

# Lightning Risk Points

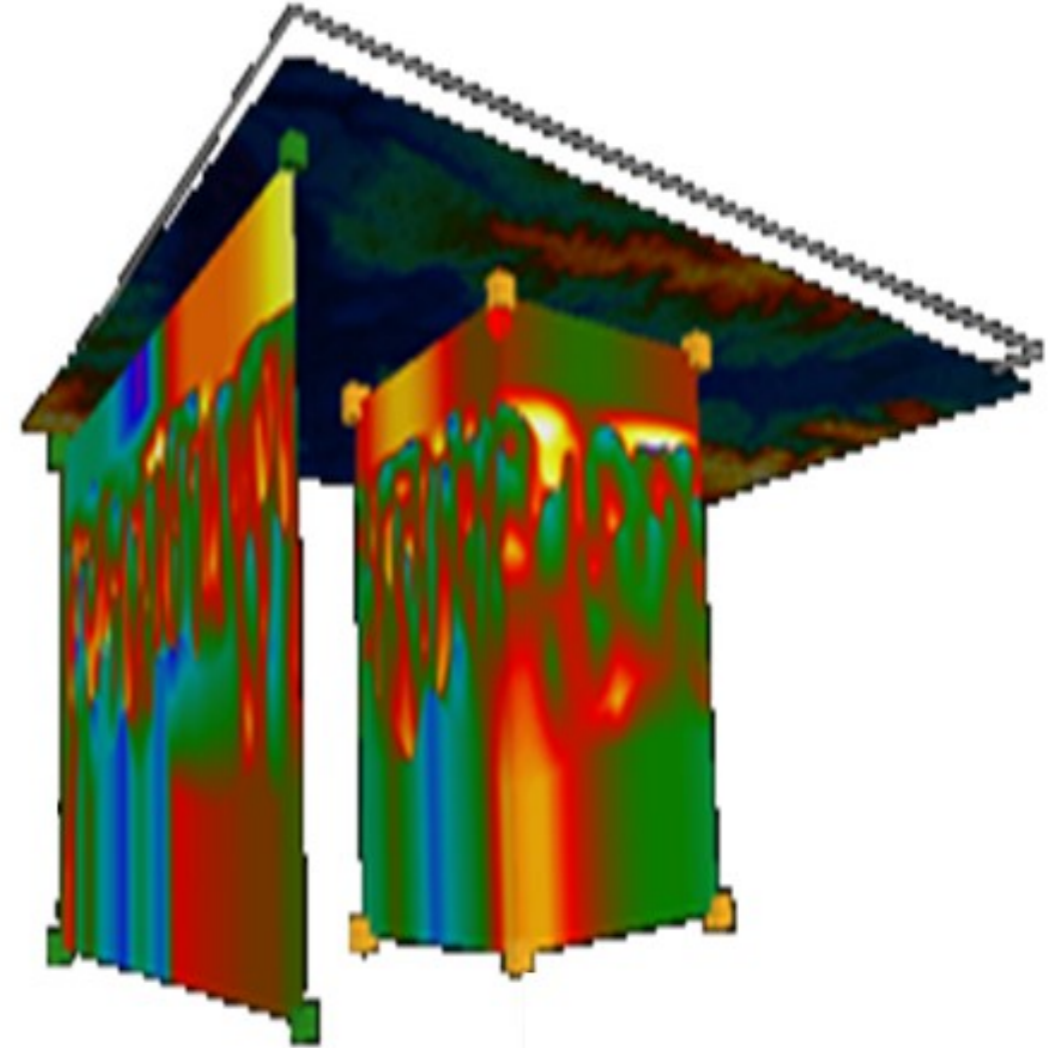
H. Roice Nelson, Jr.  
Dynamic Measurement LLC  
28 June 2017

