North American Solar Electro-Magnetic Induction Detection Network

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ABSTRACT

A Radio Finding Detection Network is proposed to detect *Solar Electro-Magnetic (EM) Induction* effects producing an electromotive force, or voltage, across ancient electrical conducting volcanic rock complexes underlying North America. Electro-Magnetic Pulse (EMP), climate change, hurricanes, tornadoes, lightning, earthquakes, volcanism, and certain types of wildfire outbreaks may be stimulated during a weakening of the solar magnetic field especially during the upcoming solar minimum, increasing Earth's internal inductance power capable of driving much more violent events. This experimental testing is aimed at globally monitoring geophysical EM events to develop new forecasting methods. North American focus is on the New Madrid Fault, Florida hurricanes, and California wildfire and earthquakes, improving the science of natural disaster forecasting, management, investment, and governance, contributing to better resource-related negotiations and policy debates.

Keywords: *Radio Direction Finding, Solar Induction, EM Coupling, Solar Minimum, New Madrid Seismic Zone, Seismic Precursors, Earthquake Forecasting, Stellar Transformer, Total Electron Content, Wildfire, Hurricane, Jet Stream Precursors*

1. NORTH AMERICAN EM DETECTION NETWORK

Ancient electrical conducting volcanic rock complexes revealed in magnetic anomalies underlying North America (Fig. 1) can be monitored for precursor signals from these EM activated structures during solar cycles. ***Solar Electro-Magnetic Induction***[1] effects may produce an electromotive force, or voltage, across these ancient conducting rock complexes with deep connections to Earth's mantle and core. This precursor EM induction activity generates radio waves since it is similar in nature to lightning (from below) and can be a precursor warning to Electro-Magnetic Pulse (EMP), climate change, hurricanes, tornadoes, lightning, earthquakes, volcanism, and certain types of wildfire outbreaks during Coronal Mass Ejections. A Radio Finding Detection Network is proposed to detect these precursor effects. Our North American focus is on the New Madrid Fault, Florida hurricanes, and California wildfire and earthquakes. This experimental testing is aimed at globally monitoring geophysical EM events improving the methods and science behind natural disaster forecasting.

Fig. 1. Detection Regions on Magnetic Anomaly Map (USGS). With USGS seismic activity (inset); Eastern Seismic Belt outlined in Red; Hurricane Region outline in Blue; California Wildfire and Earthquake Region outlined in Orange.

Solar induction research breakthroughs advocate development of a global Electro-Magnetic (EM) monitoring program of Extremely Low Frequency (ELF, 3-30Hz) and Super Low Frequency (SLF, 30-300Hz) ranges using a Radio Direction Finding Network (RDFN) as outlined below.

Global Monitoring Ongoing in Italy
Part of the North American EM detection network can be based on the already successful Radio Direction Finding (RDF) Network (Fig. 2) developed by the Radio Emissions Project [1].

Fig. 2. World Mapping RDF System of the Radio Emissions Project - 8500 km indicated by violet azimuth in NW direction to monitor New Madrid Fault area from RDF monitoring station in Lariano (Rome, Italy) [2]. Source: Google Maps.

Monitoring stations built in Lariano (Rome, Italy) were created by the Luminous Transient Phenomena in Earth's Atmosphere (LTPA) Observer Project and the Radio Emissions Project. Based on technology that evolved from the late 1800's studies of

