Researchers get rare lightning video

4 February 2015

A team of Florida Institute of Technology researchers led by Associate Professor Ningyu Liu has captured rare and hard-to-predict upward-moving lightning discharges on video, allowing for the study of this phenomenon in a way that has not been previously possible.

The study and accompanying video, which were published last month in *Nature Communications*, focus on the electrical activities of Tropical Depression Dorian in August 2013, which featured seven of these upward-moving lightning events, each having unique optical and radio signatures.

Among those working alongside Liu was Nicholas Spiva, a senior physics major at Florida Tech who was killed in a motorcycle accident late last year. They were joined by College of Science Dean Hamid Rassoul and scientists from outside of the university to investigate these lightning discharges, laying the groundwork for future study.

These upward electrical discharges have previously been classified into three groups, based on their terminal altitudes: starters (20-30 km), jets (40-50 km), and gigantic jets (70-90 km). Prior to this work, typical observations of these discharges had been limited to one type per storm. By capturing these seven discharges, which included all three types, researchers will now better understand the similarities and differences between these types and study them in greater detail.

One of the key findings from these new observations is that all seven events originated in the same thundercloud region, suggesting that these different kinds of events are generated by the same physical mechanism.

"Since 2001 our research team has been probing the mysteries of lightning," Rassoul said. "This latest observation represents yet another exciting discovery that will help us better understand the properties of lightning in all of its diverse forms."

Liu said that the upward electrical discharges transfer a large amount of electric charge into the upper atmosphere, which can potentially affect cloud formation and weather by modifying the global atmospheric electrical circuit, as well as the chemistry of the atmosphere. These discharges can also affect radio signals for long-range communication.

The team is currently studying this particular storm in depth for a better understanding of its meteorological and electrical characteristics.

"We are very curious about why this particular storm was able to generate those different forms of the upward electrical discharges, and what storm properties enabled the upward propagating leaders originating deep inside the storm to escape into space," Liu said.

Future research will focus on modeling the electrical activities of storms like this to understand how jets and gigantic jets are formed. The research team also hopes to upgrade their Florida Tech observation system so they can collect even higher quality images during future events.

More information: "Upward electrical discharges observed above Tropical Depression Dorian."

Nature Communications 6, Article number: 5995
DOI: 10.1038/ncomms6995