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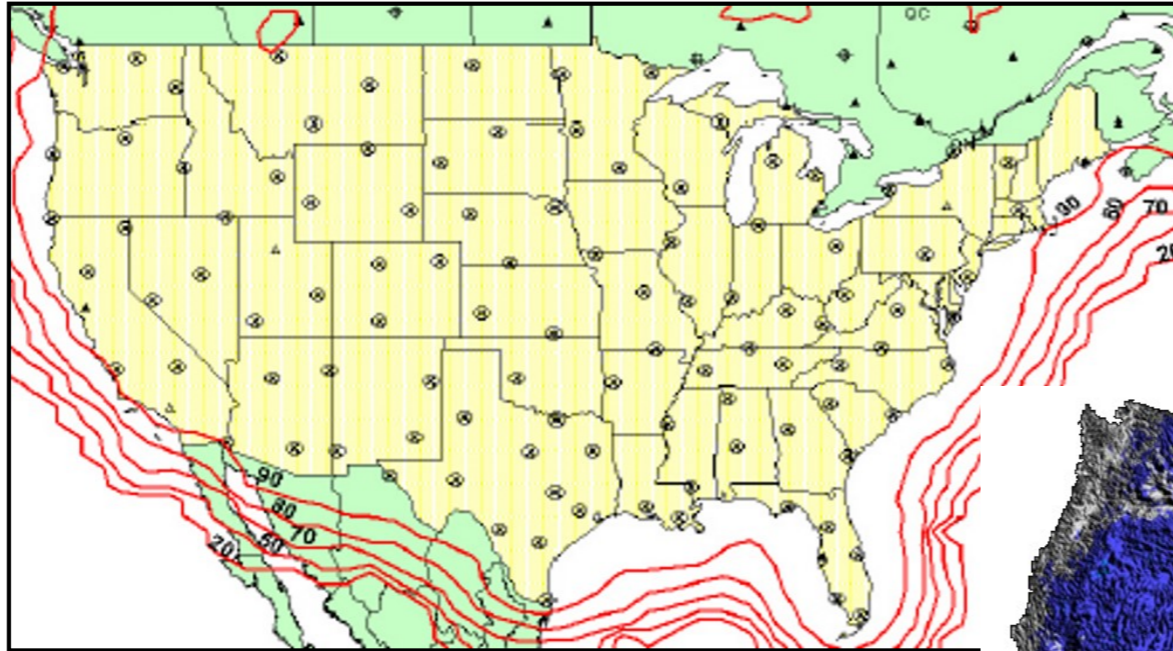
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# Exploring Insurance Implications of Lightning Risk Points