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[1] ***Solar Electro-Magnetic*** or ***Magnetic Induction*** is the production of an electromotive force, or voltage, across an electrical conductor in a changing *Magnetic* field. The induction characteristics are determined by current alignments between layers in the Earth and polarity
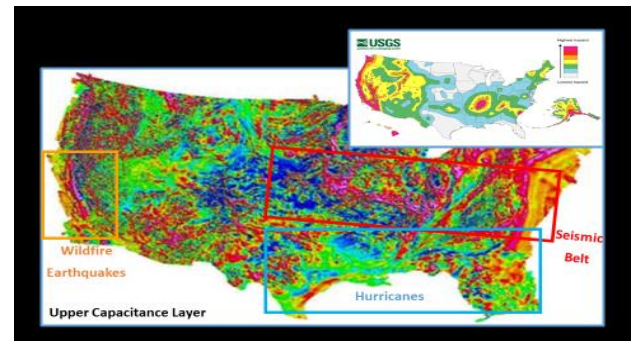
relationships between of the Earth, Sun and other planets. The alignment and polarity determine the attraction or repulsive forces in ***Plasma Core*** physics and determine charging and discharging forces on our planet.

Heinrich Hertz, who discovered the directionality of an open loop of wire used as an antenna. It allows 24/7 monitoring of a wide bandwidth of the Earth's background ionospheric electro-magnetic emissions to trace radio anomalies in seismically active areas for a "crustal diagnosis" in real time, on a global scale [2] (Fig. 2). By combining RDF information of appropriately spaced antennae array stations (of some tens of km) one can locate the source of EM emissions by triangulation and discriminate source direction, position, and distance from the station. The system provides data on the temporal variation of frequency, magnitude, and source intensity. During the experimentation with the Radio Emissions Project strong and precise radio emissions were detected preceding destructive earthquakes worldwide [3, 4]. The "dark purple" azimuth was kept under strict control focused on the Seismic Belt of the New Madrid Fault 8,500 km away from the monitoring station in Italy [2] (Fig. 2). Pre-seismic crustal emissions of radio waves are detected with RDF at very low frequency in the band above 20 kHz manifesting about 20 hours before earthquakes in New Madrid.

Local Monitoring

For more local in ground, Point & Detect (PND) EM precursor detection technology [5, 6] is centered on a high inductance, passive loop antenna (Fig. 3) design implementing an electromagnetic shielding effect, negating signal capture in all directions around the loop, except a certain exposed section oriented parallel to the ground for in-line ground wave reception. The open section allows focus of incoming ground wave signals propagating along Earth's surface and the entire antenna can be course-corrected on a swiveling platform with 360° rotation.
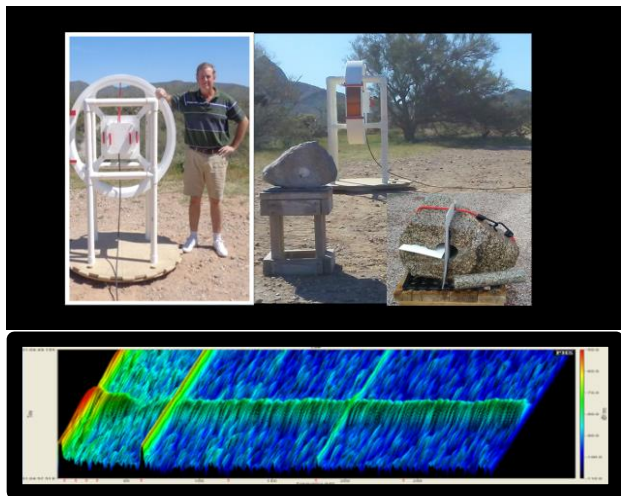

Fig. 3. **Loop Antenna Prototype** (upper images) vertical detection of rock fractures at 5m distance. The loop antennae are completely mobile, all weather. Lower plot correlates to the vertical granite fracture of the whole block and the full spectrum pulse < 300 Hz. Field triangulating EM is accomplished with multiple units with Point & Detect (PND) feature for radio detection finding. (Photo: Kenneth Jones - Prototype)

