

**The spatiotemporal relationship between geomagnetic perturbations and Ebola Viral Disease outbreaks and civil strife in Equatorial Africa: *A reexamination of the interpretation of clay burning by Iron Age African tribes during severe geomagnetic perturbations.***

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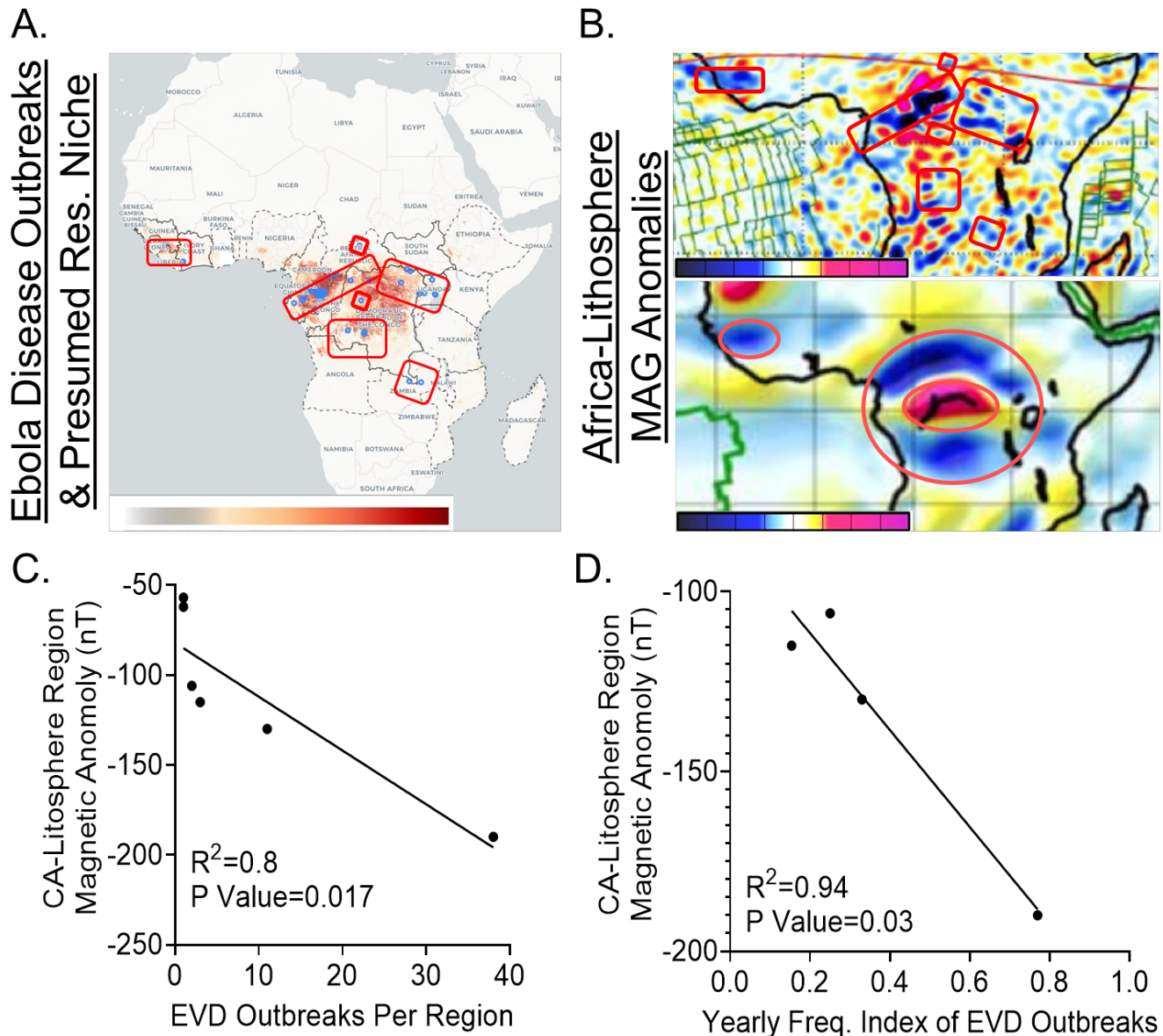
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Emerging infectious diseases and civil strife represent a disproportionately high source of morbidity and mortality in the human populations in the equatorial belt compared to the rest of the world. It is well established that infectious diseases and civil strife in the equatorial belt exhibit a spatiotemporal wave-like dynamics, which is intricately linked to severe perturbations in the climate; this relationship is codified in modeling frameworks employing the El Nino-Southern Oscillation Index as a predictive parameter. Archeological evidences suggest that Iron Age African tribes in the Limpopo River Valley Basin burned clay structures in their habitable and communal spaces during periods of severe climate perturbations, which were temporally associated with severe geomagnetic perturbations. The current interpretation of the actions of the Iron Age African tribes in the Limpopo River Valley Basin posits that said actions were ritualistic and superstitious attempts to ameliorate the severe climate perturbations and associated adverse impacts on health and civil order in their societies. This publication demonstrates that the spatiotemporal wave-like dynamics of Ebola viral disease outbreaks and civil strife in Equatorial Africa is associated with severe magnetic perturbations in the lithosphere. This publication also proposes a novel hypothesis, which argues that viral infectious disease outbreaks are mediated via very low frequency-electromagnetic waves emanating from the lithosphere, which is coupled to the large low-shear-velocity provinces at the core-mantle boundary. Said very low frequency-electromagnetic waves induces transformation of endogenous viruses in the human genome or vector/reservoir genome into infectious agents; with said infectious agents also capable of transmission across hosts. Furthermore, very low frequency-electromagnetic waves emanating from the lithosphere induces civil strife via aberrant modulation of neurocognitive processes. Consequently, the burning of clay by Iron Age African tribes in their habitable and communal spaces during periods of severe geomagnetic perturbations is re-interpreted as an effective means of blocking/shielding humans from the very low frequency-electromagnetic waves emanating from the lithosphere, thus preventing/ameliorating emerging viral infectious diseases and civil strife, as “burnt” clay is a potent attenuator of very low frequency-electromagnetic waves.