- 1. Lightning Analysis**
- 2. Risk Points**
- 3. Business Opportunity**

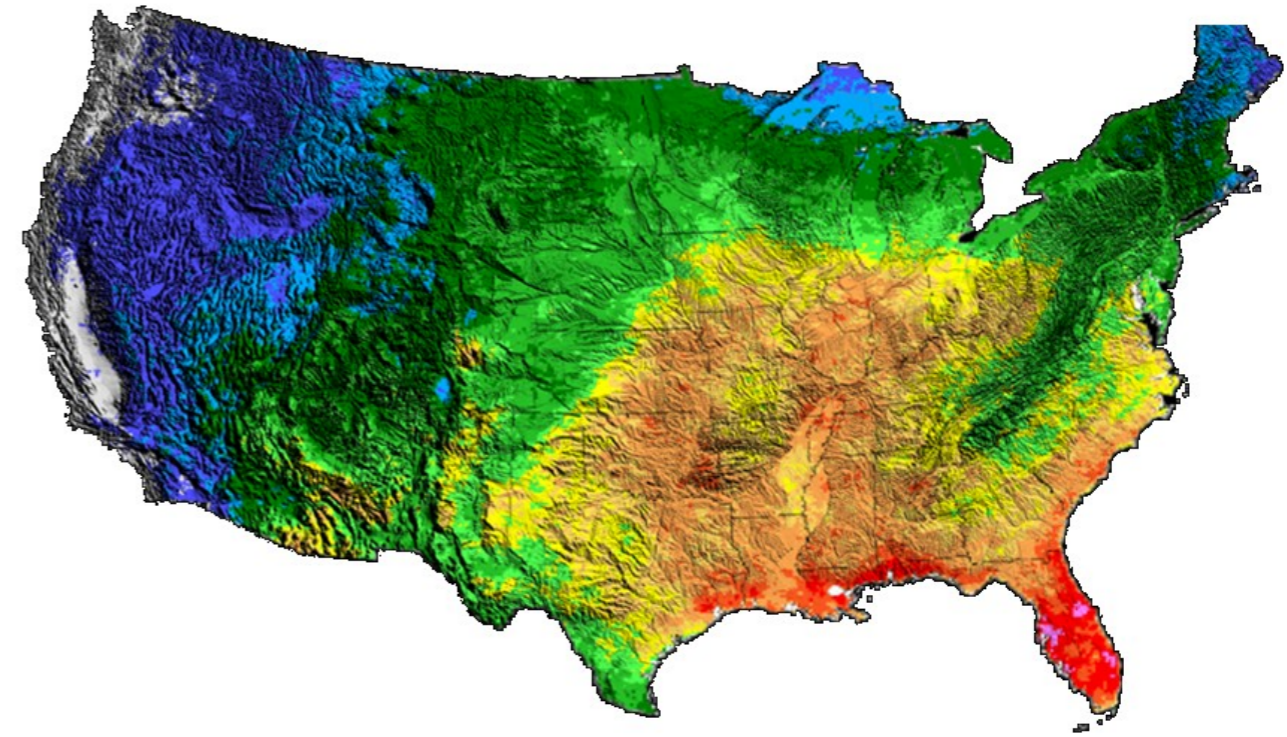


# Lightning Sensors have recorded 18+ years of data



From this raw data strike locations are triangulated, like earthquake locations.

Strike characteristics, from which lightning attributes are derived, are also recorded.



