Solar superstorm awes locals in 1859

It was known as “the week the sun touched the earth.” In late August and early September 1859, two geomagnetic solar superstorms walloped our planet, illuminating the nighttime sky of Central Illinois with jaw-dropping northern light shows.

Solar storms originate from sunspots, darker, cooler areas of the sun’s surface created by the twisting of its magnetic field. Enormous solar flares—“coronal mass ejections” in scientific parlance—leap outward from these sunspots, generating in the process solar wind shockwaves (think of a bullet leaving a gun). And on occasion, the earth sustains a direct hit from these shockwaves.

When that happens, the solar winds of supercharged plasma buffet the earth’s magnetic shield, interacting with atoms and molecules in the upper reaches of the atmosphere. All this bumping about produces the transcendent “auroral forms” (clouds, flashes, waves, streamers, shafts, etc.) and colors (white, red, violet, pink, green, etc.) we see as northern lights.

Two massive solar storms appearing four days apart in the late summer of 1859 gave “the week the sun touched the earth” its name. The first one reached here Aug. 28, and the second one Sept. 1.

“Papers from all over the country, as far south as St. Louis, Louisville and Philadelphia at least, speak of the auroral display ... as the most brilliant which had been seen for years in their respective localities,” noted The Pantagraph in its a lengthy account of the first superstorm. And the lightshow was no less spectacular in Central Illinois.

Today, we inhabit a world of visual overstimulation and saturation, and so it’s hard for us to appreciate how these “spectral campfires” (in the words of The Pantagraph) affected, aesthetically and imaginatively speaking, mid-19th century observers. Although some folks with certain religious proclivities interpreted the aurora borealis (a fancier name for northern lights) as a sign of the End Times, many Americans knew these seemingly fantastical displays were natural in origin and were related, somehow and someway, to electricity and magnetism.

Regardless, many of the finely tuned (and attuned) accounts from the 1859 lightshows are impressively sublime. “For some time the aurora threw out remarkably bright wings along both eastern and western horizon,” recounted one observer, “and at the same time the tips of the streamers, where they converged near the zenith glowed with a remarkably intense and fiery redness.”

Humans have witnessed solar storm-generated aurora borealis since time immemorial, but the storms themselves made little impact on the pre-electrical world.

The back-to-back cosmic maelstroms of 1859, though, did play havoc with the Internet of the day—telegraphy. During geomagnetic solar storms of sufficient strength, telegraph lines and equipment remained "live" even when disconnected from a power source. In any case, atmospheric interference and overheated equipment meant few messages could get through during the height of these storms.

In the late morning of Sept. 1, amateur English astronomer Richard Carrington was busy sketching an enormous cluster of sunspots when he unwittingly witnessed the origin of the week's second superstorm—a sustained flare emanating from one of the spots, its brightness "fully equal to that of direct sunlight."

This mother of all coronal mass ejections, known today as the Carrington Event, was said to carry the energy of 10 billion (that's billion with a "b") atomic bombs. The aurora borealis it produced could be witnessed as far south as the Caribbean.

"The fantastic northern lights were abroad in their strength again on Thursday night," announced The Pantagraph, heralding the Sept. 1-2 storm. "They did not, while we watched them, assume so brilliant and variegated an appearance as on Sunday night [the Aug. 28 storm], but the display was a remarkably fine one notwithstanding."

"Remarkably fine," it should be noted, was a wee bit of an understatement. A Mr. H. Moore, who lived a few miles outside of Bloomington, watched the grand spectacle with his family. Between 2:00 and 3:00 a.m. they witnessed a sky "almost covered with brilliant rays of many colors and of extraordinary beauty, running to a common center." For Mr. Moore, it was "the most magnificent sight he ever saw in his life."

That same night someone from the Pantagraph, likely Publisher Williams Foote or Editor Edward J. Lewis, walked outside and, as a test, successfully read newsprint under the "auroral light." The Pantagraph was a Republican Party newspaper in a highly charged partisan era (the Civil War was less than two years away), so the news story chosen for this special occasion ridiculed U.S. Sen. Stephen Douglas of Illinois, one of the nation's leading Democrats.

Midwestern skies have been lit up by periodic aurora borealis since then, such as one particularly strong event on Apr.16- 17, 1882. "Words fail to describe the intense and ever-varying beauty of the awe-inspiring spectacle," remarked The Pantagraph that spring.

This geomagnetic storm "practically rendered useless all telegraph wires from New York to Ogden [Utah]." On the whole, it was a tough day for the Western Union Telegraph Co. In one Chicago office, several operators burned their fingers on disconnected equipment. "Such was the force of the 'element' that several wires were burned off entirely, and the switchboard, upon which connections are made, caught fire on several occasions."

Some readers may recall the geomagnetic solar storm of March 1989 that caused power outages across a large swath of Quebec, leaving million of residents without power for

upwards of nine hours. The aurora borealis from this event could be seen as far south as Texas.

There have been near misses as well. In July 2012, a solar storm packing a punch on par with the two 1859 storms hurtled passed Earth in what was deemed a near miss.

A few years ago the National Academy of Sciences studied the potential effects of another Carrington-level event if it were to occur today. Satellites, communication infrastructure and power grids would be at greatest risk. Technologically advanced though we may be, our civilization today is far less resilient and far more precarious than it was in 1859, given our dependence on electricity for … well everything. The Academy's report predicted "extensive social and economic disruptions." Blackouts in certain areas could last weeks. Damage estimates ran between $1 and $2 trillion (that's trillion with a "t").

The appearance of sunspots (and thus solar storms) is cyclical, occurring every eleven years or so. The last solar cycle peaked in 2013. We can breathe easy for now. Yet when it comes to the next Big One, it's not a question of if, but of when.

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