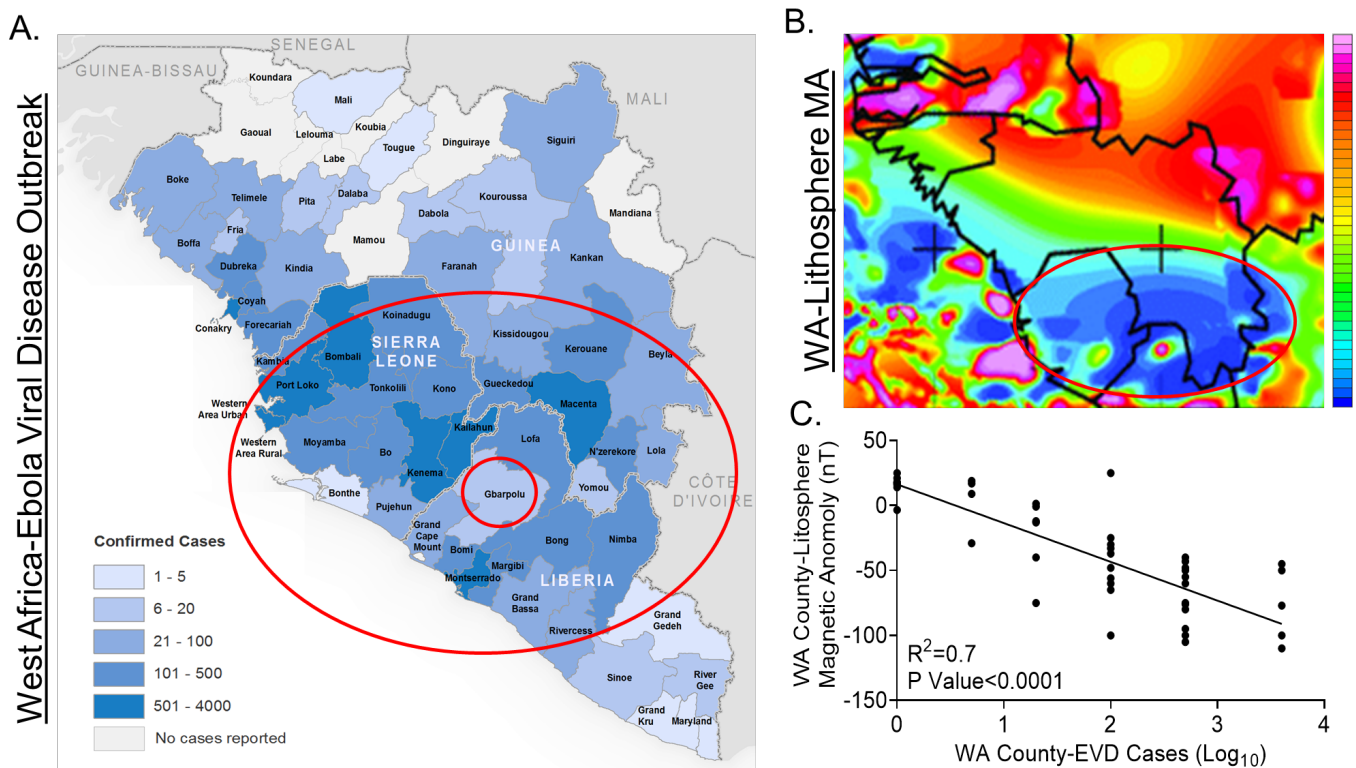
## Introduction

Emerging infectious disease epidemics and civil strife disproportionately affects developing countries in and around the equatorial belt, especially countries in Equatorial Africa (1). Several studies have demonstrated that the disproportionate level of emerging infectious disease epidemics and civil strife in the equatorial belt are associated with shocks to the physical space, including droughts, floods, and other climate/calendar-associated natural disasters (1-3). The relationship between climate/calendar-associated events and emerging infectious disease epidemics and civil strife are formalized in forecasting models based on the El Niño Southern oscillation (1, 3, 4). Furthermore, the dynamics of emerging infectious diseases and civil strife in the equatorial belt mimics a wave-like dynamics spatially and/or temporally (5-7). Emerging evidence suggests that shocks to the lithosphere are coupled electromagnetically to shocks in the atmosphere and ionosphere, and codified in the Lithosphere-Atmosphere-Ionosphere coupling (LAIC) model, thus providing a possible



**Figure 1: The spatiotemporal relationship between lithosphere magnetic anomalies and Ebola viral disease outbreaks.** The location of Ebola viral disease (EVD) outbreaks in both humans and animals were mapped over the niche of the presumed reservoir for Ebola virus (i.e. fruit bats) (A), and compared to the lithosphere magnetic (MAG) anomalies (using map-top panel and model-bottom panel) of said regions in Africa (B). Note: The cases outside of the Mano River basin region and Central Africa were excluded (i.e. the cases in Ghana on the original map) as those were imported/limited. (C/D) Analysis of number and yearly frequency index of EVD outbreaks in the demarcated regions in Central Africa (CA) compared to the strength of the magnetic anomaly (using WMADM Scale-Top Panel in 1B. Blue=low, Fuchsia=High) in said regions, as EVD has been in the region greater than 40 years.

