



How can you benefit with the ScholarShare® College Savings Plan?

GET THE FACTS



- News
  - Articles
  - Videos
  - Images
  - Books
  - Search
- Health & Medicine
  - Mind & Brain
  - Plants & Animals
  - Earth & Climate
  - Space & Time
  - Matter & Energy
  - Computers & Math
  - Fossils & Ruins

Science News

Share Blog Cite Print Email Bookmark

## Bolts Of Blue Lightning Thrusting Upward And Other Weird Lightning Explained

ScienceDaily (Mar. 30, 2008) — The mechanism behind different types of lightning may now be understood, thanks to a combination of direct observation and computer modeling reported by a team of researchers from New Mexico Tech and Penn State.

See Also:

Earth & Climate

- Storms
- Severe Weather
- Atmosphere

Computers & Math

- Computer Modeling
- Mathematical Modeling
- Artificial Intelligence

Reference

- Thunderstorm
- Dew point
- Supercell
- Storm chasing

"Our explanation provides a unifying view of how lightning escapes from a thundercloud," the researchers report in the April edition of Nature Geoscience.

Most people see lightning strikes that go from clouds to the ground, but some lightning goes upward, forming blue jets and gigantic jets. Perhaps the most dangerous lightning appears as "bolts from the blue" -- lightning that begins upward, but then moves sideways and then downward to hit the ground as much as three miles from a thunderstorm.

About 90 percent of lightning occurs inside clouds and is not visible to the casual observer. The researchers wondered if lightning that appears within clouds and the lightning that

escapes upward or downward shared the same development mechanisms.

"With the help of colleagues from New Mexico Tech, we were able to build a model of lightning and apply it to the various types of lightning," says Jeremy A. Riousset, graduate student in electrical engineering, Penn State. "Thanks to their observations and measurements, we know how lightning like 'bolts from the blue' happen. We know they develop like normal intracloud lightning before escaping the thundercloud at upper levels and branching toward the ground."

They also discovered that upward and sideward lightning events occurred shortly after normal downward lightning bolts occurred or intracloud lightning produced a local charge imbalance in the cloud.

Harald E. Edens, graduate student in physics, New Mexico Tech, working with Paul R. Krehbiel, professor of physics; Ronald J. Thomas, professor of electrical engineering, and William Rison, professor of electrical engineering, all at New Mexico Tech; and Mark A. Stanley, consultant, obtained detailed pictures of "bolts from the blue" using New Mexico Tech's Lightning Mapping Array, a three-dimensional lightning location system that uses multiple measurement stations to capture and time the VHF signal of the lightning. The Lightning Mapping Array can map lightning within clouds, something that normal optical photography or videography cannot do.

Riousset, working with Victor P. Pasko, associate professor, electrical engineering at Penn State, looked at the images from New Mexico and developed a model that explained the variety of lightning types. Lightning forms in clouds when different areas of the cloud become either positively or negatively charged. Once the electric field near a charged area exceeds a certain propagation level, lightning occurs. The type of lightning depends on where the charge builds and where the imbalance in charge exists in the clouds.

For intracloud lightning, the most common form of lightning, the transfer of charge occurs between the most negatively and most positively charged areas, the middle and upper parts of the cloud, respectively. Lightning that strikes the ground does so because precipitation or the storm's progression creates an excess of net negative charge in the mid-levels of the cloud. This results in either a direct ground strike or a bolt from the blue.



Most people see lightning strikes that go from clouds to the ground, but some lightning goes upward, forming blue jets and gigantic jets. Perhaps the most dangerous lightning appears as "bolts from the blue" -- lightning that begins upward, but then moves sideways and then downward to hit the ground as much as three miles from a thunderstorm. (Credit: iStockphoto/Martin Fischer)

Ads by Google

Covidien

Achieving A Healthier Bottom Line For Patient & Financial Outcomes. [www.Covidien.com](http://www.Covidien.com)

Lightning Protection Rods

Lightning Rods, Parts & Arresters On Line Prices - Do-it-Yourself. [www.LightningRodSupply.com](http://www.LightningRodSupply.com)

Lightning Protection

residential and commercial lightning and surge protection [www.bondedlightning.com](http://www.bondedlightning.com)

RTCA/DO-160 Testing

TUV provides RTCA/DO-160E, HIRF and MIL-STD-461E testing services [www.TUVamerica.com](http://www.TUVamerica.com)

Related Stories

**Lightning's Mirror Image ... Only Much Bigger** (Aug. 24, 2009) — With a very lucky shot, scientists have captured a one-second image and the electrical fingerprint of huge lightning that flowed 40 miles upward from the top of a ... > [read more](#)

**A Space Station View On Giant Lightning** (Oct. 4, 2005) — Do giant flashes of lightning striking upwards from thunder clouds merely pose an extraordinarily spectacular view? Or do they actually alter the chemical composition of the atmosphere, playing a ... > [read more](#)

**Lightning Strikes Deadliest In Summer** (June 29, 2007) — Lightning strikes were responsible for 47 confirmed deaths and 246 confirmed injuries last year, according to the National Oceanic and Atmospheric Administration, and summer is the peak season for ... > [read more](#)

**How Do Thunderstorms Create Lightning? High-Energy Particles From Space Used To Probe Thunderstorms** (June 3, 2009) — Scientists have developed a new technique to remotely measure

Just In:

'Waste' Energy Turns Water Into Hydrogen Fuel

Science Video News



Lightning: Fact or Fiction?

