# The Compact System Electromagnetically Equivalent to the Earth's Natural Events and Disasters with Application to Seismic Processes: The Completely Compact Electromagnetically Equivalent Earth Network (CCEEEN)

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#### Abstract

This research concerns with modeling both the seismicity and climate related geo-data as the self-optimization process of an electromagnetically equivalent, say EMeq and globally compact complex multi-network. There are maps set up between the parameter spaces of the geo-data and the characteristics of the EMeq network models. The temporal variations of the geo-data are correlated to the self-optimizing the specific characteristics of the EMeq complex systems in the model presented in this work. The inverses of the mapping generate the evaluations giving the detectability conditions involving some certain restrictions. The model expounds both the interaction mechanisms of natural events with electromagnetism during significant disasters and the way of detecting the significant seismic activity, say sSA, in future with the natural iterations of the geo-data on both the region under the observation and some locations neither related to the observation region as geologically, seismically, climatically, nor phenomenologically.

## 1 Introduction

The Earth is an entity with the entirety of all things what there are in its interior, on its surface, over its suface, in its atmosphere, and in its exterior in point of the way of coming into being for the natural events, NEs occuring in geophysical domain. The entirety of the Earth constitutes a unique system in point of all the NEs because of this entireness; therefore, any NE in any region of the Earth has a reason to produce an effect on the geophysically NEs in other regions of the Earth even if they are not correlated to each other in a specific science discipline yet. The reason of this relatively interrelation structure, RIS comes from the fact that any region of any NE and/or disaster is not a part of an entirely closed system. The entire Earth is a single entity providing a topological domain structure, TDS, to the things occuring in geophysical topics [1]. The boundary surfaces, BSs of the specific domains carry out these reciprocal influences among distinct domains through the conditional equations, CEs provided with the initial values, IVs and boundary values, BVs. The boundary conditions, BCs distribute these influences with the aid of equivalence principles among each others as mutual coupling effects [2, 3]. There are various contributions to explain the interaction processes, IPs of earthquake, say EQ

acttivities EQAs, with electromagnetic EM events ENs [3-8]. The source functions, SFs produce the IPs through the action functionals, AFs.

## 2 The Electromagnetic Equivalences

The natural, unnatural, and/or unconvenient alterations and/or constructions in both inwards and outwards of this *TDS* are effective to alter both the *IVs* and *BVs* beside changing the *BCs* and/or the geometry of *BSs*; therefore, the *NEs* and *hazards*, *HAs* involving disasters build themelves up with coupling the effects of each other mutually as re-forming processes. This observable fact bring the hypothesis below on the *significant NEs*, *sNEs* independent from the topic [1]:

*Hypothesis 1 (The event independent self-control mechanism entirety, EISCME)*: The all geophysically *NEs* in any *TDS* make mutual progress and come to truth as a result of an *EISCM* in the entirety of the Earth.

We call the *event independent self-control mechanism entirety*, *EISCME* both the principle building this observable fact and the hypothesis [2, 7-8]. This *selfcontrol mechanism*, *SCM* works for the entire entity of the universe with the entirety of all things what the universe involves in the same way [9]. The changes, at (*BSs*, *BVs*, *IVs*) and (*BCs*, *SFs*), done through the natural and/or unnatural and convenient and/or unconvenient ways by human communities cursorily, eliminate the way to build stable, consistent, and continual detection of the *earthquake processes*, say *EQPs* [1, 2]. The *EISCME* hypothesis [9] brings the result below:

**Result 1:** All the natural events and hazards involving disasters are the results of *building processes with a self-control mechanism, BPwaSCM* of the *completely compact electromagnetically equivalent earth network, CCEEEN.* 

*The (BS, BV, IV)* forms the general basis triplet, GBT for any event topology, AET in their own TDSs. The (BC, SF) forms the general basis doublet, GBD for the AF.

#### **3** Atmospheric Phases in Seismic Activities

The *EM* parameters of the ingredients of the Earth change with the *climatic events*, *CEs* like falling of rain, snow, and etc. say *fall activity FA*; i.e., the admittivities of lands,



*fault zones FZs*, rock masses, etc. increase with excessively falling of rain. If the end points' surfaces of *FZs* and/or tectonic *plates PLs* are very close or touch to each others then the electrical charge transfer between different sides of the *FZs* or the tectonic *PLs* increases as accelerated. This situation prevents the occurences of Van der Waals like potentials, so *Casimir-Polder like forces*, CPLFs are decreased. There are two types of the result of this *ENs* [10].

**Result 2:** i) Let  $Z_1$  and  $Z_2$  be two arbitrarily different seismic zones, SZs. The transfer of electrons in the domain  $Z_1$  gets easy when the admittivity of domain  $Z_1$  increases with the excessive *FAs* then the electrical charges may escape from the domain  $Z_1$  and accumulate in the domain  $Z_2$ , so *CPLFs* may effect in domain  $Z_2$  that goes to generate seismicity creating *sEQs*, possibly.

ii) If the absence of FAs in  $Z_2$  occurs for a suitably long time; i.e., the absence of FAs in  $Z_2$  for a very long period then the similar *seismic activity*, SA, may occur.

