

A display of lights above the storm

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In 2015, European Space Agency (ESA) astronaut Andreas Mogensen was onboard the International Space Station (ISS), photographing the tops of thunderstorms from Earth orbit. And he saw something very interesting indeed.

Blue jets.

Blue jets are a type of Transient Luminous Event (TLE), flashes and glows that appear above storms that are results of activity occurring in and below those storms. Blue Jets pulse from the tops of intense thunderstorms and reach up toward the edge of space.

In January 2017 researchers at Denmark's National Space Institute published their analysis of his observations in *Geophysical Research Letters*. Mogensen was able to capture clear video as the station flew over the Bay of Bengal, and they were amazed by what that video showed.

Olivier Chanrion, lead author of the publication reported that "During 160 seconds of video footage, 245 pulsating blue discharges were observed, corresponding to a rate of about 90 per minute." One of the [blue jets](#) observed reached 25 miles (40 km) above sea level.

Visual evidence of TLEs wasn't available until 1989. Early evidence included [red sprites](#) photographed by cameras onboard the [space](#) shuttle, and photographs taken during a NASA and University of Alaska airborne campaign. Red sprites are glows in the upper atmosphere, tied to the presence of large lightning flashes but not attached to the clouds themselves. In recent years the ISS has afforded astronauts the opportunity to photograph a number of natural light shows produced at the tops of thunderstorms.

A 2013 study by researchers from the French Alternative Energies and Atomic Energy Commission analyzed pictures from the NASA Crew Earth Observations Facility aboard the station. The pictures revealed 15 sprites and their parent lightning flashes. In August 2015 the Expedition 44 crew onboard the station photographed red sprites over two different storms within 3 minutes of one another, first over the American mid-west and then near the coast of El Salvador. These sprites reached as high as 62 miles (100 km) above the surface of the Earth.

All of these studies are contributing to researchers' understanding of lightning and thunderstorms, how they form and develop over time, and why storms produce different TLEs in different circumstances. However according to Tim Lang, atmospheric scientist at NASA's Marshall Space Flight Center, "TLE studies have been, to an extent, fortunate observation. We've gotten better at finding them, but it's mostly case-based analysis."

NASA and partner agencies are advancing in their efforts to make continuous storm observations. NASA's Lightning Imaging Sensor (LIS) was installed on the International Space Station in February 2017 as part of the DoD Space Test Program. LIS on the station is the latest in a line of instruments used to locate and detect lightning over a large region of the Earth's surface. The Atmosphere-Space Interactions Monitor (ASIM) will be installed outside Europe's Columbus laboratory on the ISS later this year. Torsten Neubert, ASIM Principal Investigator says, "The instruments will monitor thunderstorms and their effects on Earth's atmosphere, gathering information about Blue Jets and other TLEs, as well as flashes of X- and Gamma-rays." LIS and ASIM will be providing data that gives researchers the opportunity to analyze storms from both below and above. All of these studies are adding to our knowledge of how storms evolve and change, helping improve [storm](#) models that could lead to better predictions and forecasts.

More information: For more science from above the clouds visit www.nasa.gov/station

Provided by NASA

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