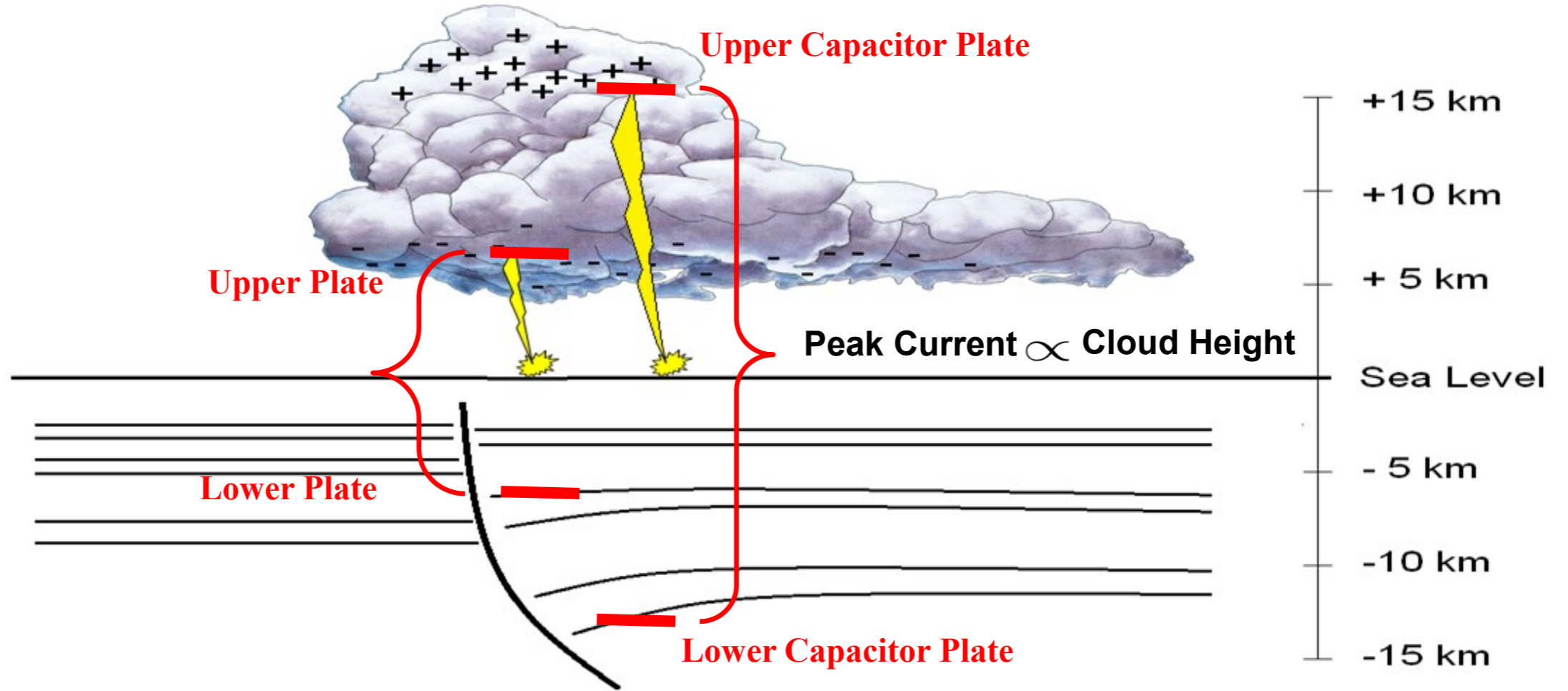
**Avg Flash Density**  
fl/sq km/year



Dynamic Measurement has an exclusive license to this data for geology and exploration applications.



# Millions of Lightning Strikes, Millions of Measurements of Electrical Interaction with Geology



# Relationships between Lightning & Geology Patented



US008344721B2

(12) **United States Patent**  
Nelson, Jr. et al.

(10) **Patent No.:** US 8,344,721 B2  
(45) **Date of Patent:** Jan. 1, 2013

(54) **METHOD FOR LOCATING SUB-SURFACE NATURAL RESOURCES**

(75) Inventors: **H. Roice Nelson, Jr.**, Houston, TX (US); **Joseph H. Roberts**, Houston, TX (US); **D. James Siebert**, Katy, TX (US); **Wulf F. Massell**, Conroe, TX (US); **Samuel D. LeRoy**, Houston, TX (US); **Leslie R. Denham**, Houston, TX (US); **Robert Ehrlich**, Salt Lake City, UT (US); **Richard L. Coons**, Katy, TX (US)

(73) Assignee: **Vaisala Oyj**, Helsinki (FI)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 391 days.

(21) Appl. No.: **12/655,810**

(22) Filed: **Jan. 7, 2010**

(65) **Prior Publication Data**  
US 2011/0163733 A1 Jul. 7, 2011

(51) **Int. Cl.**  
*G01R 31/02* (2006.01)  
*G01N 27/00* (2006.01)  
*G01W 1/00* (2006.01)

(52) **U.S. Cl.** ..... 324/72; 324/71.1; 702/4  
(58) **Field of Classification Search** ..... 324/72, 324/71.1; 702/4  
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

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2010/0023267 A1\* 1/2010 Karabin et al. .... 702/4

\* cited by examiner

*Primary Examiner* — Amy He

(74) *Attorney, Agent, or Firm* — Portland Intellectual Property, LLC

(57) **ABSTRACT**

A method for locating sub-surface natural resources. The method utilizes lightning data to discern relatively likely locations for finding the sub-surface natural resources.

**16 Claims, 8 Drawing Sheets**



US009523785B2

(12) **United States Patent**  
Denham et al.

(10) **Patent No.:** US 9,523,785 B2  
(45) **Date of Patent:** Dec. 20, 2016

(54) **METHOD FOR DETERMINING GEOLOGICAL SURFACE AND SUBSURFACE RESISTIVITY**

(71) Applicant: **Dynamic Measurement, LLC**, Cedar City, UT (US)

(72) Inventors: **L. R. Denham**, Houston, TX (US); **H. Roice Nelson, Jr.**, Cedar City, UT (US); **D. James Siebert**, Katy, TX (US)

