

Lightning Data: a new geophysical data type

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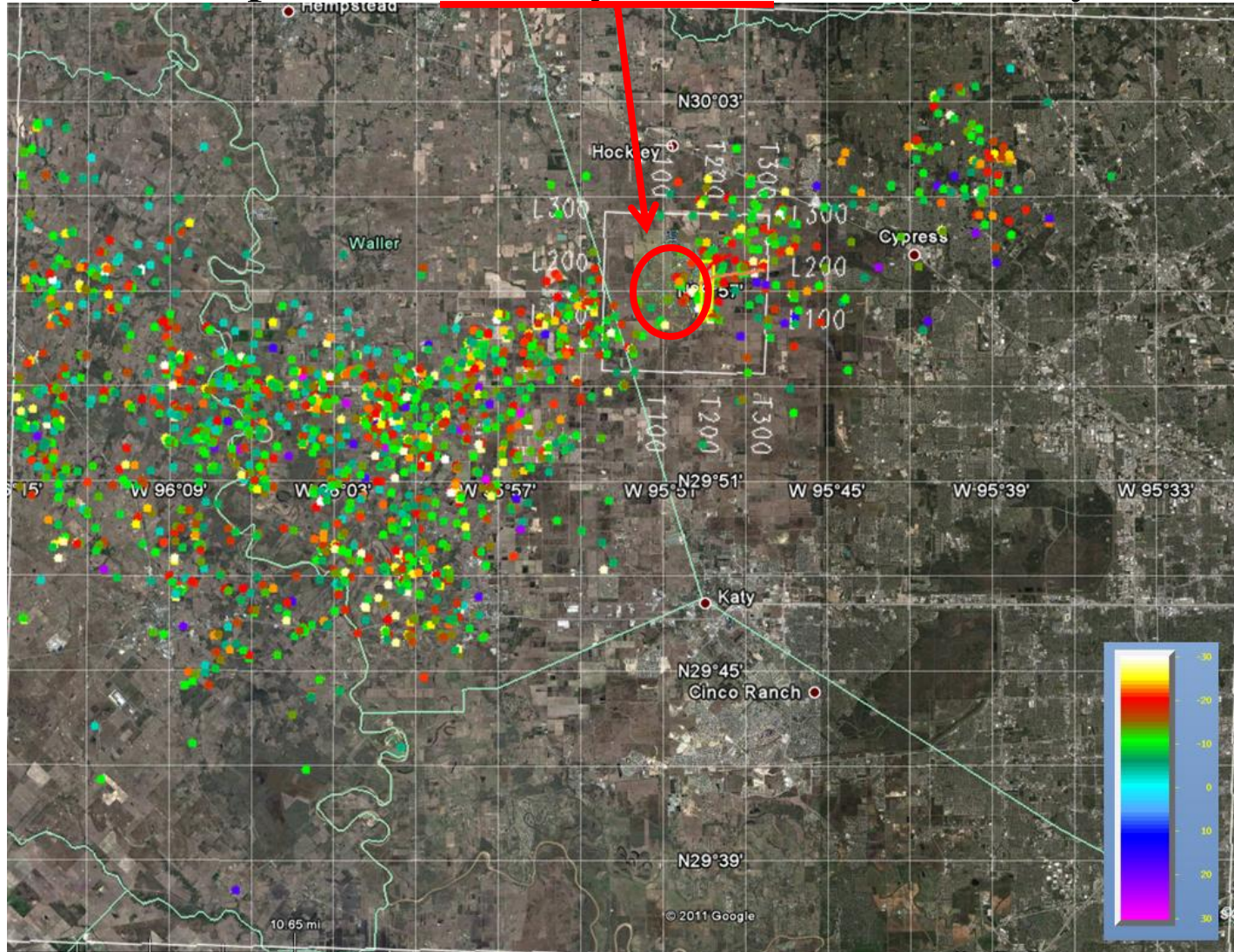
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20 May 2013

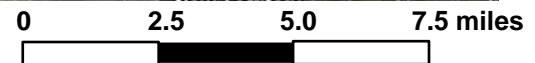


Recorded Lightning Strikes Confirmed

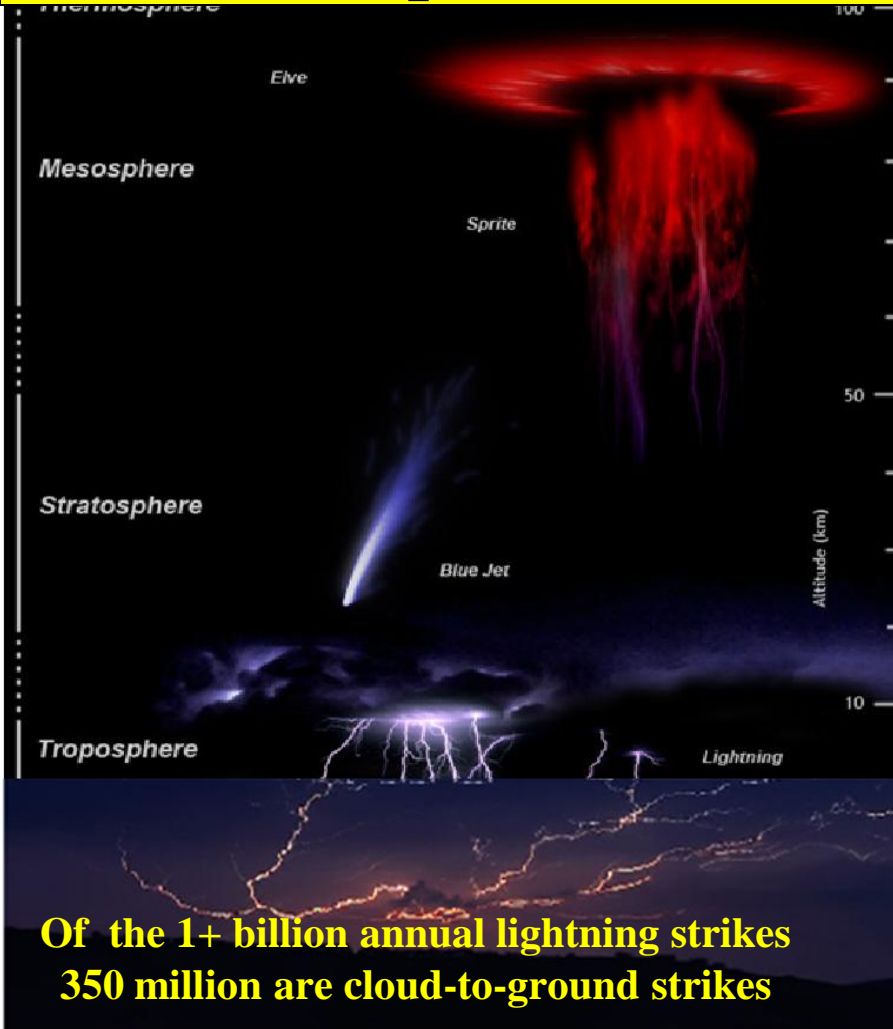
27 Sep 2011, Hockley Dome Harris County, TX



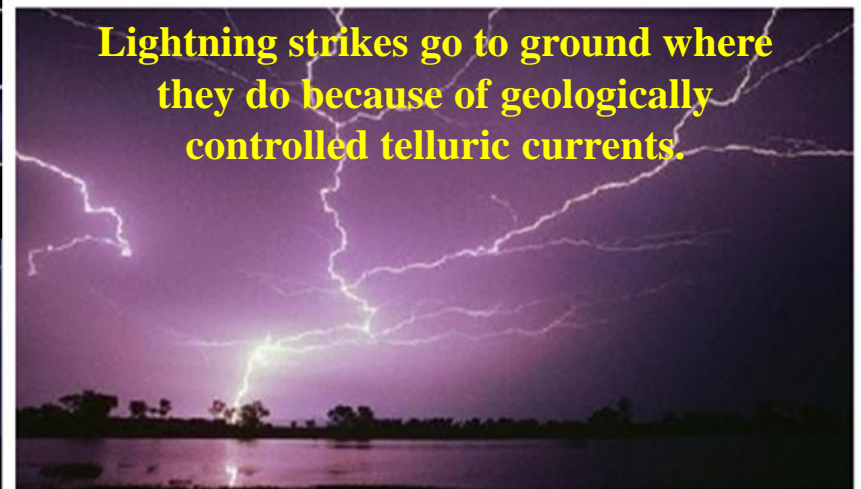
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Lightning provides a rich data set to analyze, explore, & compare with other data sets, enhancing exploration of subsurface geology.



Cloud-to-Cloud lightning travels 250+ km or 2 ½ times more distance than Sprite & Elves.