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[2] The **Magnetic Moment** is defined as a quantity that represents the *Magnetic* strength and orientation of a magnet or other object that produces a *Magnetic* field. The *Magnetic Dipole Moment* of an object is defined in terms of the torque the object experiences in a given *Magnetic* field. The strength and direction of this torque depends not only on the magnitude of the *Magnetic Moment* but also on its orientation relative to the direction of the *Magnetic* field and is therefore **considered a vector**. The direction of the *Magnetic Moment* points from the South to North Pole within the magnet in this case the Earth. The magnetic field of a *Magnetic Dipole* is proportional to its *Magnetic Dipole Moment*. The dipole component of an object's magnetic field is symmetric about the

2. SOLAR ELECTRO-MAGNETIC INDUCTION STELLAR TRANSFORMER

Solar Electro-Magnetic (EM) Induction drives simple step down energy induction between Sun and Earth, much like the transformer process that steps down household energy from higher voltage transmission lines sourced from the power company. The Sun represents a large coil from the power company, while the Earth represents the smaller coil to your home. The larger coil element generally excites current into the smaller coil element by induction of step down energy. Layers within the Earth hold and release charge acting as condensers, or capacitance layers. *Thus the larger Stellar Transformer [7] hypothesis concludes that induction characteristics are determined by the Earth's Magnetic Moment[2] primarily considered in relationship to the Sun & Moon and to a lesser extent other planets.* Vector induction components of torque generating power for Earth's magnetic moments are outlined below.
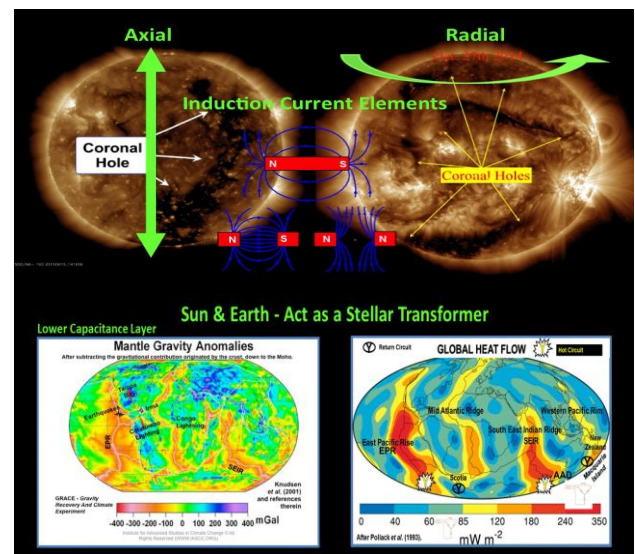

Fig. 4. **Solar Stellar Transformer Induction Current Elements** (upper) Coronal holes express induction elements in axial vs. radial orientations determining axial vs. radial effects on Earth systems. Polarity determines attractive/repulsive force determining charging/discharging relationships [7]. **Mantle Gravity Anomalies** (lower left) from GRACE satellite mission data indicate Earth's induction current elements of East Pacific Rise (EPR) polar and continental axial circuit connections to Catatumbo, Tampa Bay lightning anomalies, and Southeast Indian Rise (SEIR) radial circuit connections to the African Rift/Congo global lighting anomalies [7]. **Global Heat Flow** (lower right) reflects "hot" circuit configurations.

To simplify understanding of the relationships, solar coronal holes aligned with the Sun's north-south polar axis can be considered as axial induction elements, while those aligned with the equator are considered radial induction elements. These dark

direction of its *Magnetic Dipole Moment*, and decreases as the inverse cube of the distance from the object. The strength of a *Magnetic Dipole* is called the *Magnetic Dipole Moment*. **Considered a measure of a dipole's ability to turn itself into alignment within a given external magnetic field.** In a uniform magnetic field, the magnitude of the dipole moment is proportional to the maximum amount of torque on the dipole, which occurs when the dipole is at right angles to the magnetic field. The *Magnetic Dipole Moment*, often simply called the *Magnetic Moment*, may be **defined then as the maximum amount of torque** caused by magnetic force on a dipole that arises per unit value of surrounding magnetic field in vacuum (Wikipedia & Britannica).

coronal holes on the Sun represent the induction current elements activating mid-ocean ridge structures on earth of our *Earth-Sun Stellar Transformer* (Fig. 4). The Sun charges/discharges from elements within the arm of our spiral galaxy activating the complete Solar System including Earth, via electro-magnetic wavelength and frequency response, in an Electric Universe framework [8].