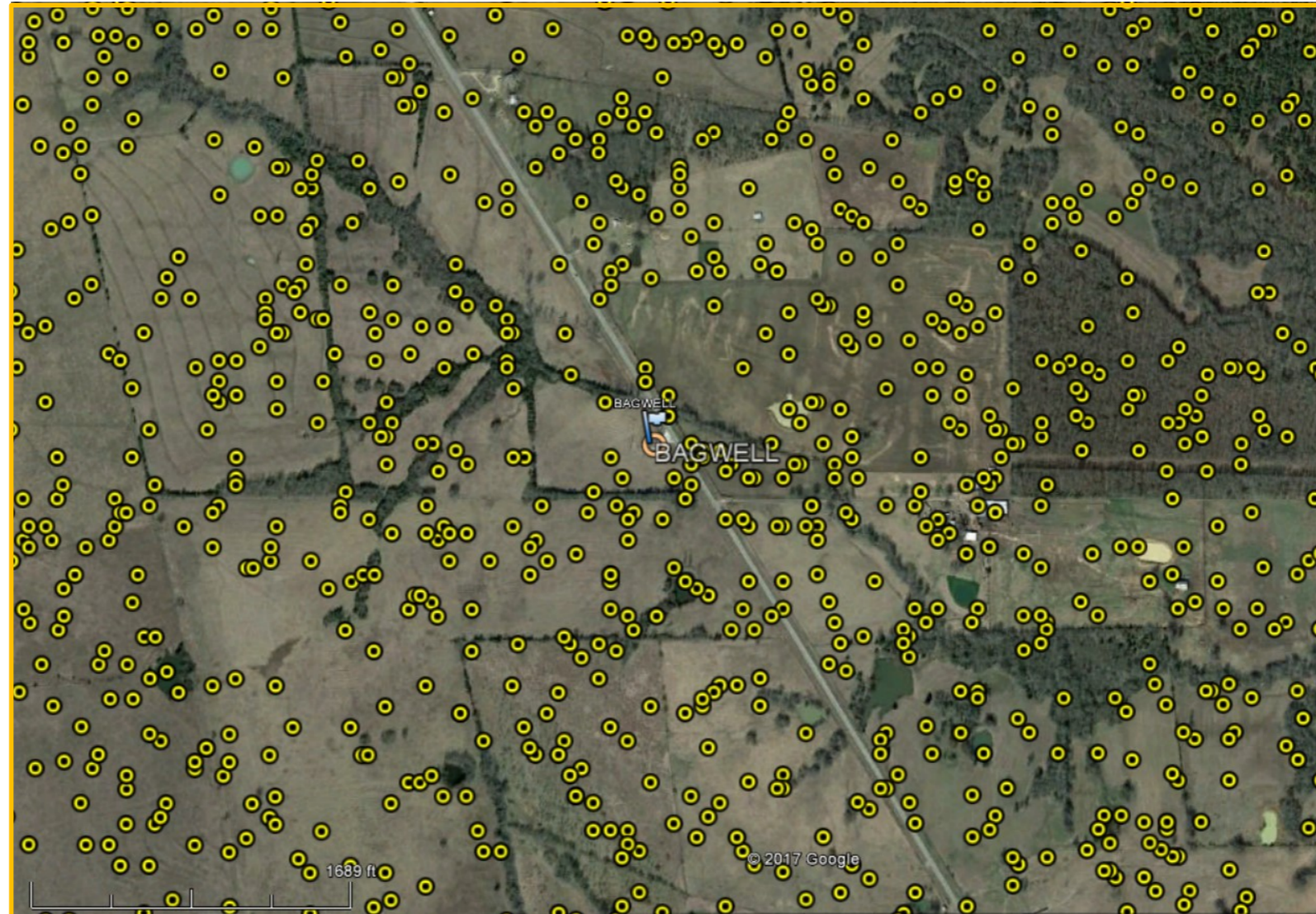
(73) Assignee: **Dynamic Measurement, LLC**

(57) **ABSTRACT**

A method for determining geological subsurface resistivity. The method includes obtaining a set of lightning parameters associated with a lightning strike received by a geological volume of material, the set of lightning parameters including an indicium of the current of the lightning strike at a first initial time and an indicium of the current of the lightning strike at a first decay time subsequent to the first initial time, and inferring the resistance of the volume of geological material, at least in part, from the set of lightning parameters.

