

Scientists Seek Sprite Light Source

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by Mike Bettwy

Giant red blobs, picket fences, upward branching carrots, and tentacled octopi --- these are just a few of the phrases used to describe sprites --- spectacular, eerie flashes of colored light high above the tops of powerful thunderstorms that can travel up to 50 miles high in the atmosphere.

Image: This dramatic, garishly colored image was captured with a low-light level camera on June 7, 2001. It shows what appears to be a "burning tree", or red sprite, above the National Cheng Kung University campus in

Tainan City, Taiwan. Click on image to enlarge. Credit: ISUAL Project, NCKU/NSPO, Taiwan

Most researchers have long supported the theory that sprites are linked to major lightning charges. Still, some scientists believe that conditions high in the atmosphere, like meteoritic dust particles or gravity waves might also induce sprite formation.

Now, a study led by Steven Cummer of Duke University, Durham, N.C. and Walter Lyons of FMA Research, Inc., Fort Collins, Colo. has found more evidence that sprites are generated by major lightning strikes. They also found the total charge, as it moves from the cloud to the ground, and multiplied by that distance, known as the "lightning charge moment," is most critical in the sprite's development. The study appeared in the April 2005 issue of *Journal of Geophysical Research---Space Physics*.

During the summer of 2000, researchers from across the nation participated in the Severe Thunderstorm Electrification and Precipitation Study. While the primary goal was to study severe thunderstorms and their link to heavy rain and hail, scientists also gathered important data on lightning's role in triggering events above thunderclouds, like sprites.

Armed with the aid of sophisticated instruments and sensors, Cummer collected information from three thunderstorm outbreaks across the central U.S. and compared the "lightning charge moment" in both sprite and non---sprite producing lightning.

"The idea was that if other factors contributed to lowering the electric field threshold for sprite initiation, they would probably not always be present and we would find that sprites occasionally form after just modest lightning strokes," said Cummer.

Simulations created with the help of NASA computer animations and other data showed that weak lightning strikes do not create sprites. They also found factors other than the cloud---to---ground charge transfer are generally not important ingredients in sprite development.

Sprites, not formally identified until 1989 when the Space Shuttle (STS---34) recorded flashes as it passed over a thunderstorm in northern Australia, are largely unpredictable and brief --- lasting only 3 to 10 milliseconds and inherently difficult to study. But, the technique used in this study also proved that "a single sensor can monitor moment change in lightning strikes over a very large area, providing a reasonable way of estimating how often sprites occur globally," said Cummer. Much research to date has instead relied on the strategic placement of multiple low light video cameras.

Lightning's other cousins, including elves that bring a millisecond flash of light that fills the entire night sky within a 100 kilometer (62 mile) radius of the associated lightning strike --- are generating much interest because of their strong electric fields and electromagnetic pulses that may interact with the Earth's ionosphere and magnetosphere.

Related websites:

- + [FMA's Sprite and Lightning Research](#)
- + [FMA's Sprite Trivia](#)

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