mechanistic link between changes in/on the lithosphere and changes above the lithosphere (Atmosphere and Ionosphere). Currently, the mechanism by which climate/calendar-associated events influence emerging infectious disease outbreaks and civil strife is poorly understood; and the impact of severe geomagnetic perturbations on those outcomes are also poorly understood. Furthermore, the emerging evidences demonstrating the presence of a myriad of endogenous viruses, including endogenous “Ebola and Marburg viruses” in human and other animals genomes has challenged the dominant paradigm that the so-called “emerging viral diseases” such as Ebola and Marburg viral diseases were recently (20th century) introduced into humans. An alternative reservoir of human knowledge, termed, Indigenous Knowledge, which has been continuously verified via repetition, inference and prediction, often over several millennia, provides a source of insights and solutions. However, Indigenous Knowledge is generally assumed to be primitive and superstitious, thus it is underexplored (8). Recently, said assumptions of Indigenous Knowledge have been challenged, with evidences demonstrating that Indigenous Knowledge holds valuable information and insights/solutions into unresolved scientific problems, mostly notably in the field of ecology (9, 10) and sustainable agriculture (11, 12). The application of Indigenous Knowledge to infectious disease outbreaks and civil strife has been underexplored, with Indigenous Knowledge rarely incorporated in strategies for addressing or understanding the mechanisms of emerging infectious disease outbreaks and civil strife in their affected regions. This work reexamines the practice of burning clay in habitable and communal spaces by Iron Age African tribes during periods of severe geomagnetic perturbation, in relation to the current severe geomagnetic perturbation in Equatorial Africa, which is associated with recurring Ebola viral disease outbreaks and civil strife.



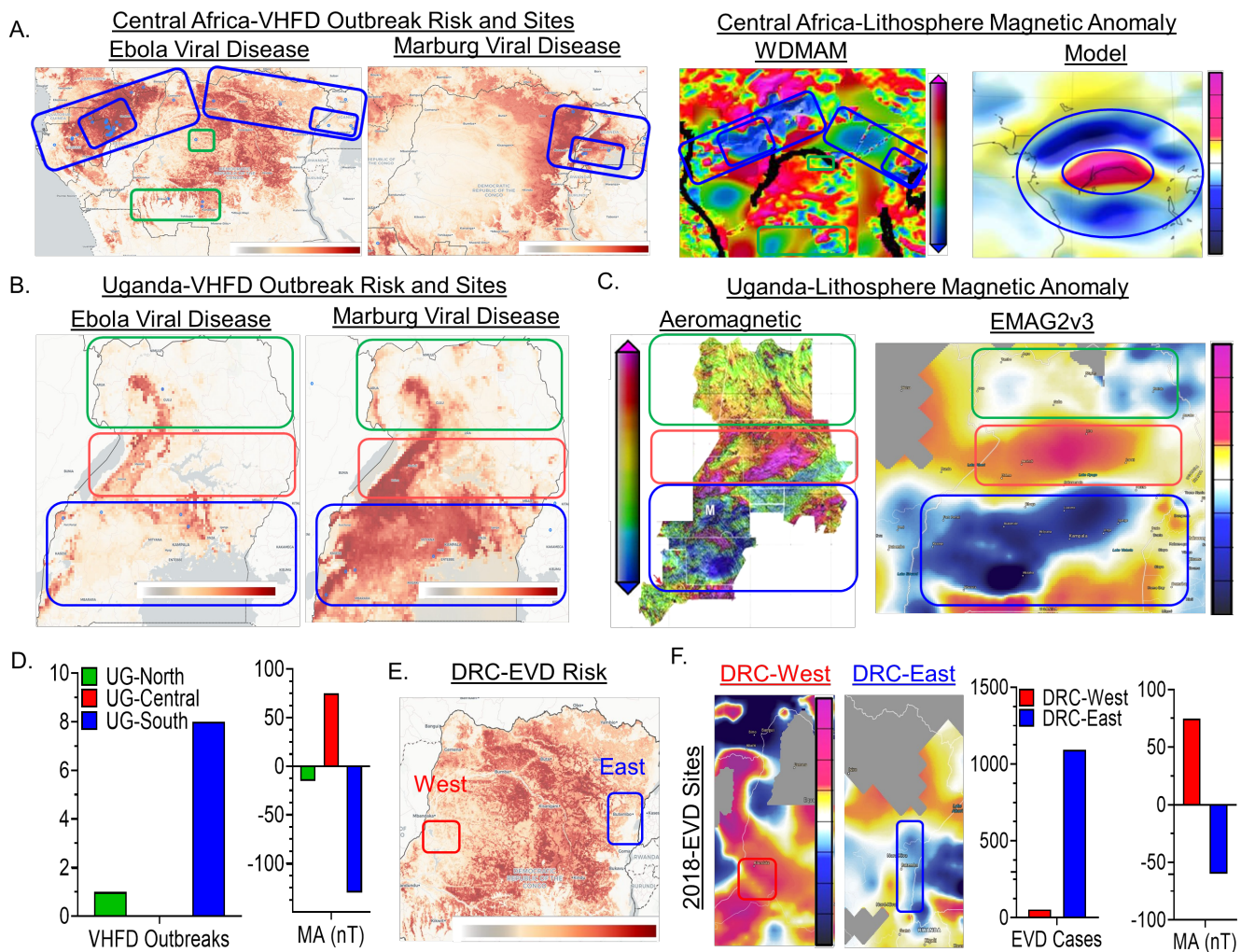
**Figure 2: The spatial relationship between lithosphere magnetic anomalies and the Ebola viral disease outbreak in West Africa.** The number of Ebola viral disease (EVD) cases per county in West Africa (WA) were tabulated and mapped by the World Health Organization (A); said map was compared to the (B) lithosphere magnetic anomalies (MA; Blue=low, Fuchsia/Pink=High) in the Mano River Basin region to determine structural similarities. (C) Comparative analysis was performed between the number of EVD cases per county and the approximate strength of the lithosphere magnetic anomaly per county for all the counties in the Sierra Leone, Guinea and Western Liberia (visible portion of Liberia on the original map). The eastern portion of Liberia was not published in this map, however the magnetic anomaly is relatively high per data from other maps).