**6 Claims, 2 Drawing Sheets**

# Lightning Locations in Red River County, Texas



28 June 2017

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# Lightning Locations in Midland Count, TX



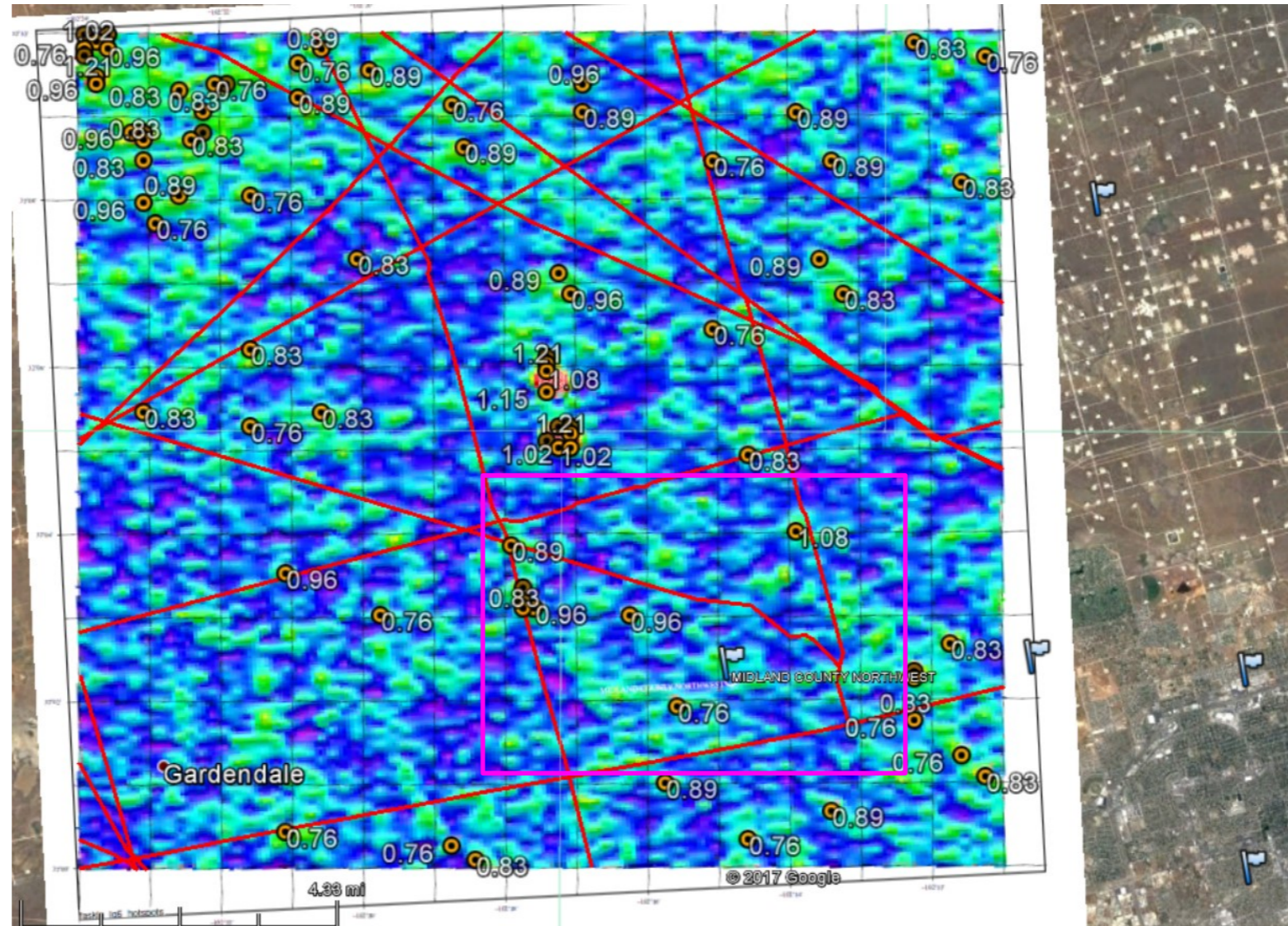
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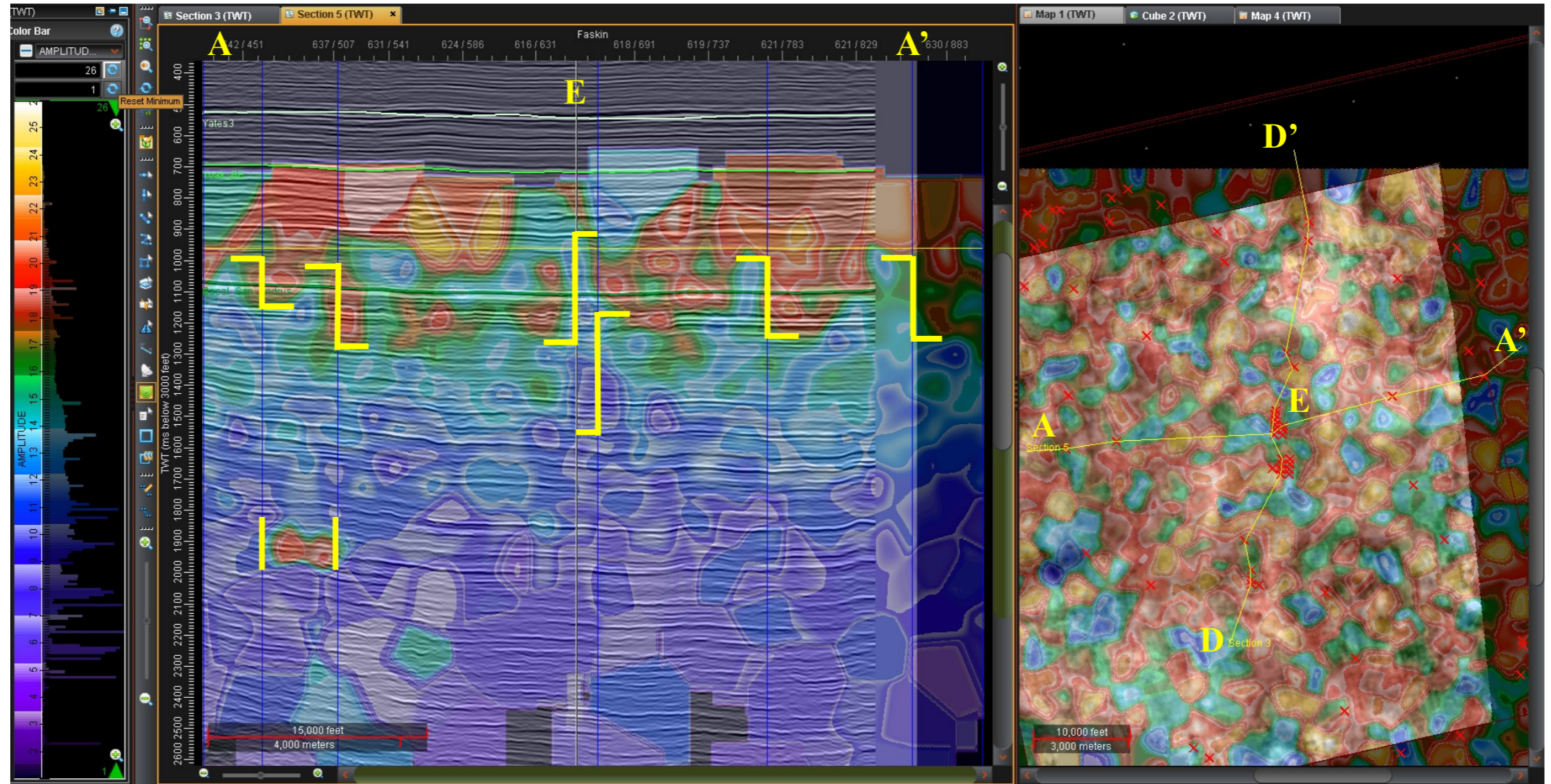