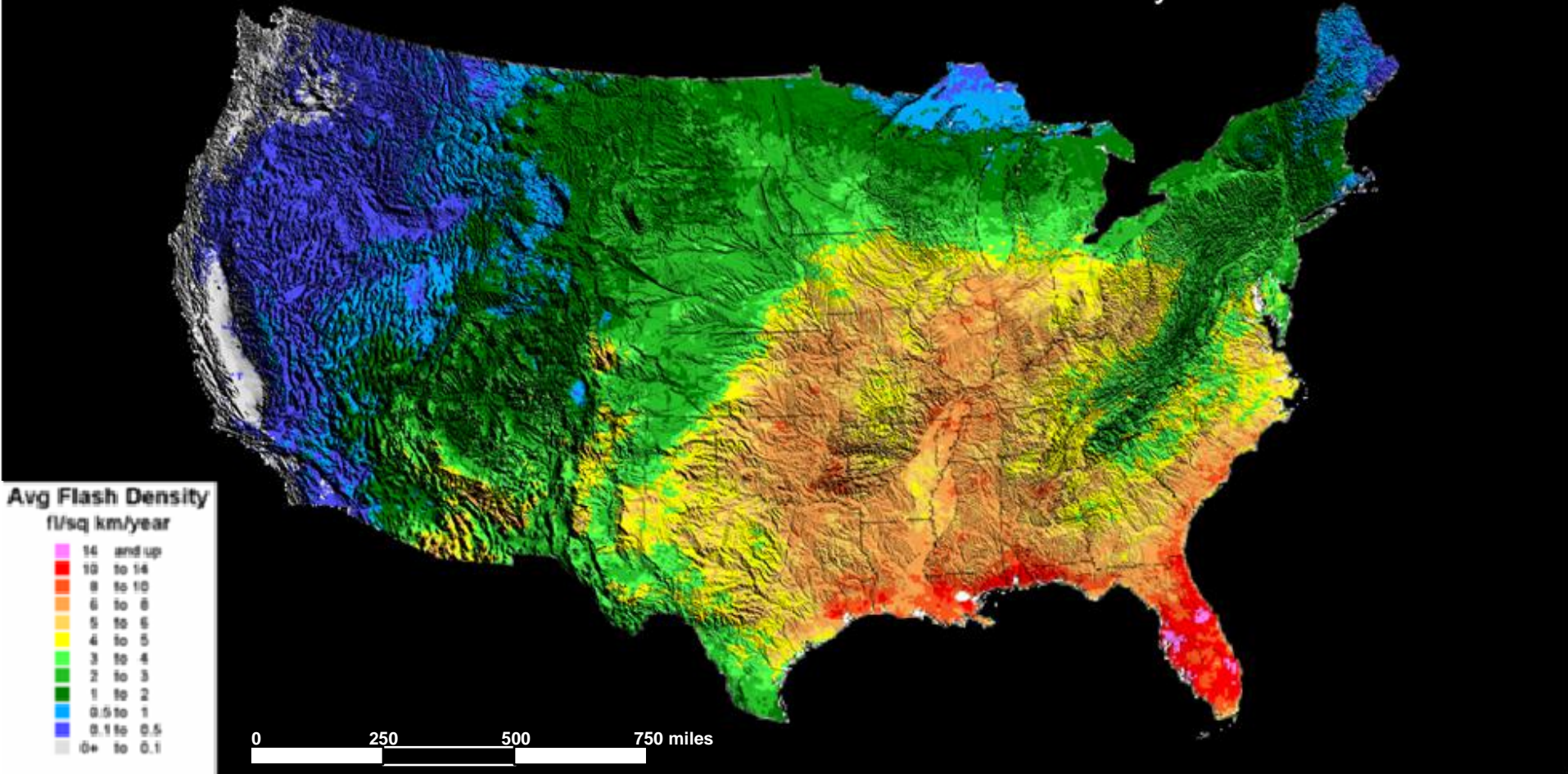
Lightning strikes go to ground where they do because of geologically controlled telluric currents.

Of the 1+ billion annual lightning strikes 350 million are cloud-to-ground strikes

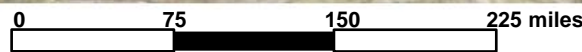
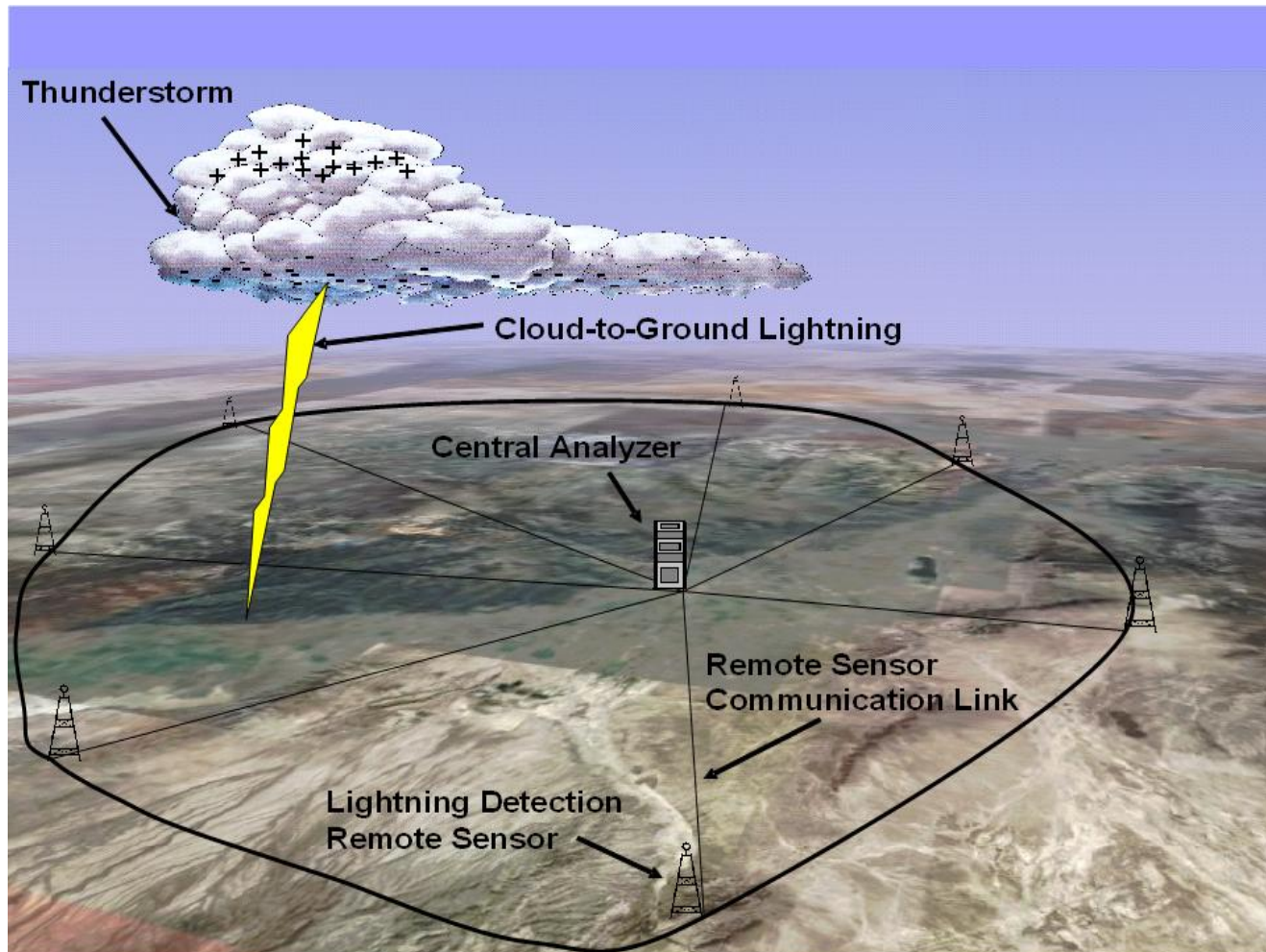
NLDN (National Lightning Detection Network)

Historical Use: Insurance, Meteorology, & Safety

1997 to 2007 Cloud-to-Ground Flash Density



~330 Sensors record U.S. NLDN lightning strikes with +/- 100-500 foot location resolution



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Lightning Measurements Include:

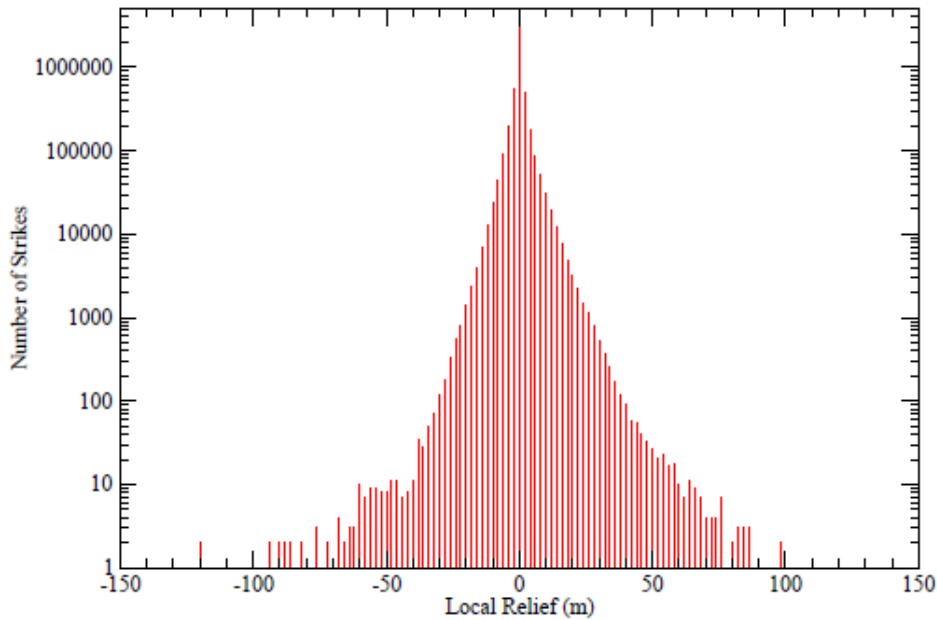
- Location
- Time and Duration
- Rise Time
- Peak Current
- Peak-to-Zero
- Polarity
- Reliability
- Number of Sensors