## Results

### Spatiotemporal relationship between geomagnetic dynamics and Ebola viral disease outbreaks in the equatorial belt of Africa.

Comparative analysis of the spatial dynamics of Ebola viral disease (EVD) outbreaks in Central (includes some East African countries) and West Africa and lithosphere magnetic anomalies in Central and West Africa, demonstrates that Ebola outbreaks are spatially restricted to regions of low-magnetic field strength anomalies; the frequency of EVD outbreaks in said regions also inversely correlates with lithosphere magnetic field strength (Figure 1). These associations overlap the geographic distribution of the currently presumed reservoir for Ebola virus (namely, fruit bats) (Figure 1). The number of EVD cases per county varied significantly across the Mano River Basin region of West Africa during the 2014-2016 outbreak, with Northern Guinea and Eastern Liberia exhibiting extremely small number of EVD cases compared to other regions (Figure 2). In the West African-EVD outbreak, the number of EVD cases is infinitesimal compared to the total population of any given county, therefore, it is presumed that the number of EVD cases per county is not significantly affected by the

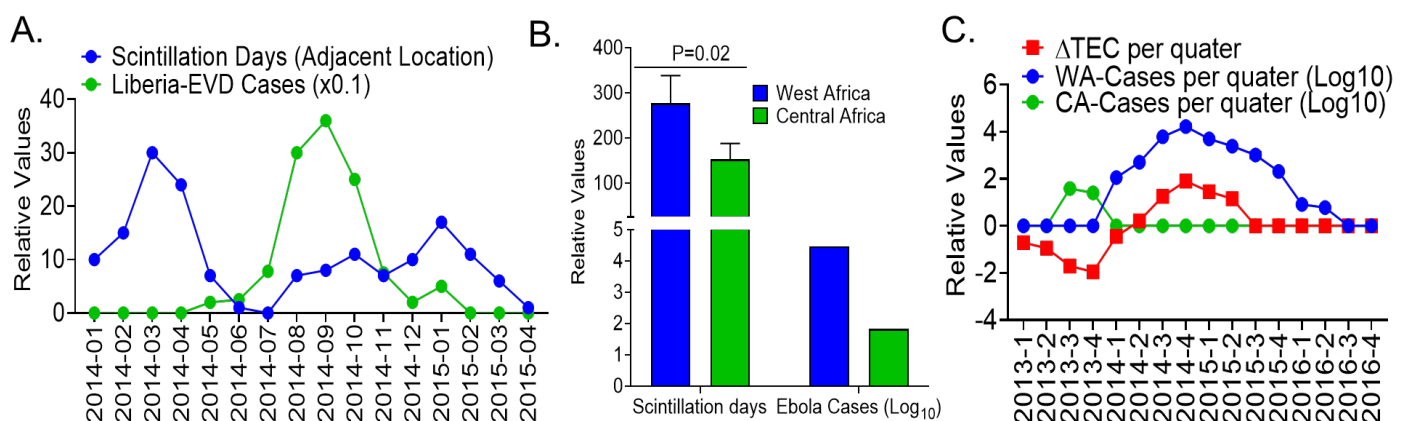


**Figure 3: The spatial relationship between lithosphere magnetic anomalies and viral hemorrhagic fever disease outbreaks in Central Africa.** (A) The niche of the presumed reservoir species of viral hemorrhagic fever diseases (VHFD)-Ebola viral disease (EVD) and Marburg viral disease (MVD) and outbreak sites were compared to the lithosphere magnetic anomalies (MA) in Central Africa, with boxes demarcating the encompassing regions and inner boxes identifying sub-regions with high number of outbreaks. (B/C/D) The niche of the presumed reservoir species of EVD and MVD were mapped along with outbreak sites in demarcated regions (North, Central and South) of Uganda and compared to the lithosphere magnetic anomalies of said demarcated regions. (E/F) The niche of the presumed reservoir species of EVD in regions of the 2018-EVD outbreaks in the Democratic Republic of Congo (DRC) were demarcated and compared to the lithosphere magnetic anomalies of said regions, along with comparative analysis of the number of cases and the strength of the lithosphere magnetic anomalies.



differences in the total population or population density across the counties. Analysis of the relationship between the number of EVD cases per county and the strength of the lithosphere magnetic anomalies in the Mano River Basin region of West Africa demonstrates concentric oval regions (6) centered on a location in Northwestern Liberia, for both parameters; with an inverse relationship between the spatially-overlapping parameters (Figure 2). Prior to 2014, EVD outbreaks were spatially restricted to Central Africa (including East African countries), with several countries in and around the Congo River Basin and the encompassing Greater Bangui Magnetic Anomaly region experiencing multiple outbreaks (Figure 3). Analysis of viral hemorrhagic fever disease (VHFD, namely Ebola viral disease-EVD and Marburg viral disease-MVD) outbreaks and presumed reservoir species in Central Africa demonstrate spatial overlap between with low strength-lithosphere magnetic anomalies, including detailed analysis of outbreaks in Uganda (Figure 3). Of importance, the spherical shell shape of viral hemorrhagic fever disease (EVD and MVD) outbreaks in Central Africa spatially overlaps with the spherical shell shape of the vertical field anomaly of Central Africa (Figure 3). The EVD outbreaks in DRC that began in 2018 occurred in two regions (West and East), but exhibited differential outcomes. The Équateur Province (West-DRC) outbreak resulting in extremely small number of cases (~50 EVD cases) and quickly dissipating, while the North Kivu and Ituri Provinces (East-DRC) outbreak resulted in large number of cases (>1000 EVD cases) and is ongoing (per the date of analysis of said data-March 2019) (Figure 3). Analysis of the magnetic anomaly demonstrate that the East-DRC outbreak co-localized with a relatively low strength-lithosphere magnetic anomaly region, while the West-DRC outbreak co-localized with a relatively high strength-lithosphere magnetic anomaly region, albeit adjacent to a very low strength-lithosphere magnetic anomaly region and near a lake (Figure 3).