The result 2 explains a fact that there are some inversely correlated effect among domain Z1, domain Z2, and excessive FAs. We call push/pull effect, p/p, which is related to the variations of EM parameters of SZs, the inversely relation among different types of such anomalies [2, 11]. One type of anomaly pulls the anomaly in other type according to the mechanism of p\p effect but iff the other type anomaly occurs then the earlier type of anomaly is prevented or altered; i.e., the previous anomaly pulls the second but the second pushes the previous anomaly. The motivating point of effective detection, ED of EQs is to fix the occurrence of the above said interactions and to follow its traces instead of processing the plots of shakes during SAs. The relationship between ENs A and B is based on inversely transferring of BVs, SFs, and coefficients of the ENs between each other through topological transformations, TTs [9]. These TTs establish the bidirectional information communication, bIC between both climatic and seismic processes, CaSPs, through the CCEEEN from the ionosphere to the inner core. These communication schemes are figured from the specific records of both seismic and atmospheric events AEs, say SaAEs, observed during 1999-2010 and 2018-2020. The couplings among ionospheric, atmospheric AT, oceanographic, climatic, and/or seismic processes SPs provide the communication among the ENs of different cathegories in here. We define this principle as the spati-o-temporal transplantation effect in EQPs, say principle 1. The modeling of SPs as *EM* device approaches is given in [3, 6-8].

## 3.1 The Connection of Seismicity and Fall

The possibile correlation between *AEs* and *EQs* is given in Figure 1. The excessive *FAs* in *SIDT* [1] synchronous the least *FAs* in *Specific Aegean Domain Topology*, *SADT*, pushes the *sSAs* to *SADT* from *SIDT*. If the *FAs* process is reversed, then *SIDT* pulls the *SA* to *SIDT* from SADT but the push effect of SIDT is dominant on all other  $p \mid p$  effects of CaSPs and SaAEs through a pull effect of SIDT on the FA before the sSA. The possible triggers of sSAs given in § 4.2 below are the reason of abovesaid results through conditionally specific stochastic processes, CSSPs. The classical theory, CT for SAs is a valid approximation for SAs lesser than sSAs, only. The threshold is 5.9 Richter in magnitude. The significance of energy in EQA begins for SAs over 4.5 R, approximately [2]. The range [4.5, 5.9] is transition span between CT and CSSP. Every sSP may not generate sEQAs because of stochastic inverse coupling mechanisms, SICMs.

#### 4 The QED Effect and Seismic Processes

The primary wave, PW may be modeled with deterministic ingredients and processes but secondary wave, SW has to be modeled with stochastic ingredients and processes. The PW comes from the mechanics of PLs as a result of forces between PLs generated by the dynamics of colliding PLs. The SW comes from forces similar both the Casimir-Polder forces and Van der Waals effects generated by the nano structure occuring amoung touch-to-touch phases of PLs just at the end of PW phases. The planetary movements, PMs effect both mechanics and dynamics of PLs, similar to the tide, that is visible easily with eve. The PLs may move due to the forces generated by these displacements. The PLs may collide to each other with the effects of these forces. If the *PLs* touch to each other under the effect of these forces then Van der Waals potentials like effects occur and CPLFs work on the PLs generating high amount of energy able to come hazardous EQs to truth.

The roundtrips of electrons in the atomic orbits at FZs generate the periodical and vibrational effects during the EQAs; therefore the periodicity and vibration of sEQAs depend on the periodical processes in the **atomic structures at FZs** instead of relating them with the solar orbit of the Earth; yearly periodic, historic, etc. [12]. The shortness of the time span of EQ is related to both the shortness of the periods of these atomic effects and the



Figure 1. The parameters per year at Anatolia and East Thrace: (a) Total number of AT anomalies. (b) Total rainfall (mm). (c) Distribution of magnitudes (M<sub>s</sub>) of *sEQs*. (d) Total rainfall (mm) in Marmara region (*Specific Marmara Domain Topology*, *SMDT*). (e) Total rainfall (mm) in Aegean region (*SADT*).

very short-time existence of the nano-scale distances between the tectonic *PLs* and/or *FZs*.