Topography & Strike Location

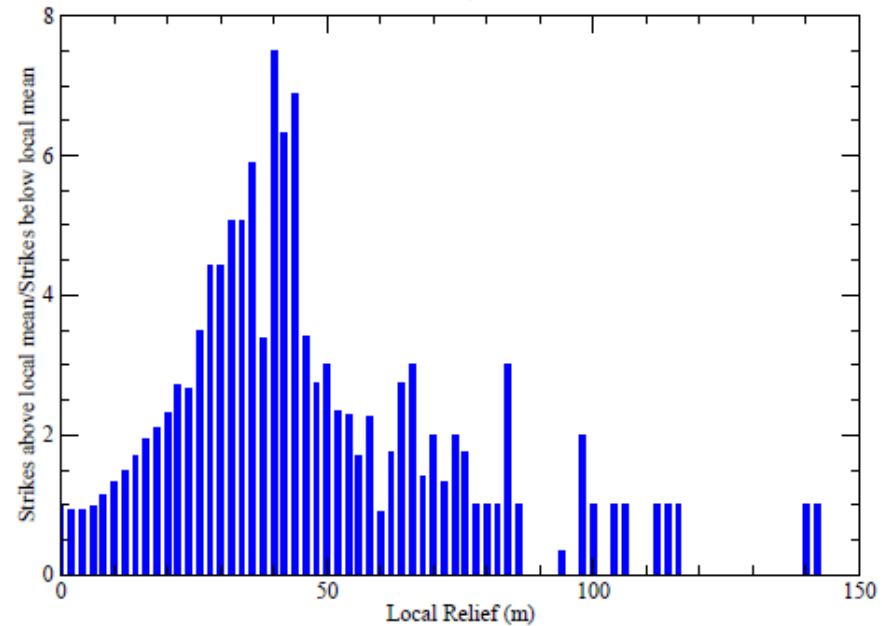
Lightning Strikes vs Local Relief

North Dakota, 1999-2008

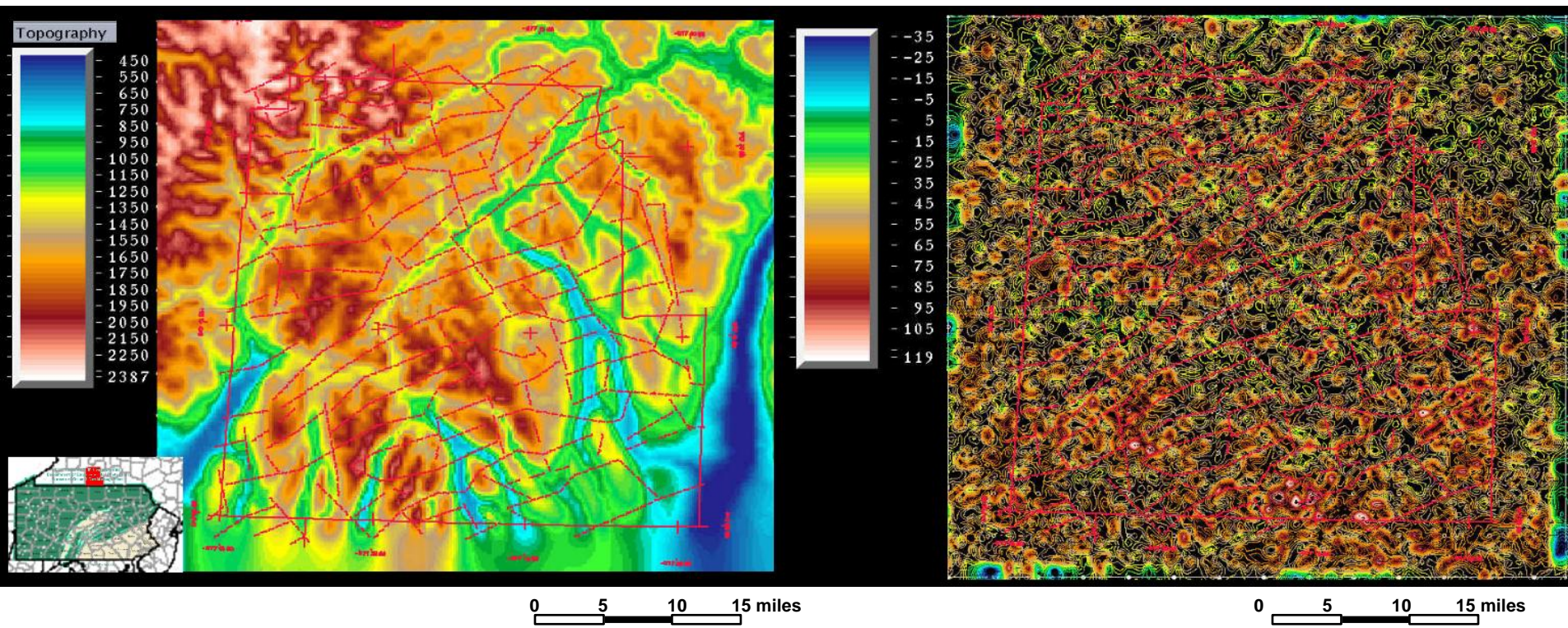


Lightning Strikes vs Local Relief

North Dakota, 1999-2008



Topography, Lightning Density, & Aeromagnetics

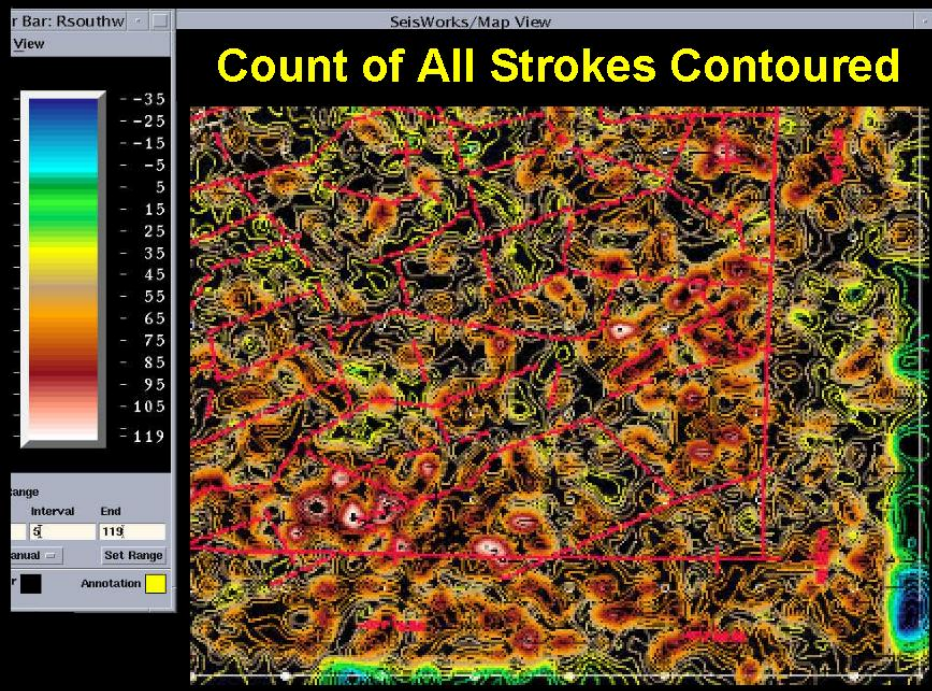


Steubens County, New York

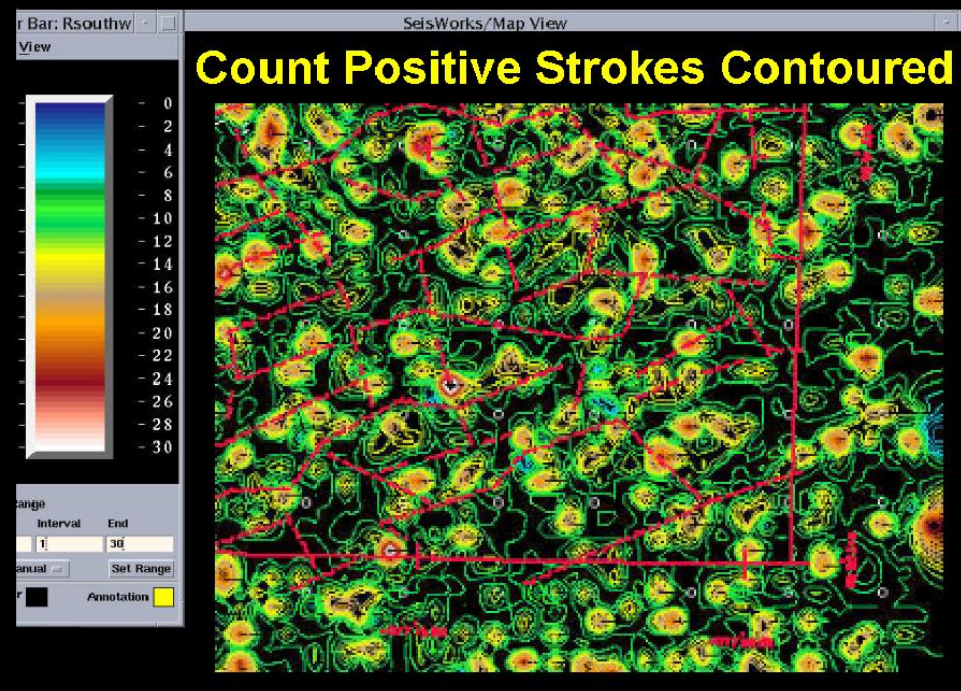


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Zoom on Southeast Quadrant Showing All Strokes & Positive Strokes under Air Mag Faults