Perturbations (i.e. excitations) of the lithosphere magnetic field are coupled to ionosphere scintillation (13-15), which predominately occur after sunset. Equatorial regions exhibit disproportionally high levels of scintillation (16, 17), with the notable exception during the summer months. Analysis of the West African (Liberian) EVD outbreak demonstrates a temporal relationship with equatorial-ionosphere scintillation based on the number of scintillation days per month in Abidjan, Ivory Coast (a location in West Africa that is adjacent to Liberia; data for Liberia is not available due to the lack of requisite infrastructure/equipment), with the peak of both parameters separated by six months, and the summer months also associated with residual scintillation (Figure 4). Equatorial Africa experience two EVD outbreaks in 2014 (West and Central African-EVD outbreaks), with the Central African-EVD outbreak resulting in extremely small number of cases and rapidly dissipating over a few months, while the West African-EVD outbreak resulted in high number of cases and lasted for about a year. The divergent outcome of the two regions was associated with the relative duration of equatorial-ionosphere scintillation (Figure 4). Ionosphere scintillation results from irregularities in the total electron count (TEC) of the ionosphere (18), and thus associated with changes in TEC, which perturbs the transmission of electromagnetic



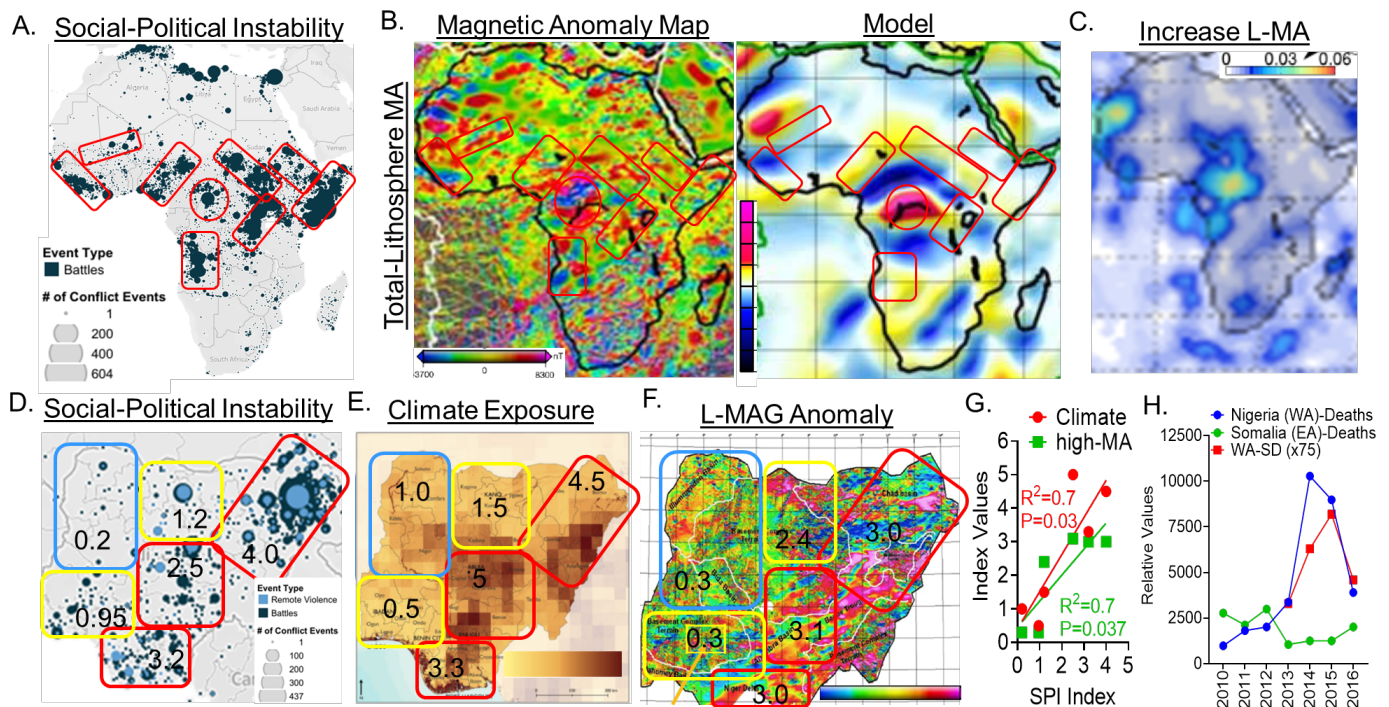
**Figure 4: The temporal relationship between ionosphere scintillation and Ebola viral disease outbreak.**

(A) The ionosphere scintillation was examined at an adjacent location (Abidjan) outside of the EVD-affected area in West Africa, as said infrastructure is not available in the affected countries. The duration of the scintillation per month at said location was compared to the number of EVD cases per month. (B) The duration of scintillation in the West African region was compared to the Central-East African region, along with the number of EVD cases in both regions. (B) The total electron count (TEC) trend over Africa was compared to the trend of the EVD cases in both West and Central Africa.

