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TITLE: Harnessing Lightning in the Hunt for Hydrocarbons.

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ABSTRACT BODY:

Abstract Body: Lightning occurs everywhere & its energy is now being used by the petroleum & mining industries to find natural resources. This naturally-sourced electromagnetic energy, comprised of billions of worldwide cloud to earth electrical discharges, produces millions of usable attribute data that can be tracked, stacked & mapped for use as a geophysical exploration tool.

Natural Sourced Electromagnetics (NSEM) is a patented emerging technology that offers the petroleum & mineral exploration industries a green & relatively quick, scalable & inexpensive mapping tool. Although lightning is guided by meteorological conditions, the precise location of strikes & their individual attributes appear to be influenced by lateral inhomogeneity caused by faults, fractures, mineralization, pore-fluids & salinity variations. Empirical results suggest faults may facilitate the upward flow of positive & negative currents that can in turn influence lightning, in much the same way that faults are believed to facilitate micro-seepage of hydrocarbons to the surface.

Examination of worldwide lightning data shows lightning strikes are not uniformly distributed. An analysis of 16 years of recorded North American lightning data also reveals non-random strike patterns. After the raw lightning data is stacked & mapped much like multi-fold seismic data, lightning strike density & geologically diagnostic lightning attribute maps show interesting & at times remarkable correlations to surface & subsurface geology.

3-D apparent resistivity volumes can be generated from lightning data & displayed in the same fashion as 3-D seismic data, with all wells, curves

& synthetic seismograms posted & correlated in the usual manner. Lines, traces, arbitrary lines & apparent resistivity slices can then be extracted, calibrated, interpreted & integrated with available seismic & subsurface data to expand interpreted areas beyond the bounds of existing conventional data.

The case studies presented will reveal how lineations, lightning-sourced data clusters & offsets appear to correlate to geologic features, electrical rock properties & hydrocarbon accumulations. One such example will demonstrate how several well-documented active surface faults in the vicinity of two salt domes could be identified in the subsurface.

In addition to mapping faults, NSEM maps electrical rock properties which can be used to distinguish lithology, & if calibrated to well logs, identify favorable hydrocarbon-bearing intervals.