0 2.5 5.0 7.5 miles

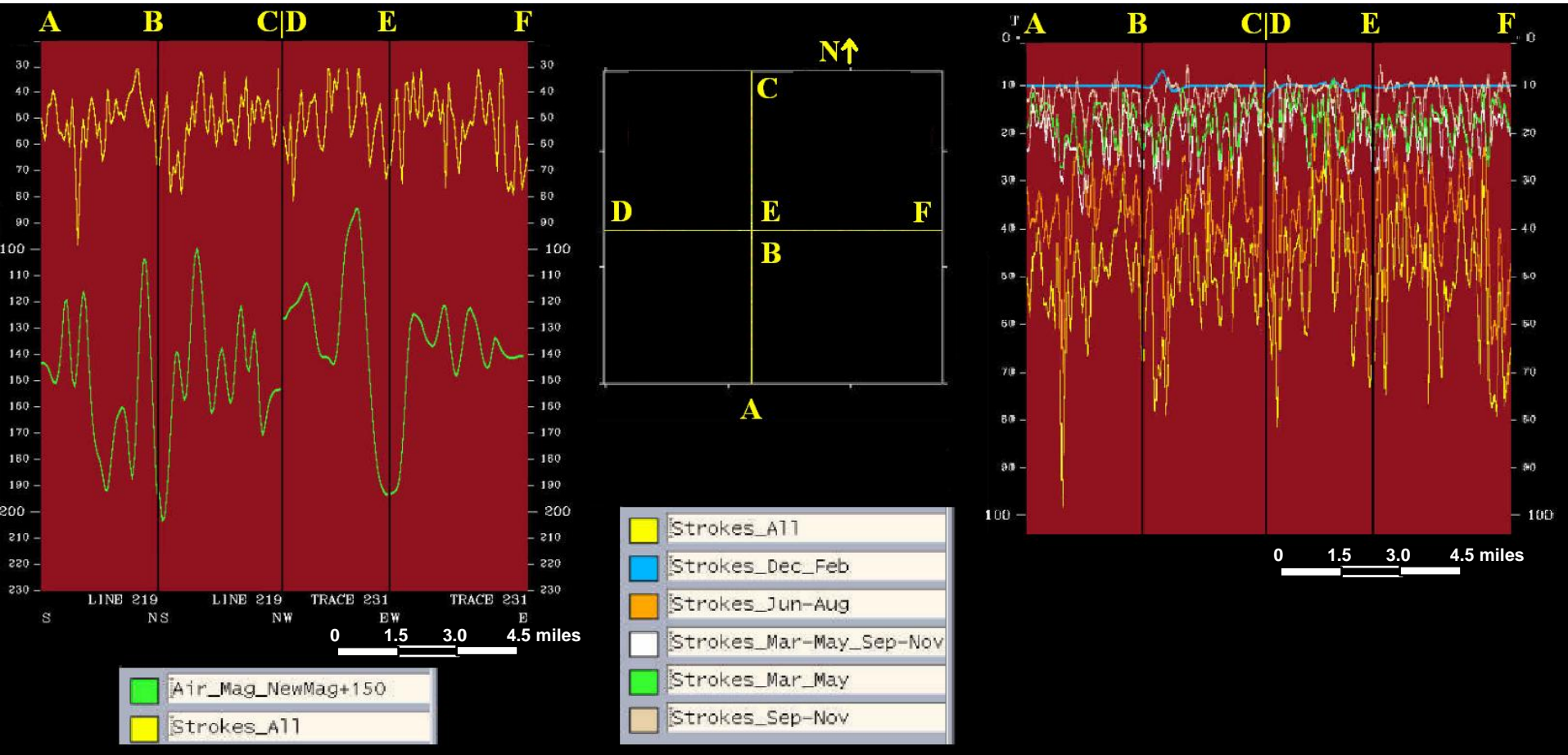


0 2.5 5.0 7.5 miles

Steubens County, New York



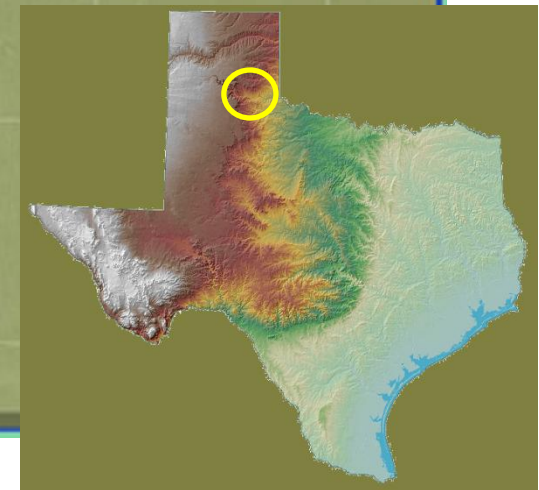
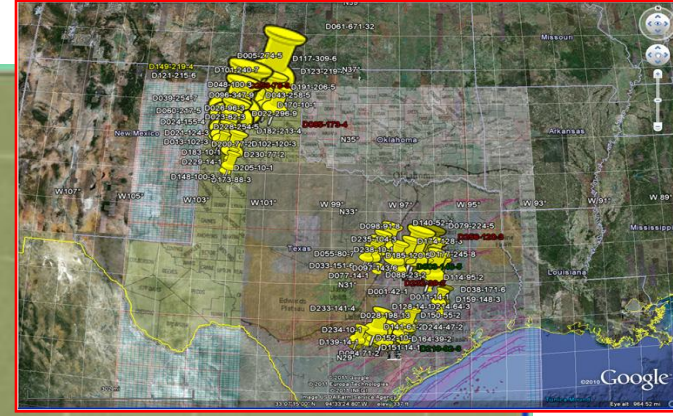
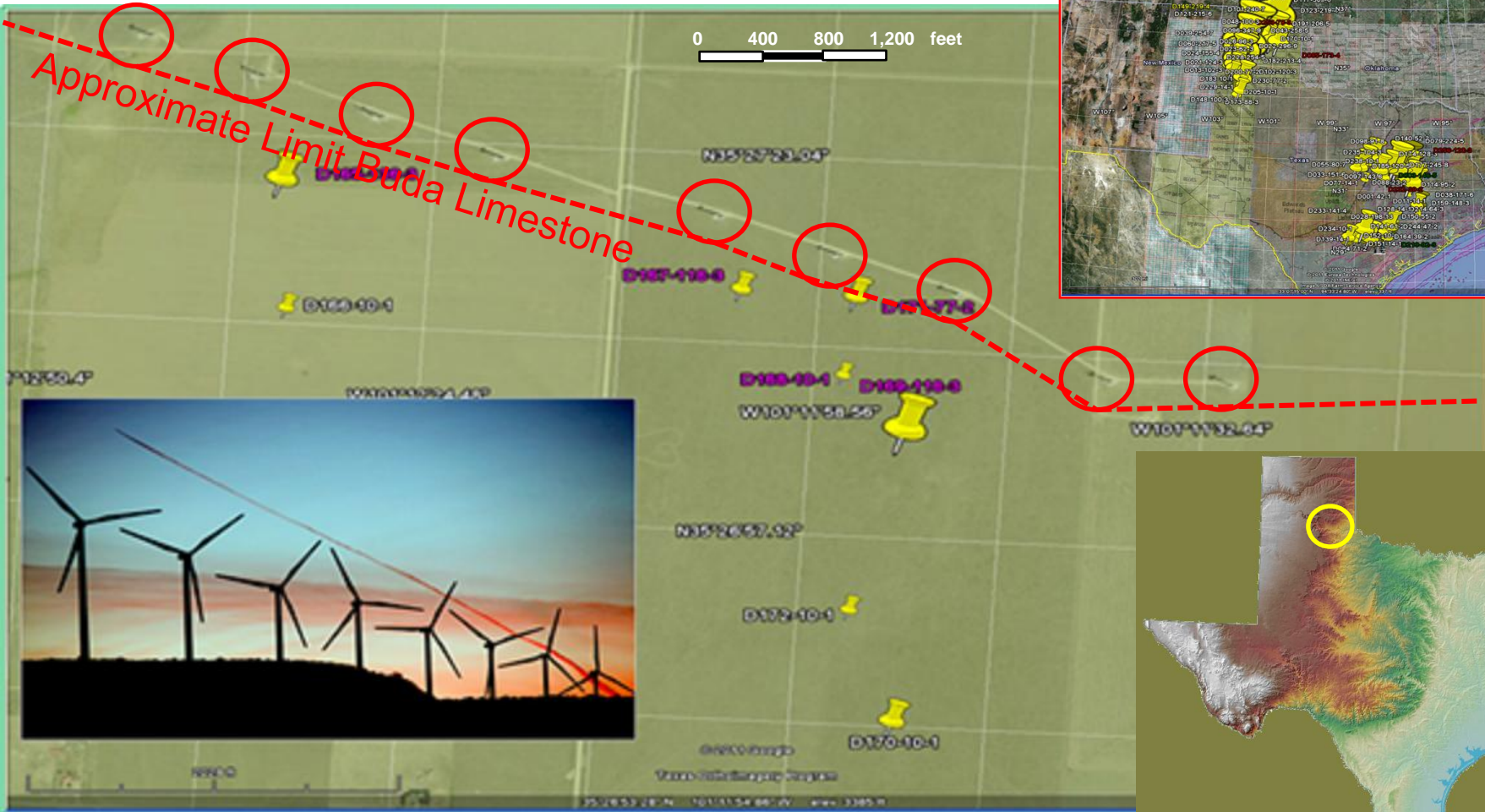
Cross Sections of Strokes / Air Mag & of Seasons