Solar Minimums

Solar cycles currently trend toward weaker magnetic fields (Fig. 5). This allows Earth's internal inductance power to increase. Much more violent geomagnetic events can be stimulated during a weakening of the solar magnetic field especially during the upcoming solar minimum. Cycle 25 begins the Grand Solar Minimum (GSM) that some forecasters expect to last around 3 (11 -14 year) solar cycles thus 2021 to ~2055.
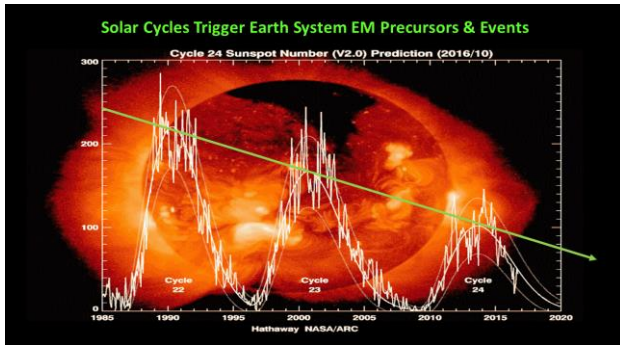

Fig. 5. Solar Cycle Trend Approaches Minimum (Green Line)**.**

Solar Electro-Magnetic Pulse (EMP), climate change, hurricanes, lightning, earthquakes, volcanism, and certain types of wildfire outbreaks appear highly stimulated by solar induction during a weakening of the solar magnetic field especially during the upcoming Grand Solar Minimum (GSM).

Reoccurring New Madrid Earthquakes

Historic New Madrid earthquakes have occurred during every solar minimum, four in a row, since 1400 AD (Fig. 6). And catastrophic New Madrid earthquakes such as occurred in 1811–1812 were associated with the Dalton Minimum affected the larger New Madrid Seismic Zone (Fig. 6). Based on the next arrival of a major prolonged solar low or solar hibernation cycle, which may last until 2050 AD or more. Another series of large earthquakes are expected to strike the New Madrid region [9, 10].
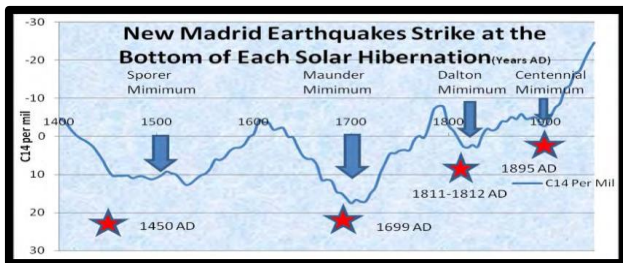

Fig. 6. Solar Activity Deduced from C^{14} Proxy Variation. History of New Madrid earthquakes compared to solar minimums or "solar hibernations" from 1400-1950 AD. Major New Madrid earthquakes as red stars. Source: [9] Data: [11].

