Electromagnetically Equivalent Dynamic Model of Seismic and Atmospheric and Ionospheric Conjoined Network of Turkey: the State Space Approach

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Abstract

This research concerns itself with modeling the seismicity-related geo-data as the self-optimization process of an electromagnetically equivalent device and developing a less accurate but fast model. The electromagnetically equivalent device model is extended as considering the whole Earth like a complete system. The crustal structures are considered as a complex network of distributed circuits involving slot antenna arrays, open waveguides, cavities, transmission strip lines, attenuators, frequency converters, dividers, couplings in the electromagnetically equivalent device model of the complete system of Earth (EEDMCSE). The variations at the geo-data taken at any port of the EEDMCSE give some functional relationships on the electromagnetic characteristics of the distributed complex network explained above. The approach is applied to Marmara and Aegean Regions of Anatolia.

1. Introduction

The mappings said here are based on the transformations among both the temporal and the spatial variations of both geo-data and the electromagnetic characteristics of the distributed complex network [1]-[5]. The temporal variations at the mappings of EEDMCSE at specific locations extract the mechanisms explaining the relationships among the characteristics of the distributed complex network and seismic phenomena of Earth in the future. The mapping said in previous paragraph is based on the transformations among both the temporal and the spatial variations of both geo-data and the electromagnetic characteristics of the distributed complex network; i.e., phase velocity, attenuation factor, phase constant, input impedance, output impedance, relaxation factor, etc.The temporal variations at the mapping of EEDMCSE at specific locations extract the mechanisms explaining the relationship among the characteristics of the distributed complex network and seismic phenomena at future.

A mapping is established between the parameter space of the geo-data and the characteristics of the electromagnetically equivalent device model. The temporal variations of the geo-data are correlated to the self-optimizing the specific characteristics of the electromagnetically equivalent device.

2. Simulation Processes

The relationships said here give a possibility of predicting the geo-data. Using the inverses of the mappings generates the evaluations giving the predictability conditions involving restrictions. The inversion of the mapping exploits a fine model at predicting the natural iterations of the geo-data at future on both the region connected the port and some locations non-related to the port either geologically or seismically or phenomenologically relating to the earth.

The FDTD codes with classical field equations are given. The FDTD codes involving penatrable material moving regularly in an inclusion with permittivity are derived. The spatial location of inclusion varies with respect to time. This situation brings the derivative of permittivity with respect to t. The result depends on the location at the time t as below:.

$$E_x^{s,n}(I+0.5,J,K)=\frac{\varepsilon^n(I+0.5,J,K)}{\varepsilon^n(I+0.5,J,K)+[\sigma^n(I+0.5,J,K)+\dfrac{\varepsilon^n(I+0.5,J,K)-\varepsilon^{n-1}(I+0.5,J,K)}{\Delta t}]\Delta t}\times$$

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$$\times E_x^{s,n-1}(I+0.5,J,K)+$$

$$-\frac{\left[\sigma^n(I+0.5,J,K)+\dfrac{\varepsilon^n(I+0.5,J,K)-\varepsilon^{n-1}(I+0.5,J,K)-\varepsilon_d^n(I+0.5,J,K)+\varepsilon_d^{n-1}(I+0.5,J,K)}{\Delta t}\right]}{\varepsilon^n(I+0.5,J,K)+\left[\sigma^n(I+0.5,J,K)+\dfrac{\varepsilon^n(I+0.5,J,K)-\varepsilon^{n-1}(I+0.5,J,K)+0.5,J,K)}{\Delta t}\right]\Delta t}\times \tag{2.1}$$

The approach is given in Figure 2.1.