Steubens County, New York

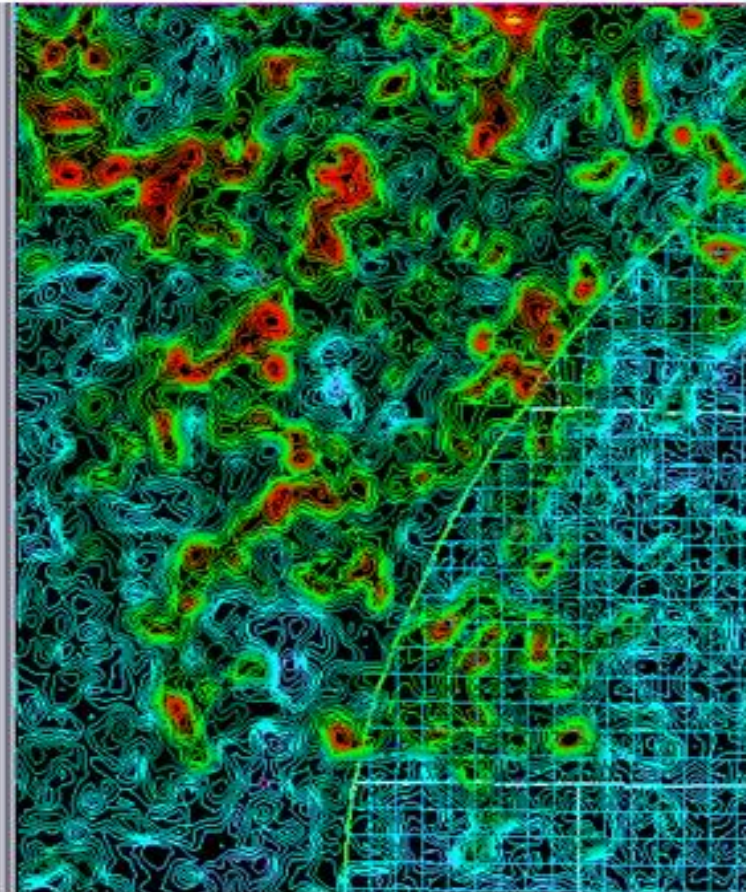
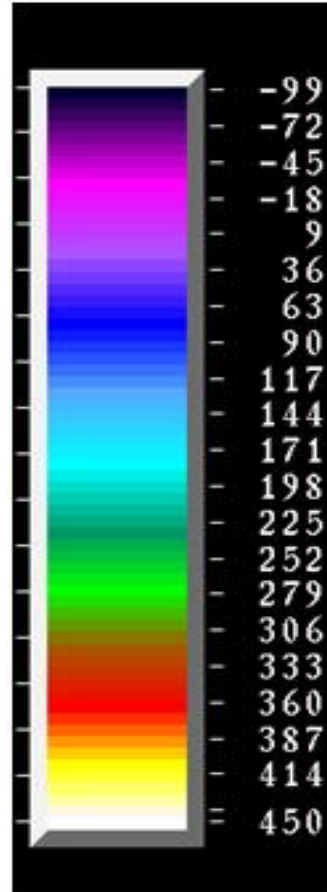
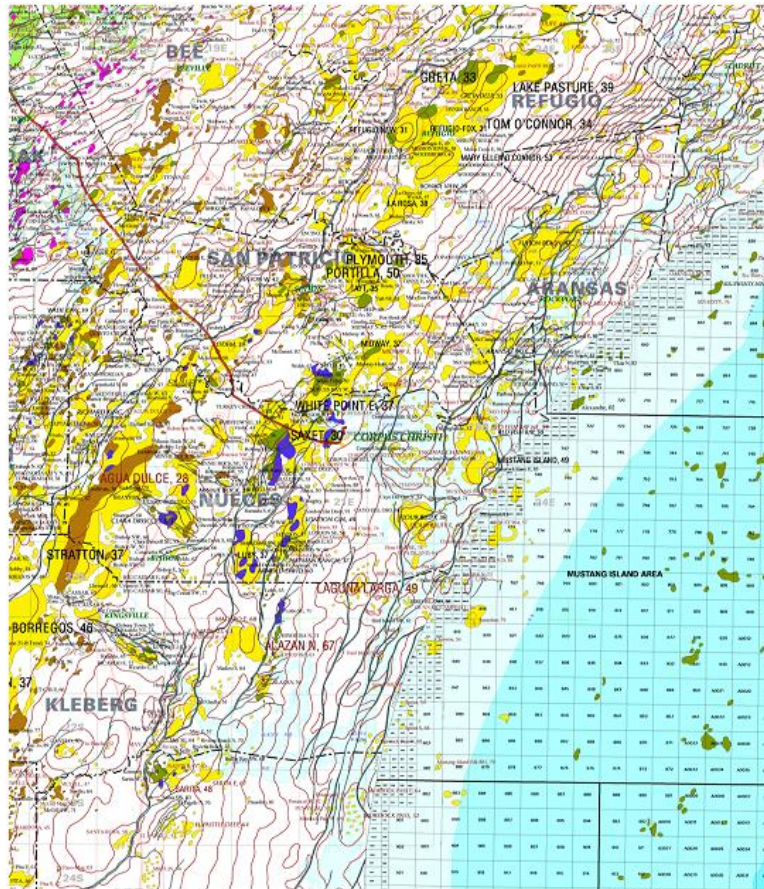


Buda Limestone Outcrop & Strike Location



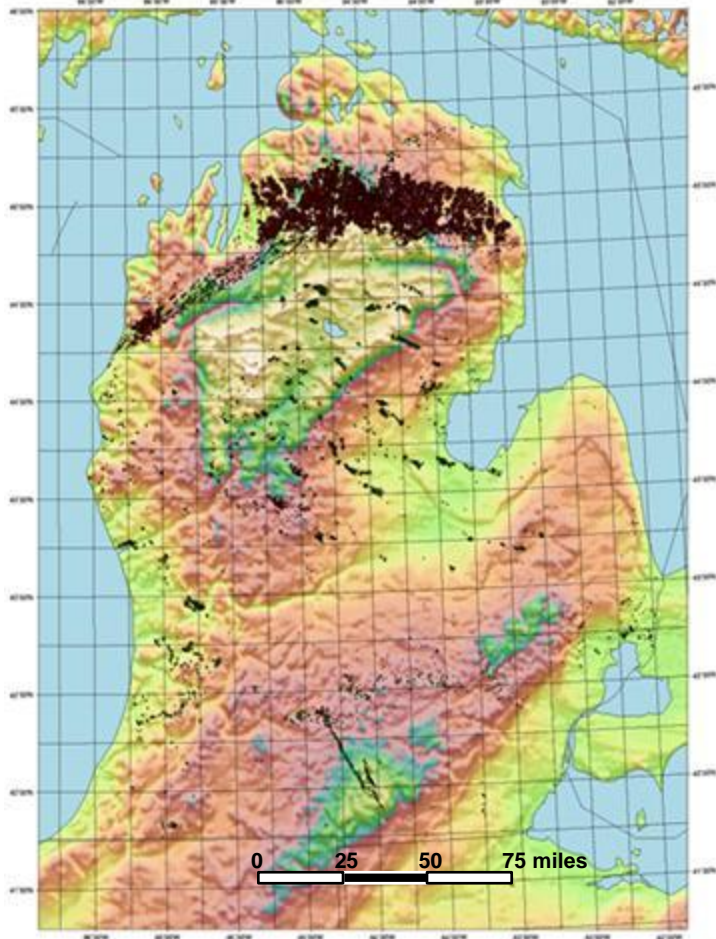
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Lightning Clusters Continue Offshore