Sunspot-Earthquake Cycle Anti-Correlations

Historic records comparing earthquake to solar cycles (Fig. 7) show convincingly an increase in quake and volcanic activities during the solar low cycles throughout the globe [12]. When the induction cycles are interrupted by disruptive solar events, violent internal discharges can occur within our planet resulting in large magnitude earthquakes, mentally conceptualized as lightning from below. This is feasibly explained by Gregori [13], who attributed to the Earth's core being a leaky capacitor or a battery; when solar activity is high, the Earth's core is charged, whereas when the Sun's activity is in low phase, the core in turn discharges energy. Precursor Earthquake activity emits radio waves implying an electromagnetic EM nature, like "low-slow" lighting from below.
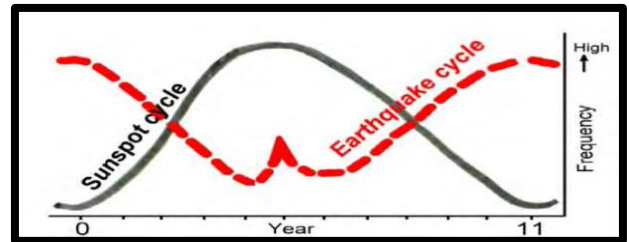
Fig. 7. Anti-correlation between the solar and earthquake cycles [5].

Earthquakes Strengthen and Shift North during Weakening

Earthquakes magnitude have been documented to increase and move northward during a weakening of solar magnetic field strength. Thus seismic energy transmigrates northward synchronized with the recent accelerated north magnetic polar movement during the declining solar cycle in the Central America-Caribbean area [14] (Fig. 8). This is confirmed by sudden increased earthquake activity since 1990 when the solar cycle 22 peaked and a longer solar cycle started, which includes the 11-year solar cycles 23, 24 and likely 25 and 26. Increased energy inputs from the southern hemisphere expand northward as explained from the mid-ocean ridge coupling to ridges encircling Antarctic (increased radial induction) with increased space weather events as explained by Stellar Transformer concepts [7]. A combination of these facts may well explain the historic devastating New Madrid earthquakes that occurred during every solar minimum, four in a row, since 1400 AD.
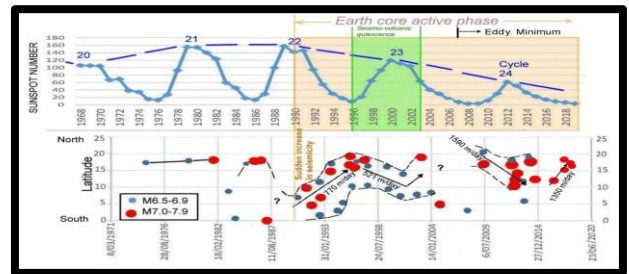
Fig. 8. Solar cycles and Earthquake Propagation Trend in Central American Pacific coast [14] Note a general trend when earthquakes move northward as the solar cycle is in decline, but southward when the solar cycle rises.

3. MAGNETIC MODELING DETECTING EM INDUCTION CIRCUITS

Quinn's Remnant Magnetization Signatures (Fig. 9) are computed as the ratio of the total geomagnetic-tensor-intensity to that of the total geomagnetic vector-intensity from the MAGSAT satellite model (Hamed & Dyment) using spherical-harmonic degrees-and-orders between nm=30 and nm=60. This geomagnetic ratio parameter is described in more detail by Quinn and Shiel, [15]. An application using their prism

technique in combination with regional rectangular-harmonic modeling is given by Quinn and Shiel [16], while an example of the combined use of magnetic source-depth inversion using prisms with global spherical harmonic modeling is given by Quinn [17]. Quinn's inverse harmonic magnetic modeling techniques showcase anomalies aligned with geologic hotspots, tectonic triple junctions and climate oscillation centers.

Fig. 9. Magnetic Modeling Basalt Flow Remnants. John Quinn's magnetic modeling at 30-65 spherical harmonic degrees locates 'Basalt flow Remnants' modern active and cooler ancient ones. Structure in lithospheric magnetic source depths: Red and Yellow are between the 30-70km range; while blues and greens are from 70-400km. (Courtesy - John M. Quinn, Solar- Terrestrial Environmental Research Institute (STERI)).

Quinn's Remnant Magnetization Signatures (Fig. 9) are considered the tips of Gregori's "Sea-urchin Spikes" within the Endogenous Earth Energy theoretical framework (Fig. 10). Some may also be meteorite impacts. A host of observational evidence is outlined in Gregori's volume of works related to earthquakes, volcanoes, environmental and astronomical observations [13, 18].