#### 4.1 The Oceanographic Interactions

The storm, tornado, and etc. coming along the *AEs* constitute *Ws* on the surfaces of oceans, seas, lakes, and/or etc. These *Ws* propagate in both *vertical and horizontal planes, VaHPs* and generate force on the bases of oceans, seas, lakes, and/or etc. These forces effect as groving according to an extention of Pascal's law for semi-compressible and open systems [10]. The tectonic *PL* under the base of ocean moves in *VaHPs* in cosequence of these effects, stochastically. These forces passes to the other *PLs* and magma according to Newton's acion and reaction principle. The *PLs* move in three orthogonal planes and generate *PWs*. The vertical components of these forces are greater than the horizontal components, mostly:

$$F_{\nu}^{P} \gg F_{h}^{P}.$$
 (1)

The *PLs* move slow than the propagation of ocean waves because total of acting and reacting forces is zero in nondissipative regions; therefore, motions of *PLs* appear in sufficiently long time after the excessive *AEs* and/or *CEs*. If the distances of *BSs* of two *PLs* fit to nano-scale when two *PLs* touch to each other during the *SP* then Van der Waals like effects cause *CPLFs* at the contact time. The Nano-scale like forces are more greater than the mechanical forces acting in vertical plane, generally:

$$F_{\nu}^{S} \ll F_{h}^{S}.$$
 (2)

The *PLs* push or pull each other with almost zero acceleration, merely. The above said nano-scale processes cause the *SWs*. The reason of the horizontal collision being more destructive than the vertical collision is the inequality (2). The effects of *PMs* become according to the *transfer process of gravity effects*, *TPoGEs* with a similar way [10].

## 4.2 Possible Triggers of sSAs

Let us think about the processes could be act to seismicity. We may begin with the *question*, Q below:

*Question 1:* Are there any vigorous motions type like *Brownian motions*, *BMs* at *SZs*? May those motions create vibrations in the *FZs*?

If the answer for question 1 is positive, i.e., yes there are and those may do, then may those vibrations trigger the *SAs*? Later we continue with the other question below:

*Question 2:* Are those motions in *Q-1*, say *Brownian-like motions*, *BLMs* among the actual triggers of *sSAs*?

The answer is positive because the physical EN behind the sSAs is related to  $2^{nd}$  order stochastic initial BV problem,

*2oSIBVP* connected to spontaneous optimization processes through the *GBT* for *AET* in *TDS* [9]. The possible triggers of *sSAs* are categorized below [1, 10-13]:

- 1. CPLFs and Van der Waals-like potentials.
- 2. Brownian-like motions.
- 3. Specific *PMs* of NEOs, Moon, Sun, and other close planets.

The 1<sup>st</sup> and 2<sup>nd</sup> categories are primary. The 3<sup>rd</sup> category makes secondary effects on 1<sup>st</sup> and 2<sup>nd</sup> categories. Every *sSPs* may not generate *sEQA* because of *stochastic couplings*, *SCs* in the manner both increasing and/or decreasing influences among three categories above.

#### 5 The Earthquake-Safe Engineering

The *EM* parameters of the materials used in the construction of buildings must provide *EM* compatibility conditions occuring among the electromagnetically equivalent *EM* parameters of *EM* equivalences for the *EQPs*. The *EQ* is a result of the specific interactions among various gravity, *EM*, thermodynamical, dynamical, mechanical, and/or static phases and more. The hazards as sSA, tsunami, and/or other; i.e., fire radiate various types of energy like gravity, *EM*, thermodynamical, and/or dynamical energy waves so that they may be transformed to the *EM* energy as illustrated in Figure 2.



Figure 2. The transforming *SAs* to useful energy.

The suitable systems designed according to Figure 2 may give ways to reduce the effects of various disasters.

#### 6 The Seismo-Communication Compatibility

The geologists and the most people beside them believe that the increase of the phone calling interrupts the *communication systems, CSs* during *sEQAs*. The reason of the *interruptions INs* seen during *SAs* come from the interaction mechanisms of *SPs* with *CSs*. The *INs* begin before *sEQPs* in a wide time span, previously. The rules of equations used in various systems change in the *sSZs*; therefore, all the systems work differently than the behaviors expected from them according to their design perspectives in the activity domain during *sEQPs*: the telecommunication systems and the early warning system of Istanbul did not work at Turkey-Tekirdag offshore *EQs*  in 201909 according to the news in public domain. This situation is a result of the equations change with the new rules as explained in various contributions [2, 5, 14-15].

# 6.1 The Detection Processes for Future EQs

The *ED* of *future EQ, FEQ* is possible with using the *EM* waves iff specific analytical conditions are satisfied [16]. Some degenerations involving cut off at some specific frequencies, modulation types, and channel bands occur in *satellite communications, SaCs* and *broadcastings, Bs* during *sEQAs*. The most *satellite broadcastings, SaBs* were at breakdown in *SIDT* from 201906 to 201909 and then the 5.7 M<sub>w</sub> EQ occurred at Turkey-Tekirdag offshore in 20190926 that was about 7 days after the *SaC, SaBs*, and *Bs* came back. Similar *breakdowns, CBs* occurred beginning from 20191215 to 20200215. The *CB* was not detected in (20201215, 20210205). The discussion of the situation being whether a signature of similar *SA* after about  $2\frac{1}{2}$  months then the breakdown or not may give useful results on *EDs of FEQ* research.

# 7 Conclusions

The temporal variations of geo-data are correlated to selfoptimizing specific characteristics of electromagnetically equivalent complex network. The electromagnetically equivalences for modeling of EQPs with the approach bring the compact systems and devices to the Earth's natural events area for designing the electromagnetically equivalent networks to detect future EQPs, effectively.

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