Lightning Maps Provide Regional Context

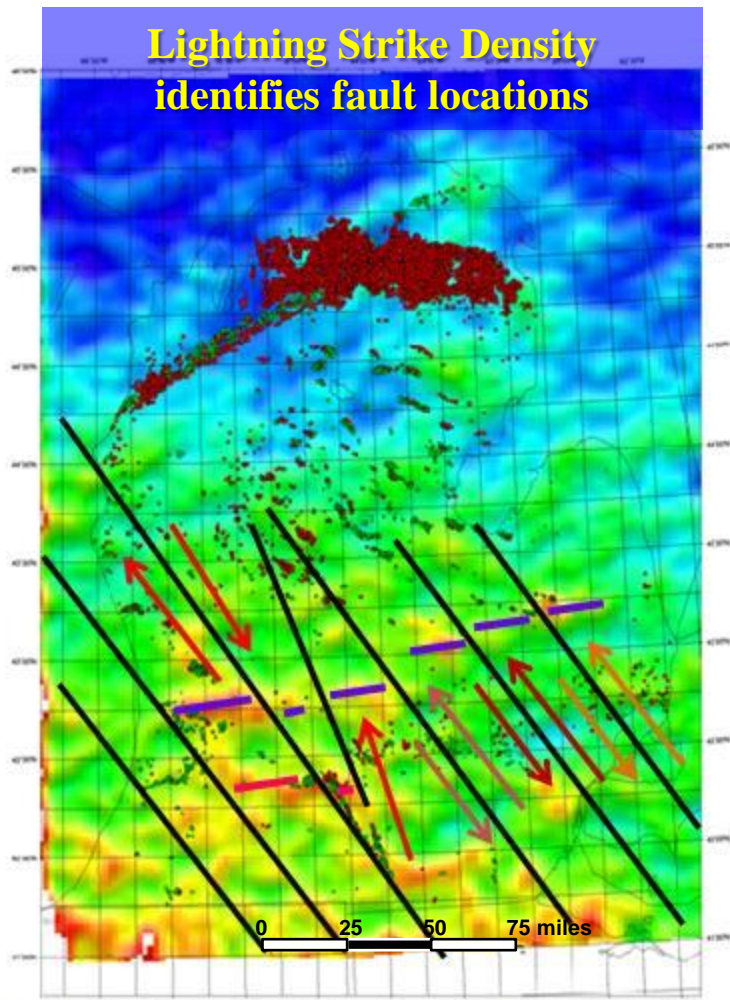
Michigan Topography



red = gas fields

green = oil fields

Lightning Strike Density identifies fault locations

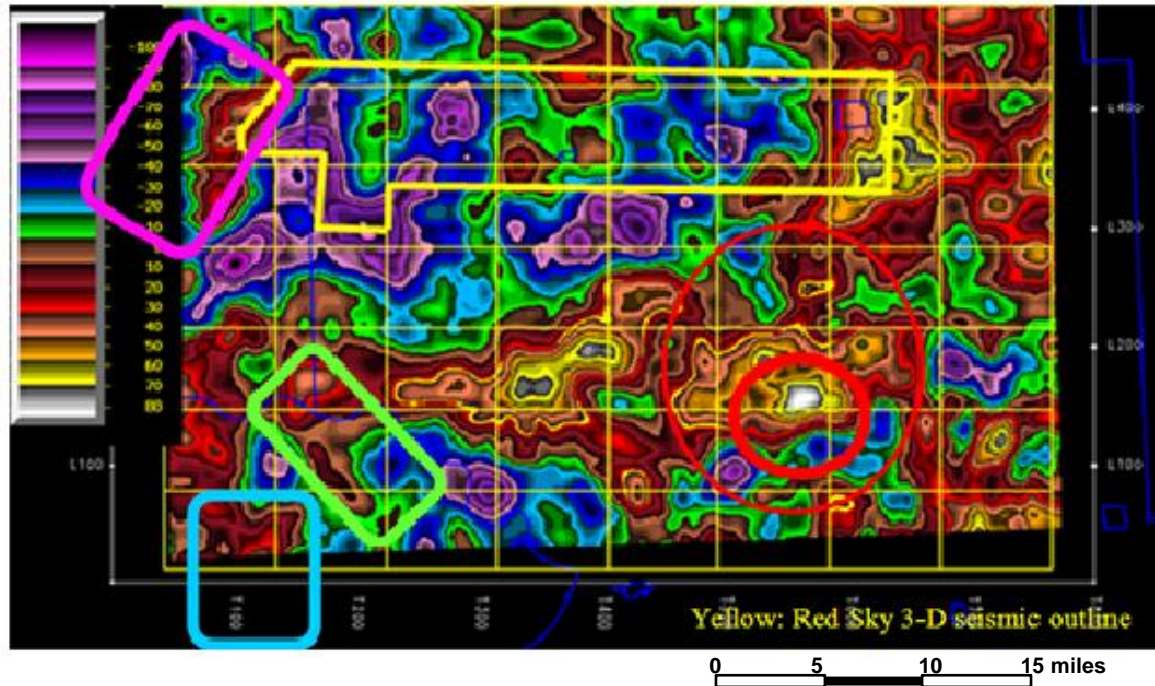


red = high density blue = low density

black = interpreted transverse faults



Lightning Maps Define Play Fairways



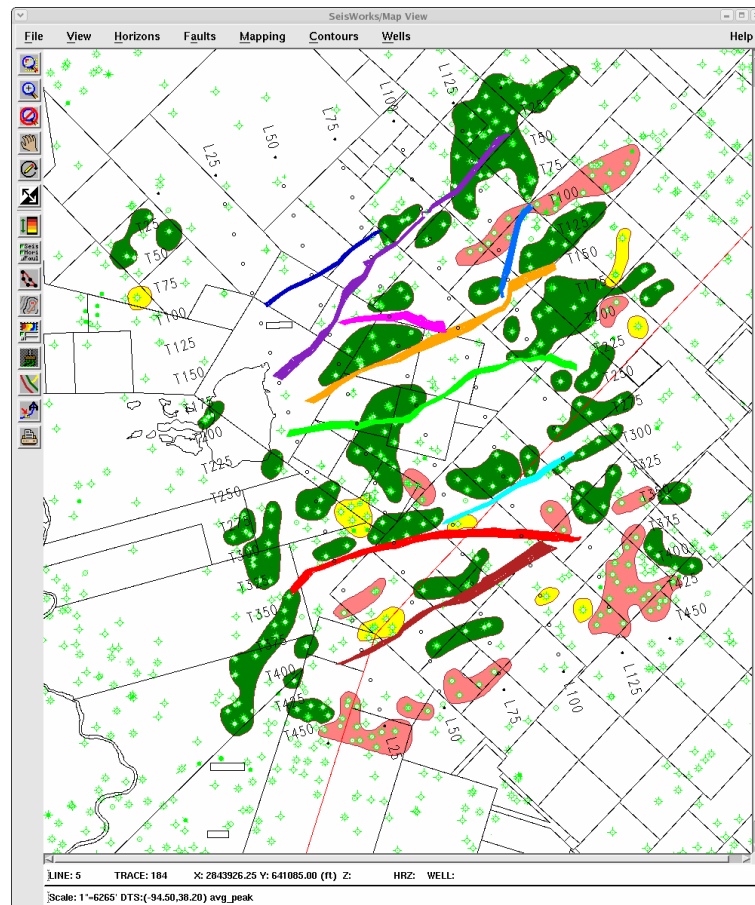
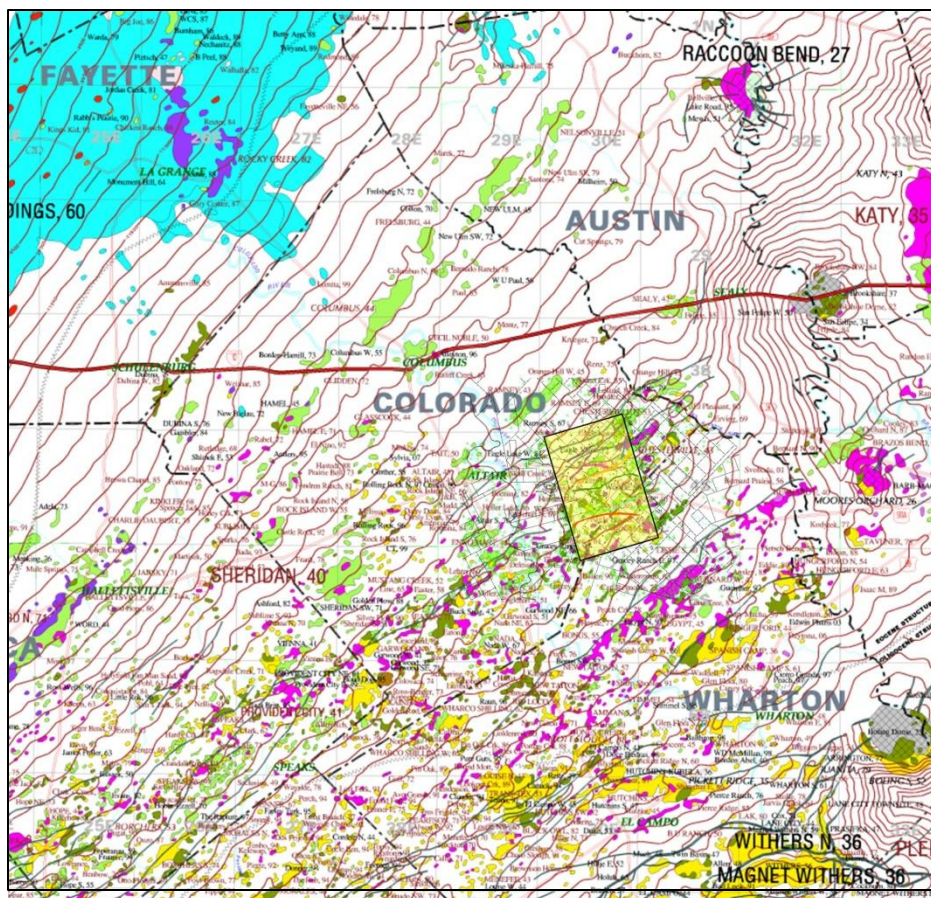
Pershall, Beaver Lodge, Antelope, and Blue Butte fields, Montrail County, ND

Peak Current of Lightning Strikes at high lunar tide



Colorado County, TX

Area of Lightning Data Coverage & 3-D Survey

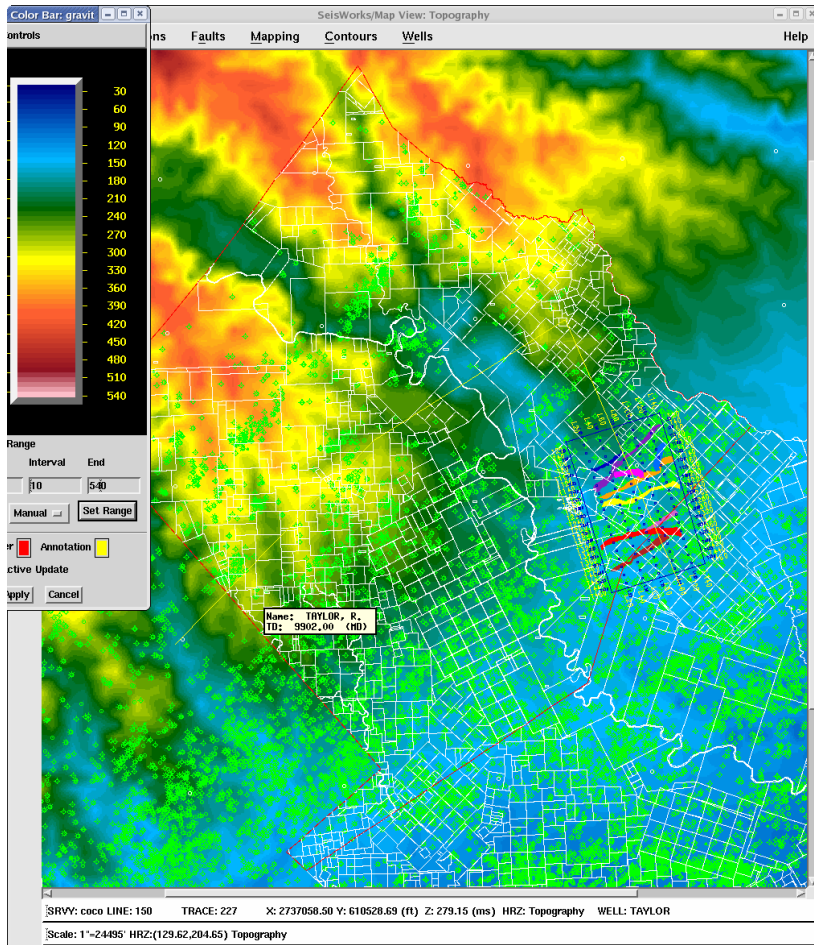


GeoMap oil and gas production: Colorado County, Texas

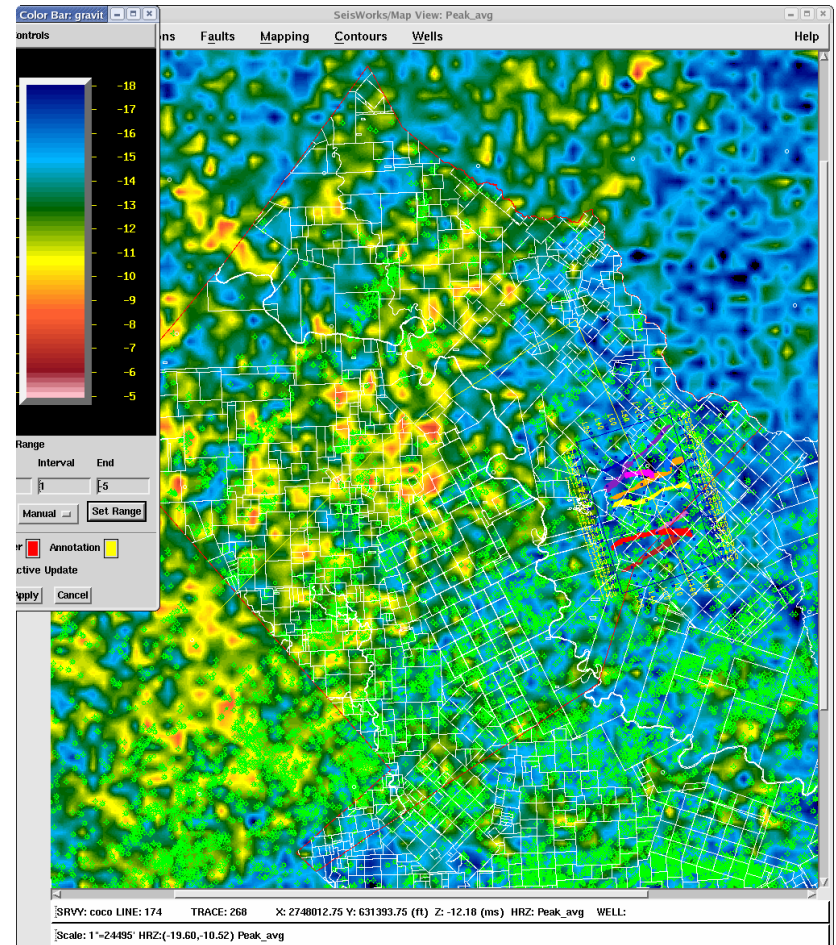


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Lightning patterns do not tie topography