Fig. 10. Earth Internal Antenna "Sea Urchin" Model by Giovanni Gregori (13), "Galaxy-Sun-Earth Relations: The origins of the magnetic field and of the endogenous energy of the Earth". Introduces the concept of electrical potential joule spikes emanating from the core proposing an induction processes along antennae or spines connecting the core to the surface electrically.

Gregori explains [13] the propagation of electrical "Joule" energy along these "sea urchin" spines to Earth's core and geologic hotspots around the globe. Joule energy in this sense means "electrical energy" at termination resulting in heat, like a toaster or oven element, i.e. a "shorted circuit". Induction mechanism is key to internal forcing (Fig. 10).

Hurricane
Research on "*Florida Hurricane Shock from Lightning Activated Geomagnetic Anomalies*" identified the overall problem with the following hypothesis: Multiple hurricane tracks inundating Florida may result from grounding of the global electric circuit along geomagnetic anomaly trends or "lightning hotspots" [19] (Fig. 11).

Fig. 11. Magnetic Modeling North American zoom into Blue Hurricane Region with large magnetic signatures east and west of Florida Peninsula. These features connect global circuits in the lower capacitance layer in Fig. 4, with the upper capacitance layer in crustal magnetic signature Southeast U.S. (lower inset) The upper magnetic trend across Tampa bridges the large magnetic signatures offshore, east and west of the Florida Peninsula. Structure in lithospheric magnetic source depths: Red and Yellow are between the 30-70km range; while blues and greens are from 70-400km. (Courtesy - John M. Quinn, Solar- Terrestrial Environmental Research Institute (STERI)).

Increased lightning strikes, along geomagnetic anomalies may attract hurricanes thermally and electromagnetically. Research indicates these geomagnetic "lightning hotspots" are activated the year previous to actual increased hurricane landfalls generally associated with an ENSO charging cycle (La Niña) during an axial induction phase on the East Pacific Rise (EPR). The EPR induction circuit activates magnetic moments of deeply connected vertical z-components of the internal magnetic field in the Southeastern U.S. and Caribbean. Thus monitoring the EM precursor activity in the Southeastern U.S. associated with these known "lightning hotspot" locations may give indication of incoming hurricane locations well before their occurrence [19].

Wildfire
Outbreaks in California in 2003-04 [20] and again in 2017-18 occurred in conjunction with increased hurricane seasons of 2004-05 and 2016-17 (Fig. 12) respectively. Our hypothesis implies this occurs from radial solar induction associated with Electro-Magnetic Pulse (EMP) from Coronal Mass Ejections (CME's). Research indicates this sequence of events is related to radial induction of Pacific fracture zones where they intersect the Continental U.S. along an extension of the East Pacific Rise mantle circuit activated by solar axial induction (Fig. 4). The Murray fracture is associated with fire near large arc shaped geomagnetic anomalies [20] through San Bernardino in 2003 & 2017, while the Mendocino fracture intersects large volcanic plutons associated with the Paradise fire in 2018 (Fig. 12). Where power lines and tower turned to molten metal from ground arcs emanating from volcanic magnetic terrains. This can be understood in terms of an extreme manifestation of St. Elmo's fire, during large Total Electron Content (TEC) events (Fig. 13). St. Elmo's fire is a glowing form of luminous bright blue or violet plasma, similar to neon lights. It is created from the ionization of nitrogen and oxygen molecules by the electric field around tall conductive objects. Sailors observed this with religious awe and considered St. Elmo their patron saint as the phenomena often occurs on ships, especially on ship's masts during thunderstorms. It has also been known to occur during volcanic eruptions. High voltage differentials between clouds and ground must exist to

