

The form and origin of the jet off the coast of Ibaraki prefecture on December 11, 2017

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1. Motivation and purpose

Since 2007 we have observed TLEs (Transient Luminous Events) at our school.

On December 11 2017, we observed a jet, a kind of TLEs, with a camera set up at our school.

Jets occur infrequently and we had not observed one since 9 December 2010 so we set about analyzing the form and cause of the jet.

2. What TLEs are

TLEs are a phenomenon that occur well above the altitudes of normal lightning and storm clouds. They are a type of lightning and are categorized by the form they take.

3. TLE observation method

We used a CCD camera as part of our TLE observation system. We precisely manage time on the PC by using GPS watches. We observed TLEs and shared the information with each other. So we could specify where Jets had occurred.

4. Jets

4-1 specifying where Jets occurred

At 22:47:13 on 11th December 2017, we observed a jet that occurred over the Pacific Ocean. This event was simultaneously observed by Mr. Shigure of Aoyama Gakuin University Sakamoto laboratory. Analysis of observational data at two points using the principle of triangulation shows that the jet occurred at 35.57 °N off the coast of Ibaraki Prefecture and 139.40 °east longitude.

4-2 Speed calculation

We cut the movie of the observed jet by frame-feed and calculated the extension speed of the light of the jet. As a result, the extension speed of the upper end of the jet was calculated to be 523.94 km / s.

5. Comparison with weather data

We acquired a weather map, satellite picture, diagram of rain cloud distribution and rainfall data from the home page of Meteorological Agency and lighting occurrence time information from Franklin Japan. We also, acquired the sprite occurrence time and generation point information from the bulletin board in SonotaCo.com. We found that a cold front passed at the point jet occurred between 9 AM and 3 PM, and a rain cloud developed over the pacific quickly between 6 PM and 10 PM. There was only one occurrence lighting near the point the jet was observed between 21:17 and 23:17. Twenty sprites occurred between 20:47 and 0:52.

6. Cause

One thing previous jet observations have in common is that a cold front passed over the occurrence point before the jets were observed. So we predict that jets are caused by a cold front passing by. Looking at the infrared satellite image, there was a rain cloud, but according to lighting occurrence information, there were few lighting strikes in this region. We thought this is because electricity was stored in the rain clouds before the jet occurred.

7. Conclusion

On 11th December 2017 we observed jets occurring at the highest degree of 66.3km near the sea at 35.57 °north latitude and 139.40 °east longitude off Ibaraki Prefecture. The ascending speed of the jet was 523.94 km / s. We compared jet observation data with lightning strike information and weather charts and made a hypothesis of the cause of jets.

8. Future tasks

We will continue to observe TLE' s and accumulate observation examples of jets and try to elucidate the mechanism of jet generation.

Acknowledgments

As we proceeded with this research, we received cooperation from Aoyama Gakuin University college student, Mr. SonotaCo and Mr. Ito who provides simultaneous observation records. Thank you very much.

References ·Homepage ·Software used

Tokyo University Press "Chemistry of Thunder" Takahashi Yu 2009

<http://www.tenki.jp/past/>

<http://sonotaco.jp/forum/viewforum.php?f=4&sid=0fec2c69e702015e2e0fdb12adfacc1>

UFOCapture HD 2

UFO Analyzer v2

Keywords: high altitude luminescence phenomenon, gigantic jet

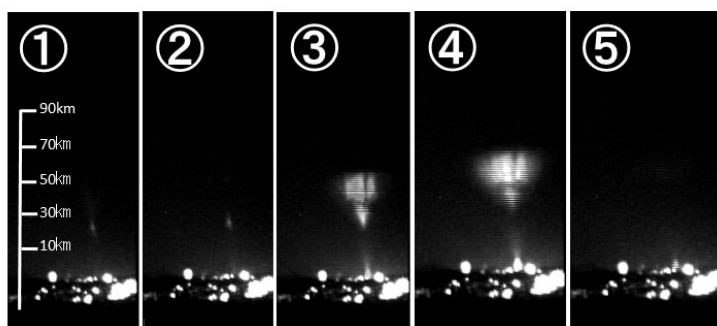


図1 2017年12月11日に発生したジェット
④が22時47分14.4秒を示す。1コマ30分の1秒間隔。
神奈川県相模原市にある青山学院大学坂本研究室にて段毛氏撮影。

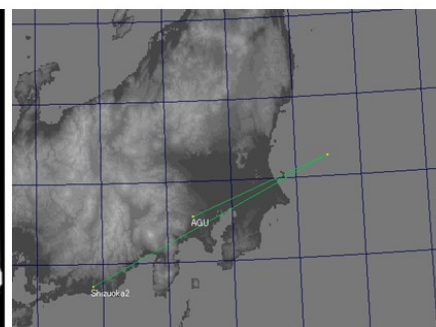


図2 三角測量の原理によりジェットの発生地点
茨城県沖の北緯35.57°，東経139.40°で発生した。
「AGU」は青山学院大学相模原校舎，
「Shizuoka 2」は静岡県立磐田南高等学校の位置を示す。