(radio) waves. Analysis of the West African-EVD outbreak demonstrates a temporal relationship with changes in the TEC of the African-ionosphere (Figure 4).

### Spatiotemporal relationship between geoelectromagnetic dynamics and civil strife in the equatorial belt of Africa.

The countries in and around the equatorial belt of Africa, including West, Central and East Africa, exhibit a relatively high degree of persistent violent conflicts compared to countries in Southern and North Africa (4). Analysis of the regions with high prevalence of violent conflicts/battles and the lithosphere magnetic anomaly demonstrate that regions with high magnetic field strength exhibit relatively high levels of violent conflicts/battles, while regions of low magnetic field strength exhibit relatively lower levels of violent conflicts/battles (Figure 5). Analysis of recent/current violent conflicts/battles in the equatorial belt of Africa during the period of 1997-2016 demonstrates that the violent conflicts in Eastern Democratic Republic of Congo (DRC), Central Africa Republic, Southwestern Chad, Northeastern and Southeastern Nigeria, Northern Cameroon, Angola and South Sudan/Southern Sudan, exhibit co-localization with regions of high strength-lithosphere magnetic anomaly of the encompassing Greater Bangui Magnetic Anomaly region (Figure 5). The spatial pattern of the violent conflicts encompassing the Greater Bangui Magnetic Anomaly region mimic concentric spherical shells centered on the focal-point of the magnetic anomaly (Figure 5). Several countries on the edges of the equatorial belt of Africa also experienced violent conflicts over the past two decades, albeit



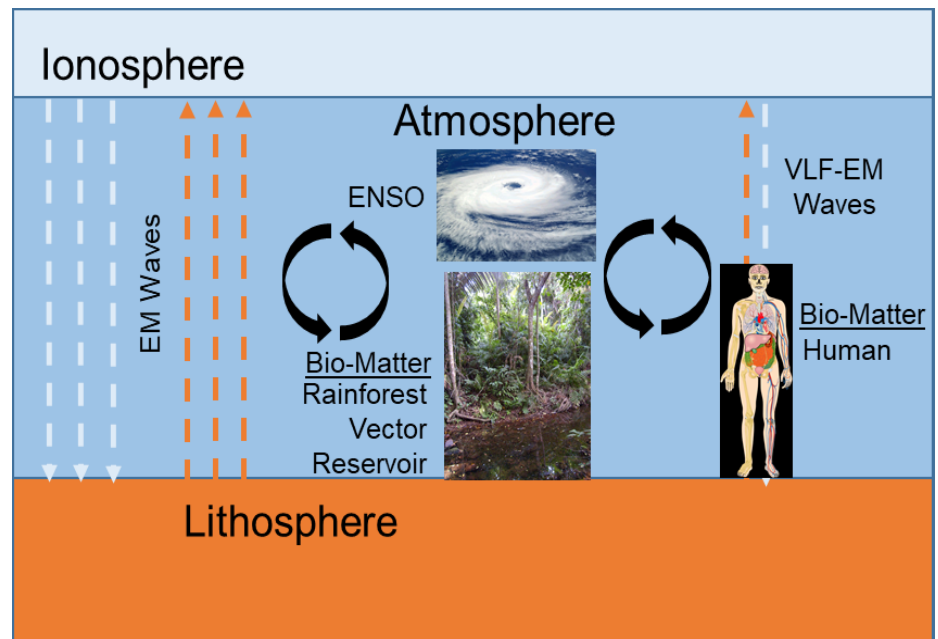
**Figure 5: The spatiotemporal relationship between lithosphere magnetic anomalies and social-political instability in Equatorial Africa.** (A) The number of violent conflicts (battles) over the past two decades were mapped and (B) compared to the associated lithosphere magnetic anomalies (two independent maps). The Sahara desert region on the northern edge of the equatorial belt has an extremely low population density, while southern Africa also on the edge of the equatorial belt has comparable high population density as the equatorial belt. (C) The changes in the strength of lithosphere magnetic anomalies over the past two decades were also mapped. (D) The spatial dynamics and the associated number of violent conflicts (battles and remote violence) in Nigeria over the past two decades were mapped and (E) compared to the associated climate exposure and (F) lithosphere magnetic anomalies of said regions. Note, the population density of Nigeria does not account for the differences in violent conflicts per region. (G) Comparative analysis was performed using a semi-quantitative index (scale 1-10), to determine the relationship between lithosphere magnetic anomalies, climate exposure and violent conflicts. (H) Comparative analysis was performed to determine the temporal relationship between the increased in violent conflicts (increased number of deaths) and ionosphere scintillation (measurements obtained from Sao Tome) in Nigeria (predominately in the Northeast) in the period of 2014-2015; Somalia in the East African sector, with relatively lower ionosphere scintillation was used for comparison.

the level of conflict and the magnetic anomaly strength are relatively lower than observed in the equatorial belt of Africa (Figure 5). Additionally, analysis of the lithosphere magnetic anomalies across Africa over the last two decades demonstrates significant excitation of the magnetic anomaly in many of the regions associated with violent conflicts across equatorial Africa (Figure 5). A detailed analysis of the violent conflicts (battles and remote violence) in Nigeria demonstrates spatial overlaps with regions of high-lithosphere magnetic field strength anomaly and the well-established parameter for predicting/modeling social-political violence, namely, climate exposure index (i.e. droughts) (Figure 5). Analysis of the intensity of the violent conflict in Nigeria (West Africa) as measured by the number of deaths per year demonstrates a temporal relationship between ionosphere scintillation (measure at a nearby location, Sao Tome) (Figure 5). Additionally, Somalia (Eastern Africa), which experienced relatively lower levels of ionosphere scintillation, also experienced a reduction in the intensity of violence over the same period (Figure 5).