create a local electric field of approximately 100 kV/m to induce a discharge in air. The geometry of an object controls the magnitude of the electric field, as charge build up on sharp points lower the necessary discharge voltage. These wildfire outbreaks generally occur along volcanic geomagnetic terrains during periods of geomagnetic storms induced from solar coupling. Historical evidence from the most powerful space storm on record in September 1859 Carrington Event, hints at the relationship to wildfires when telegraph wires shorted out in the United States and Europe, igniting widespread fires simultaneously on both continents [20]. Monitoring EM activity along these fracture intersections may give early warning of fire out breaks along these systems.
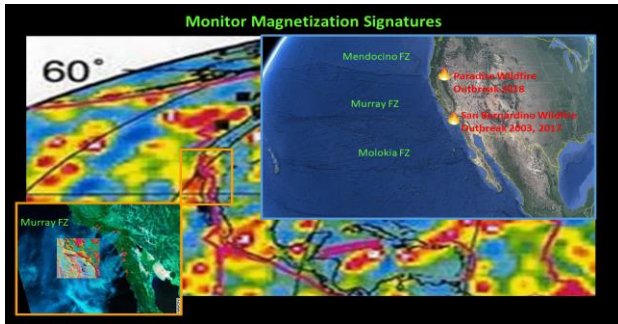
Fig. 12. Magnetic Modeling North American zoom into Orange Wildfire & Earthquake Region with large magnetic signatures along San Andreas trends intersection (upper right inset) with "Pacific Fracture" (Mendocino, Murray, Molokai) "Wildfire Breakout Zones". Lower inset 2003 Halloween wildfire outbreak along Murray Fracture associated with Coronal Mass Ejections [20]. Structure in lithospheric magnetic source depths: Red and Yellow are between the 30-70km range; while blues and greens are from 70-400km. (Courtesy - John M. Quinn, Solar-Terrestrial Environmental Research Institute (STERI)).
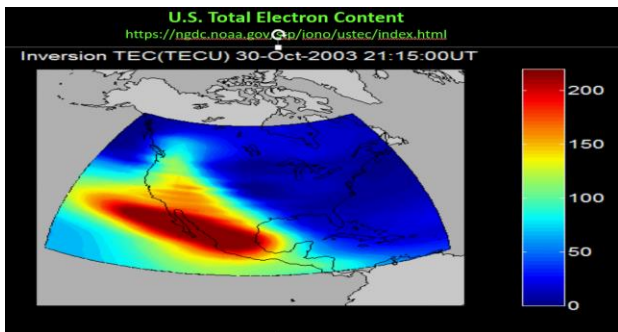
Fig. 13. Total Electron Content charge stacks up over the event area due to Solar Coronal Mass Ejections 30 Oct 2003, just before Halloween wildfire ignition on 31 Oct 2003 (NOAA).

The induction characteristics are determined by current alignments between layers in the Earth and polarity relationships primarily between Earth-Sun. The alignment and polarity determine the attraction or repulsive forces i.e. the charging and discharging forces on our planet.

Jet Streams
IEVPC Associate Scientist case studies show many M ≥ 6.0 earthquake locations were identified with Jet Stream precursors (Fig. 14). Mr. Hong-Chun Wu, a Taiwanese independent scientist, is the world authority on jet stream earthquake precursor anomalies. Satellite observation found possible atmospheric disturbances in jet stream velocity before the powerful earthquakes with durations 6-12 hours, at 100 km average distance between Jet Stream's and precursor and

epicenter [21, 22]. In fact, the interruption of velocity flow-lines that cross above an earthquake epicenter occurs 1–70 days prior to the event. His use of these short to medium-term Jetstream precursors is currently one of the most reliable forecasting techniques known to IEVPC. Prediction for M ≥ 6.0 earthquake epicenter result in less than 70 km deviation, using shock wave jet stream precursor method invented in 1999, Wu holds patent. The shock wave hypothesis related to released radioactive material (ionized gases) to the atmosphere, causing a series of physical and chemical reactions, resulting in temperature and pressure changes in the upper air jet streams. Most recently he forecast the 2019 July 4th earthquake near Los Angeles (Fig. 14).

