seeing. It's the same cause as sea sickness – your body interprets the mismatch as something poisonous in your gut.

I've heard of strange smells before, during, or after quakes, headaches, wells suddenly going dry or overflowing, and rivers flowing backwards. If you have any of these oddities up your sleeve or ones I haven't heard of, you can tell them to me via the email link or phone message line below.

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