## Discussion

Historically, there are two overarching scientific hypotheses on the mechanisms of human infectious disease outbreaks (5). Prior to the demise of Greco-Roman dominated Europe/world, the dominant scientific hypothesis of human infectious disease outbreaks posits that said aberrant health outcomes were manifestations of interactions with aberrant unseen forces that were coupled to geographic locations and seasonal/calendar-associated meteorological dynamics (5). Said hypothesis is formalized in the first book of the Hippocratic *Epidemics* (5). This hypothesis is consistent with the hypothesis of disease in most indigenous cultures, including African-Indigenous Knowledge hypothesis of emerging viral infectious disease (19-21).

Broadly speaking, African-Indigenous Knowledge hypothesis of emerging infectious disease argues that aberrant health status is a manifestation of interaction of individuals with aberrant unseen forces emanating from the Earth, resulting in an aberrant transformation of individuals. Said hypothesis argues that the physical space (and associated unseen forces) along with seasonal events play a dominant role in infectious disease outbreaks. This publication termed said hypothesis as the *endogenous hypothesis* of infectious diseases; as disease is mediated by internal transformation, albeit via unseen external forces. The demise of Greco-Roman dominated Europe/world, was associated with the abandonment of said hypothesis, and the perceived importance of the physical space and associated dynamics in infectious disease outbreaks (5). A novel hypothesis, which argued that replication of foreign contagious agents were the mediators of human infectious



**Figure 6: A proposed modified lithosphere, atmosphere and ionosphere electromagnetic coupling (LAIC) model including humans.**

A proposed modification of Kuo et al model of electromagnetic coupling between the ionosphere, atmosphere and lithosphere, wherein, the lithosphere magnetic field (orange) induces aberrant very-low frequency (VLF) electromagnetic (radio) waves (orange arrows) after sunset, which can interact with active matter (bio-matter) (i.e. humans, other animals (vectors, reservoirs), plants), resulting in aberrant transformation of the host genome and tissues and the emergence of infectious viruses (from endogenous virus fragments) and disease. The aberrant low frequency electromagnetic (radio) waves are associated with excited-magnetic anomalies, mediated by electromagnetic perturbations associated with Large Low Shear Velocity Provinces at the Earth's core-mantel boundary, which are triggered by calendar-associated meteorological events (i.e. El Niño Southern Oscillation-ENSO) and associated electrodynamics. Note: Images were obtain from Creative Commons.



diseases, emerged in the Western European dominated Europe/world (20). This hypothesis argued that physical space and seasonal/calendar-associated meteorological events had negligible impact on the mechanism of human infectious diseases. Said hypothesis is termed the *exogenous hypothesis* of human infectious diseases, as a foreign agent, and not mere transformation of the host, mediates disease. The *exogenous hypothesis* of human emerging infectious diseases is based on a fundamental assumption that all emerging infectious agents are of foreign origin (5). Emerging evidence as codified in the prion hypothesis has refuted said assumption that all human infectious agents are of foreign origin, as prion infectious agents results from transformation of normal human gene products (misfolded protein), albeit the transforming agent remains to be determined (22, 23). Importantly, recent evidences demonstrate that human viruses, including Filoviruses (i.e. Ebola and Marburg viruses) have endogenous viral fragments in animal genomes, including humans (24-28); this is in addition to the approximately 8% of the human genome that is composed of endogenous retroviruses (29). Furthermore, recent evidences demonstrate that endogenous viruses (i.e. endogenous retroviruses) play a critical role in modulating normal biological processes (29). These evidences are inconsistent with the hypotheses that foreign infectious agents that recently “spilled-over” from zoonotic reservoir species mediate emerging viral infectious diseases. Importantly, it is well established that EVD outbreaks exhibits seasonal/calendar-associated outbreaks, whose dynamics mimics spatiotemporal waves; said dynamics is not adequately reconciled with the *exogenous hypothesis* of human emerging viral infectious diseases (6). Additionally, several evidences have demonstrated widespread Ebola virus infection (based on seroprevalence survey) across Equatorial Africa, prior to EVD outbreak or no recorded EVD outbreak in said regions (30), an adequate explanation for said differential disease outbreak outcomes is lacking.

To address the above discussed inconsistencies, a *modified-endogenous hypothesis* is proposed, in which human emerging viral infectious disease outbreaks are mediated by very-low frequency (VLF)-electromagnetic (radio) waves (31) emanating from the lithosphere (Figure 6, (32-34)); with said radio waves inducing transformation of endogenous viruses in the human and/or other animals (vector/reservoir) genomes and/or associated gene products. Transformation of endogenous viruses in the host genome results in the emergence of infectious viruses that is capable of replication in the host and transfer and replication in another host (viral transmission), albeit modulated by host defense. Furthermore, this publication argues that very-low frequency (VLF)-electromagnetic (radio) waves also mediate aberrant changes in human brain and associated behavior, enabling the emergence of violent interactions and civil strife (Figure 6). This publication also hypothesize that electromagnetic perturbations associated with the Large Low Shear Velocity Provinces (LLSVPs) at the Earth’s core-mantle boundary (i.e. African-LLSVP), plays a critical role in mediating the very-low frequency-electromagnetic (radio) waves in the lithosphere that induce emerging viral infectious disease outbreaks and civil strife (35). Electromagnetic perturbations in the lithosphere, atmosphere, and ionosphere are coupled; thus, in addition to the dominate role of the Earth’s core-mantle region in modulating magnetic perturbations in the lithosphere (35, 36), the magnetosphere (37) and the Sun (38, 39) also contribute to the modulation of magnetic perturbations in the lithosphere.