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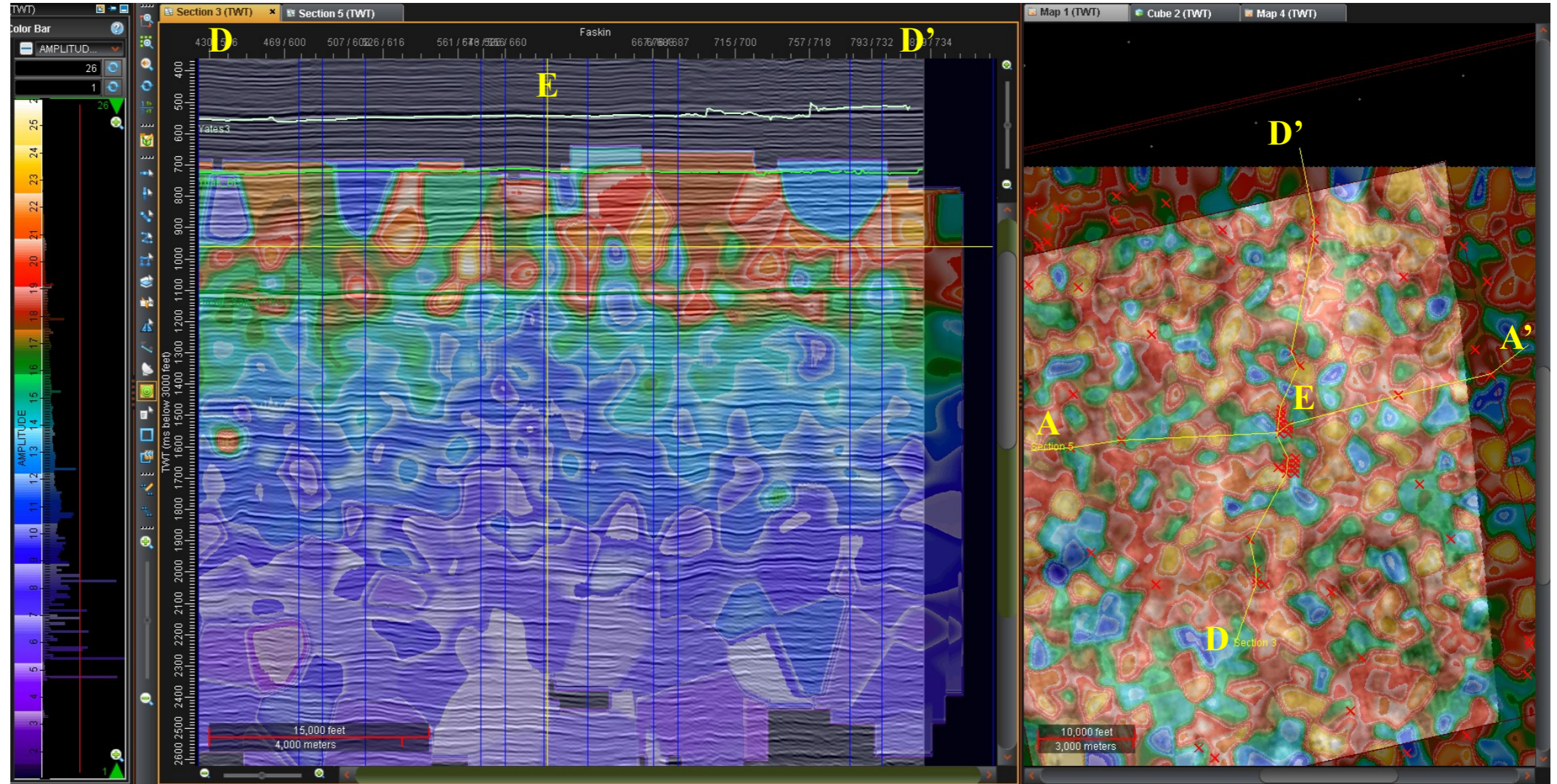
# Lightning Density, pipelines, and Risk Points Midland County, TX Project Area



# Risk Point Cross-Section A-A', Seismic + Resistivity, Midland County, TX Project Area



# Risk Point Cross-Section D-D', Seismic + Resistivity, Midland County, TX Project Area



# Business Opportunities

Better risk management of insurance portfolios follows knowledge of risk points:

- relative to \$1.3-\$2.2 million per megawatt wind towers (\$5-10 million per tower);
- relative to \$500,000 houses;
- Etc.

# Thank You!

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