

CLIMATE

Lightning strikes will surge with climate change

Research forecasts a roughly 50 percent rise in U.S. thunderbolts over next century



Warming temperatures will cause more lightning strikes in the 48 states, new climate simulations predict.

JAMES LOESCH/Flickr (CC BY 2.0)

By **Thomas Sumner**

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Global warming could have an electrifying effect. Rising temperatures may increase lightning strikes by 50 percent over the next 100 years, researchers report.

“For every two strikes you get today, you’ll get three strikes at the end of the century,” explains David Romps. He’s an atmospheric scientist at the University of California, Berkeley. Romps was the lead author of the new study. It appeared November 14 in *Science*.

The study estimates that lightning frequency will increase about 12 percent for every 1° Celsius (1.8° Fahrenheit) in warming. Computer models of climate forecast that by the end of this

century, average air temperatures at Earth's surface will rise by 4 °C.

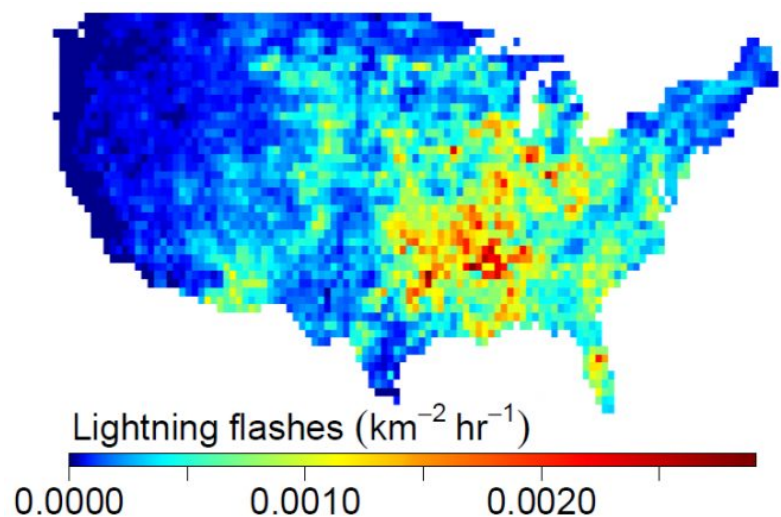
This lightning surge will have negative consequences, Romps warns. Lightning ignites most natural wildfires. It sparks chemical reactions in the lower atmosphere that produce ozone, a greenhouse gas. Lightning also kills roughly 50 Americans each year, injuring hundreds more. "Climate change is going to alter weather in ways that will become quiet noticeable," he predicts.

Currently, lightning strikes about 20 million times a year within just the continental United States. Lightning storms form when rising water vapor cools in the atmosphere, creating a cloud. As the water condenses, the cloud heats up and climbs, just like a hot-air balloon. At high enough altitudes, small ice crystals form and collide. Those collisions transfer electric charge. The same happens if you shuffle rubber-soled shoes on a carpet.

Over time, negative electric charges collect on the bottom of a cloud. If the difference in electric charge between the ground and the thundercloud becomes large enough, an electric current will arc between them. This is lightning. (The clap of thunder that follows is created when a lightning bolt heats the surrounding air. As the air rapidly expands, it produces a sound wave.)

Hotter air temperatures produce more water vapor. So scientists agree that lightning activity will probably increase as Earth warms. How big an increase in lightning to expect has been unclear: Previous predictions have ranged from 5 percent to well over 100 percent for each 1 °C increase in average global temperatures.

The additional lightning strikes could make climate change worse, says Colin Price. He is an atmospheric physicist at Tel Aviv University, in Israel. Lightning can lead to the formation of ozone. This greenhouse gas traps heat in the atmosphere. And that could trigger a feedback:



2011 U.S. lightning strikes as observed by the National Lightning Detection Network.

DAVID M. ROMPS, UC BERKELEY

More lightning would cause more warming — that would cause still more lightning, which would boost warming even more.

Power words

chemical reaction A process that involves the rearrangement of the molecules or structure of a substance, as opposed to a change in physical form (as from a solid to a gas).

climate The weather conditions prevailing in an area in general or over a long period.

climate change Long-term, significant change in the climate of Earth. It can happen naturally or in response to human activities, including the burning of fossil fuels and clearing of forests.

condense To change a gas into a liquid.

electric charge The physical property responsible for electric force; it can be negative or positive.

electric current A flow of charge, called electricity, usually from the movement of negatively charged particles, called electrons.

greenhouse gas A gas that contributes to the greenhouse effect by absorbing heat. Carbon dioxide is one example of a greenhouse gas.

greenhouse effect The warming of Earth's atmosphere due to the buildup of heat-trapping gases, such as carbon dioxide and methane. Scientists refer to these pollutants as greenhouse gases. The greenhouse effect also can occur in smaller environments. For instance, when cars are left in the sun, the incoming sunlight turns to heat, becomes trapped inside and quickly can make the indoor temperature a health risk.

lightning A flash of light triggered by the discharge of electricity that occurs between clouds or between a cloud and something on Earth's surface. The electrical current can cause a flash heating of the air, which can create a sharp crack of thunder.

ozone A colorless gas that forms high in the atmosphere and at ground level. When it forms at Earth's surface, ozone is a pollutant that irritates eyes and lungs.

vapor A substance in the gaseous state.

weather Conditions in the atmosphere at a localized place and a particular time. It is usually described in terms of particular features, such as air pressure, humidity, moisture, any precipitation (rain, snow or ice), temperature and wind speed. Weather constitutes the actual conditions that occur at any time and place. It's different from climate, which is a description of the conditions

CITATIONS

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S. Ornes. "[Where will lightning strike?](#)" *Science News for Students*. Sept. 16, 2014.

S. Perkins. "[Does lightning sculpt mountains?](#)" *Science News for Students*. Feb. 4, 2014.

E. Sohn. "[Powering ball lightning.](#)" *Science News for Students*. Jan. 30, 2008.

E. Sohn. "[Petrified lightning.](#)" *Science News for Students*. Feb. 16, 2007.

Original journal source: D.M. Romps et al. [Projected increase in lightning strikes in the United States due to global warming.](#) *Science*. November 14, 2014. doi: 10.1126/science.1259100.