0 5 10 15 miles



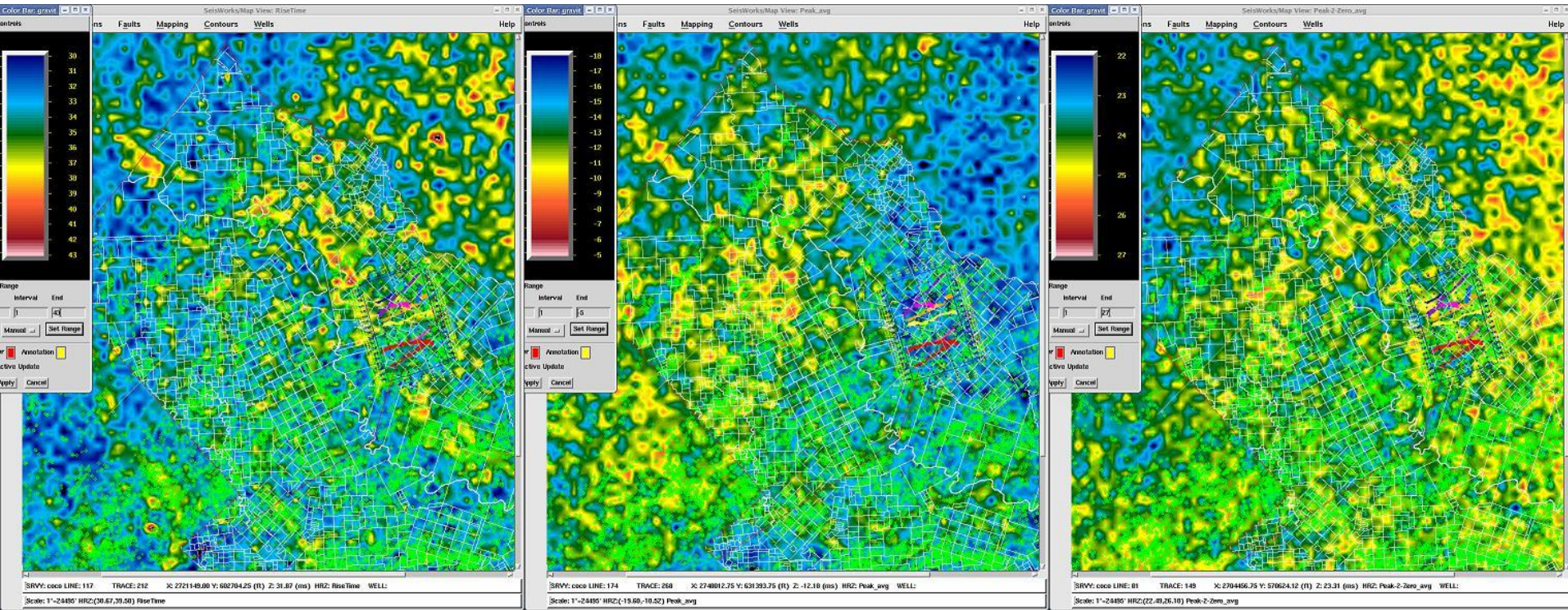
0 5 10 15 miles

Colorado County Topography and Lightning Peak Current

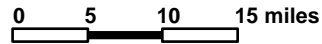


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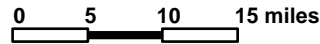
Lightning Attribute Maps Correlate with Seismic