Dear Bruce and all: This is prediction message for southern CA EQ predicted data: 2019/05/22~2019/08/22 near to L.A. (35.0N119.0W) M > 6.5 Posted on 2019/05/24.
Actual data: M6.4 2019-07-04 17:33:49 (UTC) 35.705°N 117.506°W 10.7 km
https://www.facebook.com/photo.php?fbid=2351411584910877&set=a.657516484300404&type=3&theater
Best Regards, Hong-Chun Wu
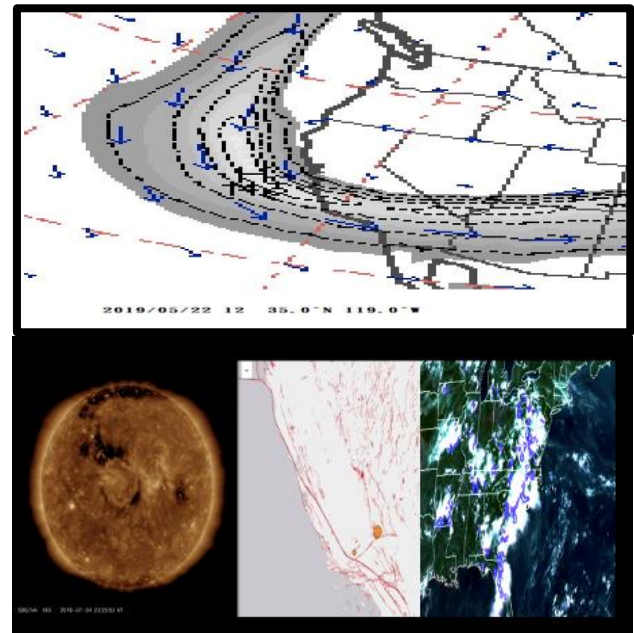
Methods verified valid for earthquake forecasting.
http://www.ievpc.org/earthquake-papers.html.

Fig. 14. Jet Stream Anomaly Forecast (upper) Wu used on 22May 2019 to forecast the July 4th earthquake near L.A. (Below Left to Right) Coronal Hole Configuration, Fault Zone with Earthquake, and East Coast Lightning in Ben Davidson's Suspicious 0bservers, 05 July, 2019, Daily 5min Broadcast. https://suspicious0bservers.org/

4. CONCLUSIONS

A Radio Finding Detection (RDF) Network to detect *Solar Electro-Magnetic (EM) Induction* effects in North America is proposed. Historical correlations to sunspots with variables such as lake levels establish a climate relationship dating back over 400 years that has primarily been attributed to the sun's variable degree of brightness in modern climate modeling. The effect of solar EM induction on Jetstream patterns and the relationship to earthquakes has largely gone unnoticed. There are strong scientific grounds to forecast another series of major earthquakes

in the New Madrid Seismic Zone during the current solar minimum. Seismic activity has dramatically increased since 1990, especially since 2007. These years are significant, because the former is the starting year of a one-order longer solar cycle, and the latter the starting year of the current Solar Minimum. Seismic energy increases and transmigrates northward with a weakening solar magnetic field raising the scepter of damaging New Madrid earthquakes that exclusively occurred during the last four major solar minimums. IEVPC's electro-dynamic Stellar Transformer [7] model, expanded within a geologic/tectonic Earth Endogenous Energy framework [13], provides a new innovative model for Earth's interactions with space weather explaining some common electromagnetic denominators associated with earthquakes and their seismic precursors. By monitoring EM induction effects within the earth, these fundamental relationships can be experimentally established ushering in new techniques in forecasting this myriad of natural disasters correlated to solar induction effects of *Stellar Transformers* [7, 23].

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