To study lightning, scientists use rockets connected to the ground by wires. They fire the rockets into clouds, triggering electrical discharges, and ... > [full story](#)

Atmospheric Scientists Link Lightning to Ice Particles In Clouds

Electrical Engineers And Meteorologists Devise Method To Measure Strength Of Lightning Strikes On Tall Buildings

Meteorologists Are Getting Better at Forecasting

[more science videos](#)

How can you benefit with the ScholarShare® College Savings Plan?

GET THE FACTS

Fidelity Brokerage Services, Member NYSE, SIPC 543786.1

Breaking News

... from NewsDaily.com

Scientists find "mother" of all skin cells



"Personal" study shows gene maps can spot disease

SpaceX aborts rocket engine test

Scientists say UK risks losing innovation edge

Big Bang experiment may reveal dark universe: CERN

[more science news](#)

In Other News ...

Billionaire Pinera takes power as quakes rattle Chile

Biden appeals for Mideast peace talks without delay

Iraq results trickle out, Maliki rivals cry fraud

Jobless claims fall, trade gap narrows on oil

Chile lifts tsunami alert on coast after tremors

Financial reform deal fails, hopes for 2010 dim

How can you benefit with the ScholarShare® College Savings Plan?

GET THE FACTS

Fidelity Brokerage Services, Member NYSE, SIPC 543786.1

more likely a gigantic jet will appear.

However, large positive charge in the upper levels of the storm causes blue jets.

"This is the first consistent definition of blue jets and gigantic jets," says Pasko.

In normal thunderstorms, blue jets are positive, originate in the uppermost part of the cloud and propagate continuously upward; while gigantic jets are negative, begin like a normal intracloud flash and propagate stepwise upward. Inverted polarity storms do exist and the charges of the various lightning types would then reverse.

The higher the cloud, the more likely either type of jet becomes. Thunderstorms in the tropics form with very high clouds increasing the chances of jets forming. Thunderstorms in the temperate United States do not have clouds quite so high, allowing a great number of bolts from the blue to occur. Bolts from the blue are very common in continental mid-latitude storms.

Every discharge of lightning from the cloud alters the charge status within the cloud, shifting the locations of the highest negatively or positively charged areas. These shifts along with mixing of the upper areas of the clouds can tip the storm toward bolts from the blue or jets depending on the circumstances.

"We are proposing a self-consistent, unified theory of lightning discharges inside and outside of clouds including blue jets, bolts from the blue and gigantic jets," says Pasko of Penn State. He adds that while their model can stipulate the requirements of each type of lightning, data collection during storms is too slow for the model to act in any predictive way.

The National Science Foundation supported this work.

Email or share this story: [More](#)

#### Story Source:

Adapted from materials provided by [Penn State](#), via [EurekAlert!](#), a service of AAAS.

Need to cite this story in your essay, paper, or report? Use one of the following formats:

- APA Penn State (2008, March 30). Bolts Of Blue Lightning Thrusting Upward And Other Weird Lightning Explained. *ScienceDaily*. Retrieved March 11, 2010, from <http://www.sciencedaily.com/releases/2008/03/080328102738.htm>
- MLA

Note: If no author is given, the source is cited instead.

the search for the source of X-rays emitted by lightning, a feat that could one day help predict where lightning will ... [> read more](#)



#### ER Physician Tells You How To Avoid A Lightning Strike And What To Do If One Occurs (Aug. 7, 2009)

— An estimated 200 people die each year in the U.S. after being struck by lightning. An extremely brief but intense hit delivers more than 10 million volts and is fatal in about 30 percent of cases. ... [> read more](#)



#### NASA Finds Intense Lightning Activity Around A Hurricane's Eye

(June 23, 2006) — In 2005, Hurricane Emily, a very strong hurricane had some of the most lightning activity ever seen in a hurricane. Scientists are now trying to determine if the frequency of lightning is connected ... [> read more](#)



#### NOAA Research Yields New Tools For Lightning Prediction (July 15, 2005)

— Forecasters at the NOAA Storm Prediction Center in Norman, Okla., now have additional tools to more accurately predict the occurrence of cloud-to-ground (CG) lightning flashes within thunderstorms. ... [> read more](#)

#### Ads by Google

##### Lightning Rods & Hardware

UL Recognized Lightning Protection  
Made In USA. Fast Free Shipping!  
[StormGrounding.com/](#)

##### US Made Fasteners

Bolts Made in the US  
High/Low Volume Manufacturer  
[www.bdthreadrolling.com](http://www.bdthreadrolling.com)

##### Business Intelligence Now

Discover the true power of Business  
Intelligence at Microsoft Tech Ed.  
[BI2010.Eventpoint.com](http://BI2010.Eventpoint.com)

##### Surge Suppressors

Save Equipment. Save Money.  
High Quality. Lifetime warranty.  
[www.surgepure.com](http://www.surgepure.com)

Number of stories in archives: 82,625

[more top news](#)

Copyright Reuters 2008. See [Restrictions](#).

#### Free Subscriptions ... from ScienceDaily

Get the latest science news with our free email newsletters, updated daily and weekly. Or view hourly updated newsfeeds in your RSS reader:

[Email Newsletters](#)

[RSS Newsfeeds](#)

#### Feedback ... we want to hear from you!

Tell us what you think of the new ScienceDaily -- we welcome both positive and negative comments. Have any problems using the site? Questions?

Your Name:

Your Email:

Comments:

Click button to submit feedback:

Find with keyword(s):

Enter a keyword or phrase to search ScienceDaily's archives for related news topics, the latest news stories, reference articles, science videos, images, and books.