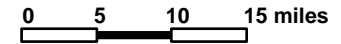
Rise Time



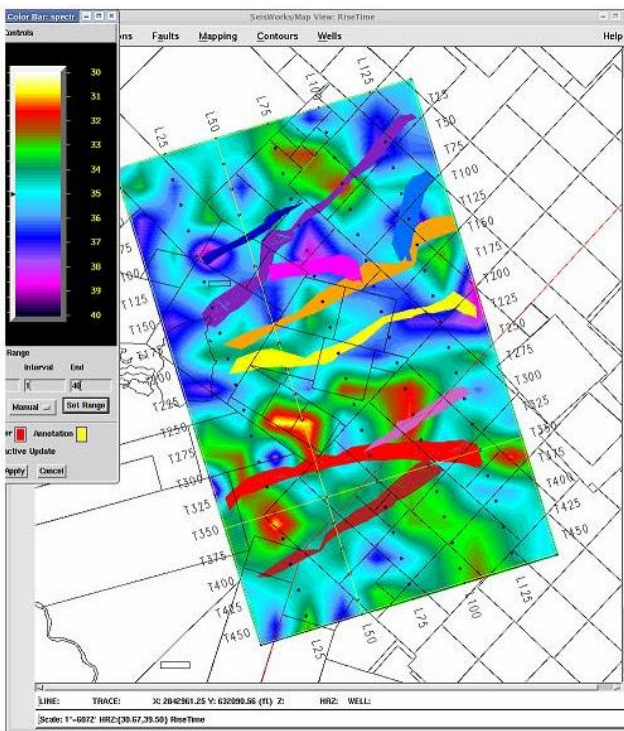
Average Peak Current



Peak-to-Zero

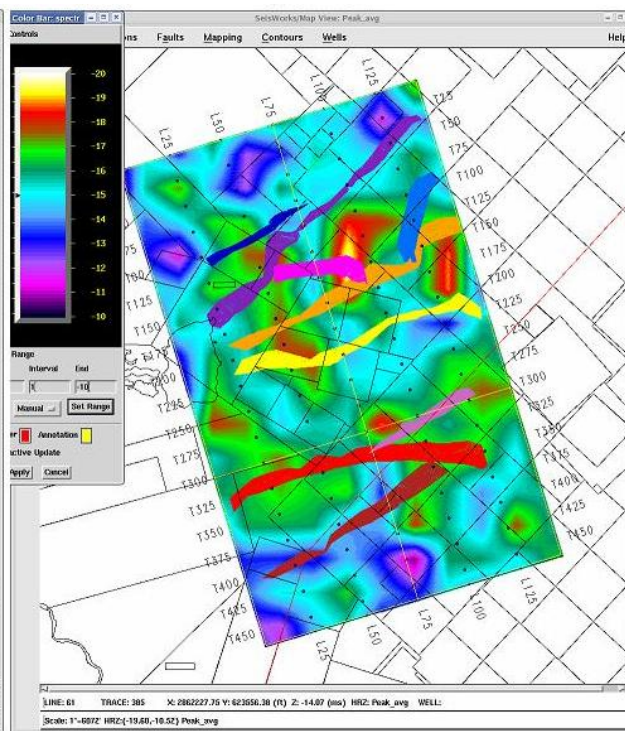


Lightning Attribute Maps Correlate with Seismic



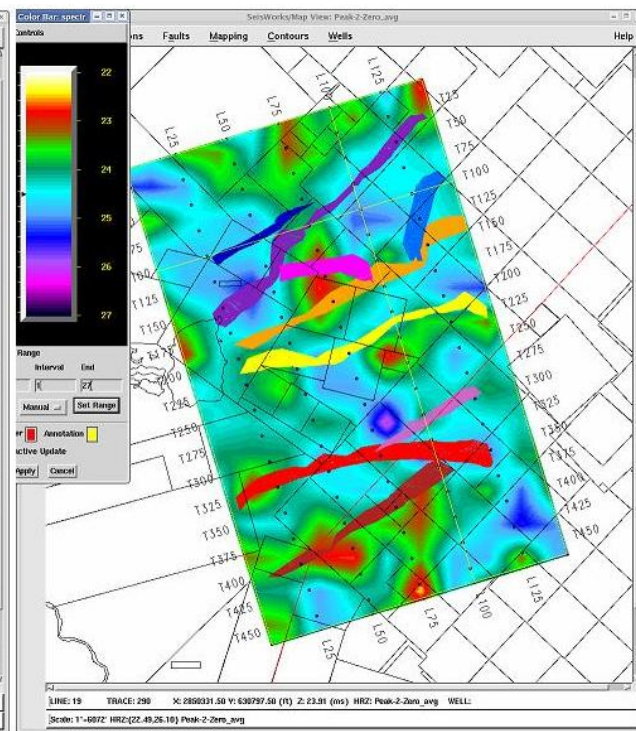
Rise Time

0 1.5 3.0 4.5 miles



Average Peak Current

0 1.5 3.0 4.5 miles

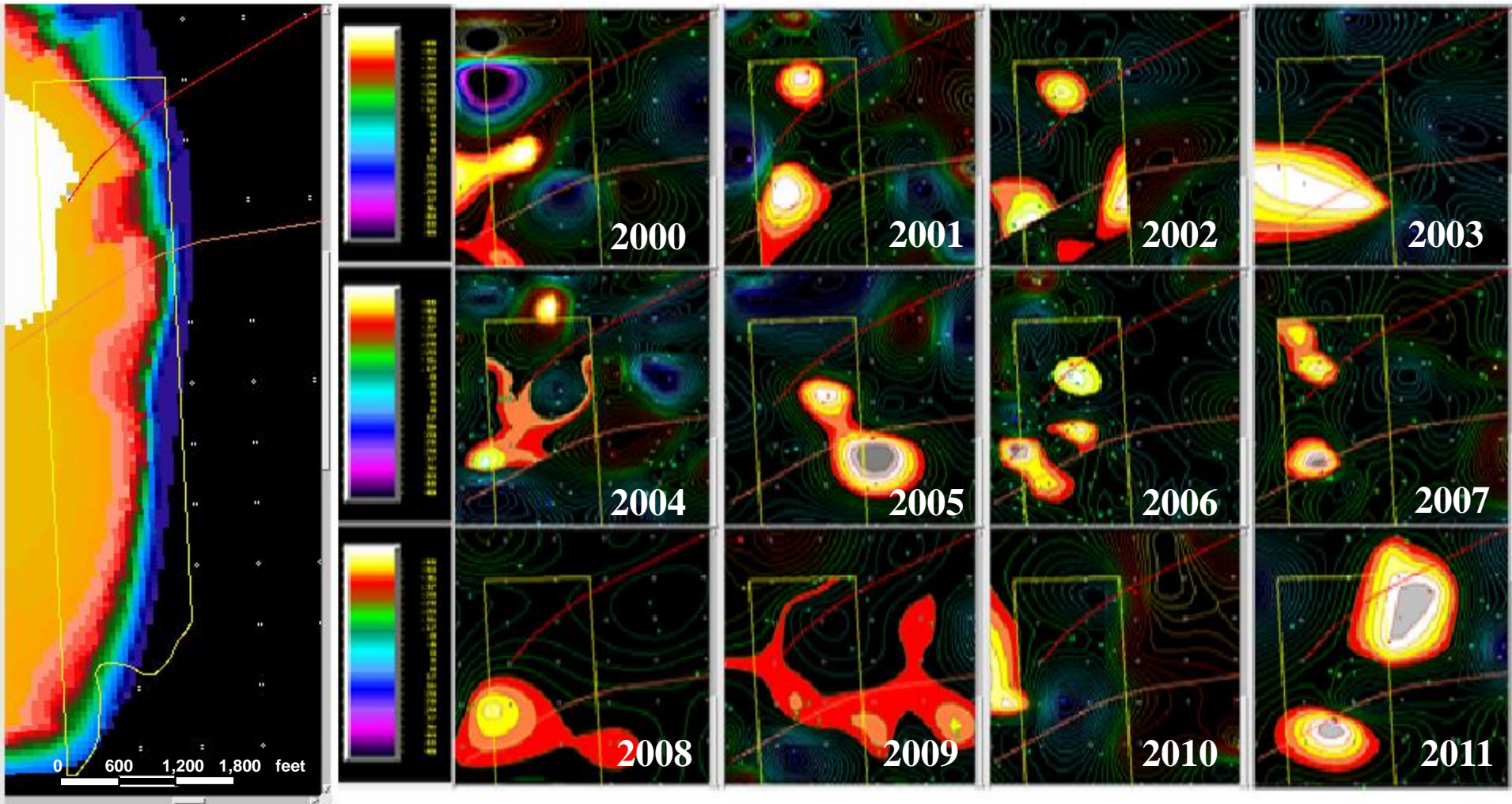


Peak-to-Zero

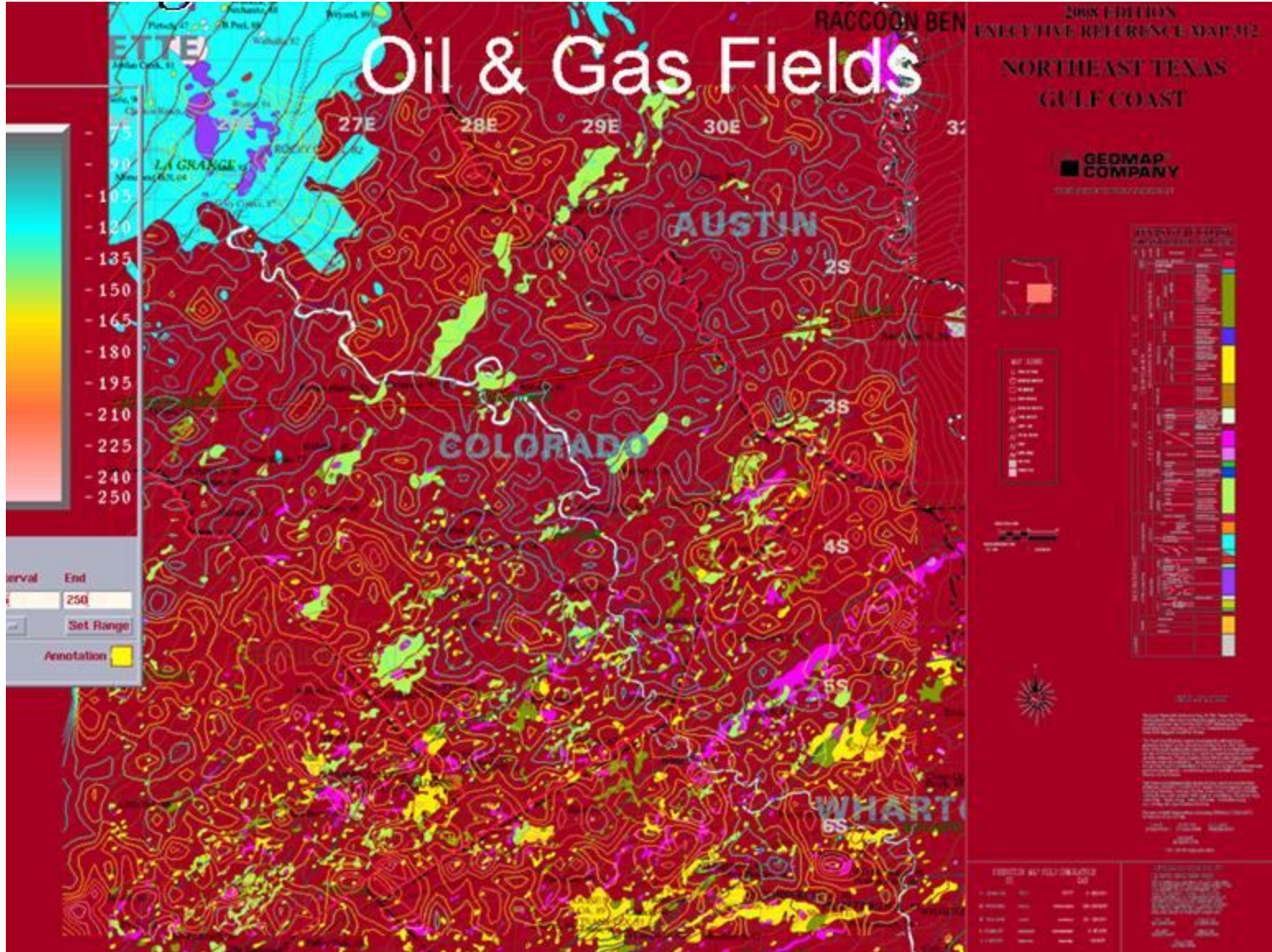
0 1.5 3.0 4.5 miles



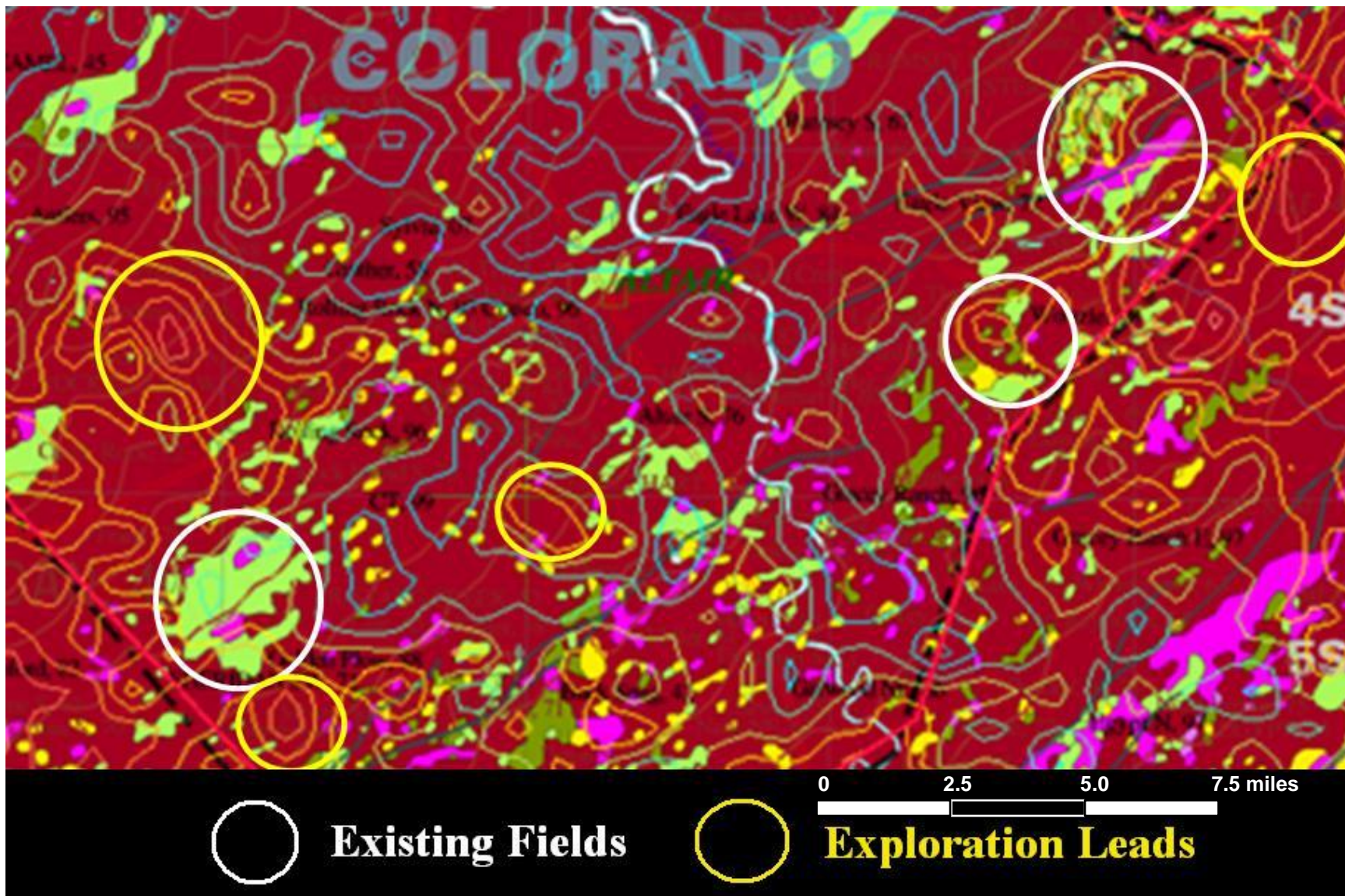
Lightning Density Shows Consistency Over Time



Colorado County, TX Lightning Analysis



Leads & Fields Highlighted by Lightning Maps



A New Geophysical Data Type - A New Enterprise



Missouri Skies: <http://www.athousandandone.com/27/>



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