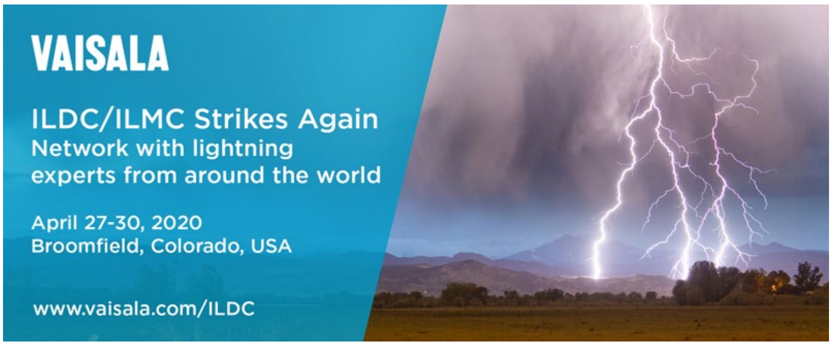

Randomizing Lightning Strike Locations Demonstrates Geological Control of Strike Locations

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Abstract

Previous presentations on using lightning analysis for natural resource exploration, given at the ILDC/ILMC Conference in Ft. Lauderdale, Florida in March of 2018,[1] were met with skepticism by some attendees. Recent research[2] has demonstrated "thunderstorms can cause perturbations in the lower ionosphere, partially ionizing the layer and creating disturbances … over timescales of less than 15 seconds … to several minutes. … The results … demonstrate a new type of energy coupling between thunderstorms and the ionosphere and offer a more complete picture of atmospheric geophysics." This new insight provides one possible explanation as to how microsecond long lightning strikes appear to interact with telluric currents at depths of 6,000 meters or more, far deeper than calculated skin depth, creating patterns in maps and volumes derived from NLDN data which tie data from traditional geophysical exploration tools and allow the mapping of faults and subsurface geologic anomalies.

These concepts relate directly with a review of lightning projects in South Texas, North Texas, West Texas, West South Carolina, East California, Central Arizona, Central Oklahoma, and South Utah. The green bar chart in Figure 1 shows the number of 300 x 150-meter cells which receive between 0.1 and 5.2 lightning strikes per year in the South Texas analysis area. The red bar chart is the same data with randomized lightning strike locations. The horizontal axis is annual strike probability. These calculations are based on 20+ years of lightning strike data in the NLDN database. Note Risk Points, greater than 3.2 lightning strikes per year, do not occur in the randomized data. We propose the non-overlapping green portion of this chart, and the charts we created for the other areas listed above, is due to interactions between geologic based telluric currents and lower frequency atmospheric currents tied to lightning strikes. These lower frequency currents have sufficient skin depth to interact with geologic currents at 6,000 meters, and may act as an electromagnetic guide for lightning strikes.

This presentation reviews results of over 10 years of using Vaisala lightning strike databases to map geology and explore for natural resources.

[1] (1) Mining and Oil & Gas Application of Lightning Analysis by Dr. D. James Siebert, Kathleen S. Haggar, L.J. Berent, and H. Roice Nelson, Jr.; and (2) Lightning data analysis provides geologic insights at South Carolina EPA Superfund Site by Kathleen S. Haggar, Dr. D. James Siebert, L. J. Berent, and H. Roice Nelson, Jr.

[2] Charging Thunderclouds Affect Ionospheric Conductivity by David Shultz, Earth & Space Science News, 06 September 2019.

Attachments

Figure_1.jpg

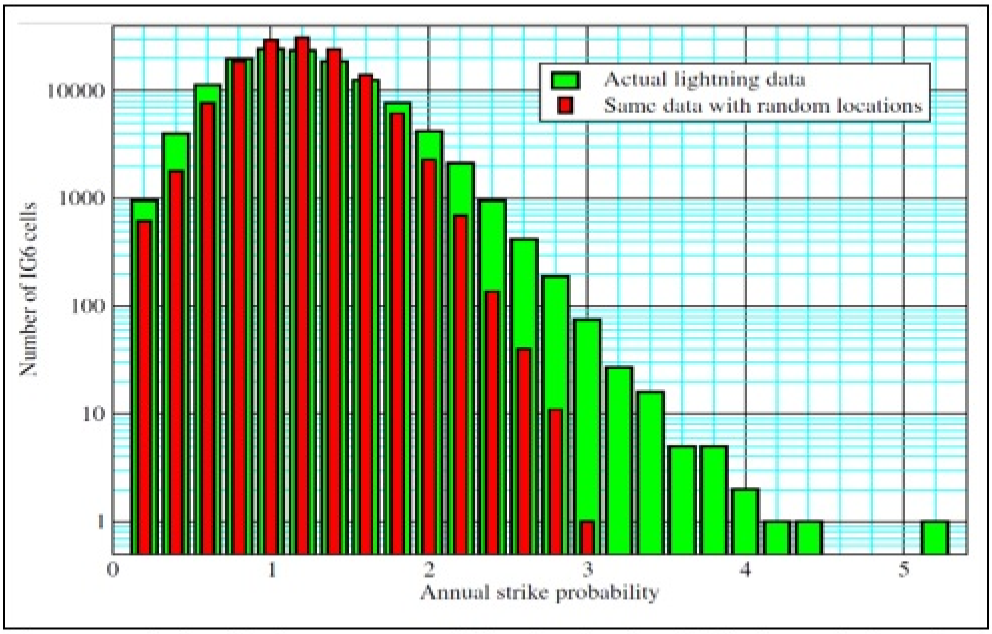

Figure 1. Relationship between recorded and randomized lightning strike locations.

Topic Areas

Applications of Lightning Data: Insurance Claims, Fire Risk, Mining, Wind Farms, etc.

Submission Format

No preference