The *modified-endogenous hypothesis* is consistent with African-Indigenous Knowledge hypothesis of emerging diseases and associated indigenous public health strategies. It can be argue that African-indigenous public health strategies employed “Time, Distance, and Shielding” as the primary means of preventing and controlling infectious disease outbreaks. In indigenous African societies, significant restrictions are imposed on activities at nighttime, which is the period associated with ionosphere scintillations, thus limiting exposure time to very-low frequency electromagnetic (radio) waves (Time) emanating from the lithosphere. Additionally, significant restrictions are imposed on activities at specific geographic locations (Distance), such as forests regions and bodies of water. Viral hemorrhagic fever disease outbreaks (i.e. EVD outbreaks) are generally associated with said locations and provides a portal through which radio waves can reach the surface, as crustal regions composed of clay are potent attenuators of electromagnetic waves (40), and said locations (i.e. rivers, lakes) have relatively lower clay content in the soil. Recent evidence suggest that African tribes in the Limpopo River valley basin burned clay material in their habitable and communal spaces during periods of aberrant climate conditions and associated disease outbreaks (and possibly civil strife), thereby “trapping” the aberrant magnetic perturbations (Shielding) associated with said periods (41). Although said intervention measures are generally assumed to be superstitious and ritualistic; in light of the evidence provided in this publication, said

practices are re-interpreted as highly effective means of attenuating (Shielding) the radio waves emanating from the lithosphere, and thereby preventing and/or controlling emerging viral infectious disease outbreaks (i.e. viral hemorrhagic fevers) and civil strife. In most indigenous African societies, including the tribes in the Limpopo River Valley Basin, clay is the predominant material employed in constructing habitable and communal spaces (Shielding), as said material is highly effective in attenuating electromagnetic waves (41). The aberrant magnetic perturbation of the period between A.D. 1225 to 1550 was temporally associated with pandemics (i.e. Black Death, cocoliztli), violent conflicts/civil strife, and aberrant climate conditions (41). Consistent with the hypothesis proposed above, a recent report argued that “Black Death” syndrome is more closely related to viral hemorrhagic fever disease (42); it is also suggested that the “cocoliztli syndrome” is a viral hemorrhagic fever disease (43). Furthermore, evidence suggests that the magnetic anomalies of A.D. 1225 to 1550 was associated with significant activity of the South Atlantic Anomaly, which spans a significant portion of the equatorial belt (South America to Africa) (41).

In summary, this publication re-interprets the actions of Iron Age African tribes in the Limpopo River Valley Basin in burning clay structures in their habitable and communal spaces during periods of severe geomagnetic perturbations and associated climate perturbations. This publication argues that said actions were neither ritualistic nor superstitious, but in fact an effective means of attenuating very low frequency (VLF)-electromagnetic (radio) waves emanating from the lithosphere and preventing and/or ameliorating emerging diseases and civil strife.

## Material and Method

Briefly, the data from Global Navigation Satellite System (GNSS), namely GPS, GLONASS, Galileo, and BeiDou-2 were analyzed by FUGRO to determined ionosphere scintillation (Yahya Memarzadeh, NOAA Space Weather Workshop, 1-5 May 2017, Broomfield Colorado USA). TEC trends in Africa were approximated from IGS’s GIMS as analyzed by Geoffrey Andima et al, 2019 (44). The world lithosphere magnetic anomaly maps were developed by an international consortium utilizing satellite, ship, and airborne magnetometer platforms. The World Digital Magnetic Anomaly Map (WDMAM) is published in Erwan Thébault et al, 2009 (45). The EMAG2v3: Earth Magnetic Anomaly Grid (2-arc-minute resolution) was developed by Brian Meyer et al, 2017 (46) and is available as an ArcGIS web platform (<https://noaa.maps.arcgis.com/apps/webappviewer/index.html?id=6717e58b755b41298dc623d8fdc967dc>) and the Central Africa-Vertical Field Anomaly map was developed by K. Hemant, 2005 (47). The lithosphere/crustal magnetic anomaly map (CHAMP data) and model (vertical field) was develop by K. Hemant and S. Maus, 2005 (47). The trend of the Africa lithosphere magnetic anomaly was developed by Sebera, Josef et al, and published at the 20th EGU General Assembly, EGU2018, (Proceedings from the conference held 4-13 April, 2018 in Vienna, Austria, p.19034) . The West Africa Magnetic anomaly map was developed by Nicolas Launay et al, 2018 (48). The Uganda magnetic anomaly map was developed by Tapio Ruotoistenmäki, 2014 (49). The equatorial-ionosphere wave over Brazil in 2015 was developed by Fabricio Dos Santos Prol et al, 2018 (50). Viral hemorrhagic fever disease maps were developed by Institute for Health Metrics and Evaluation at the University of Washington, which were based on David M Pigott, et. Al 2016 (51) (<https://vizhub.healthdata.org/lbd/pandemics/>). The West Africa-EVD map and data (including Central Africa-EVD outbreak data) was developed by the World Health Organization (WHO) (<https://www.who.int/csr/disease/ebola/maps/en/>). The mosquito vector map for Zika viral disease transmission was developed by Moritz UG Kraemer et al, 2015 (52). The Zika epidemic data was obtained from Monica C. Campos et al, 2018. All data were analyzed using graphpad Prism software.

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