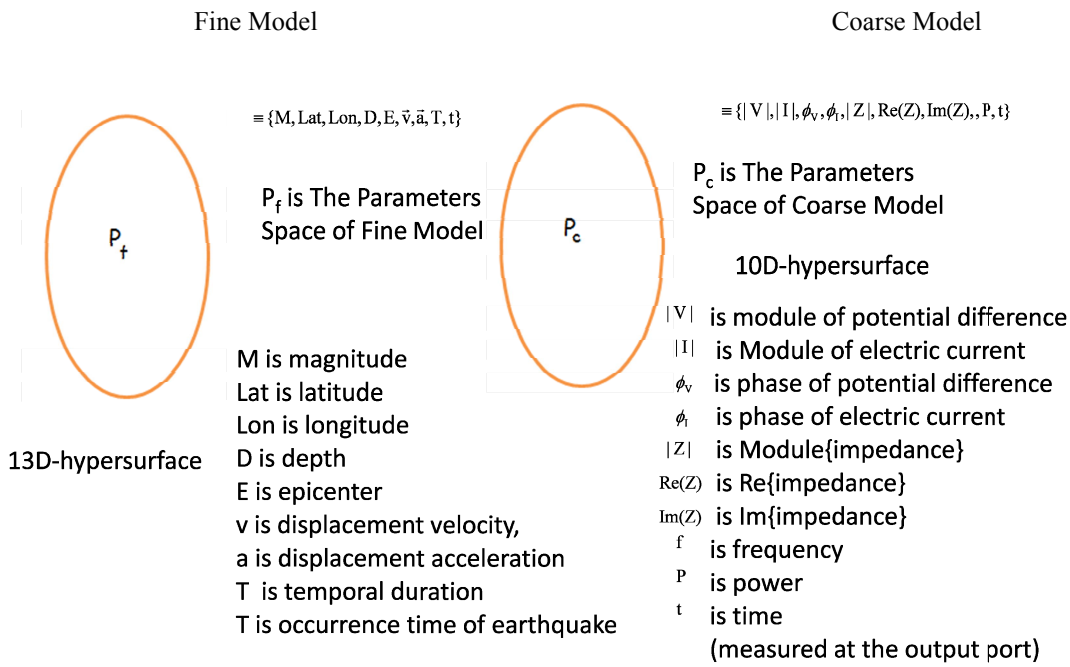

Figure 2.1. The approach.

The crustal structure of the region is modeled as fractal tree antenna models for fault zones (Figure 2.2)..

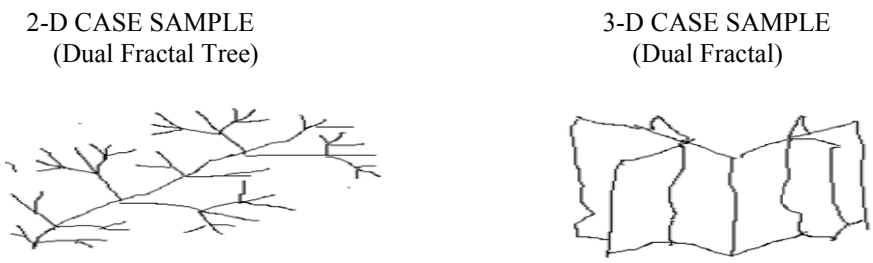

Figure 2.2. Fractal tree antenna models for fault zones.

The simulating chart for mapping is given in Figure 2.3.

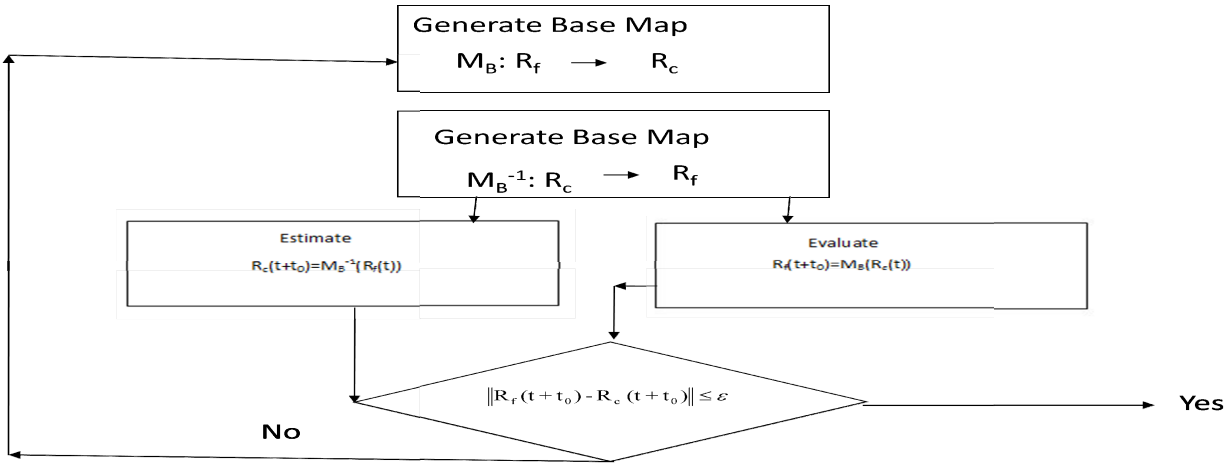

Figure 2.3. Simulating chart for mapping.

The region is mapped to the equivalent measuring surface in Figure 2.4, where the S_M is Measuring Surface and the S^2 is Ewald Sphere.

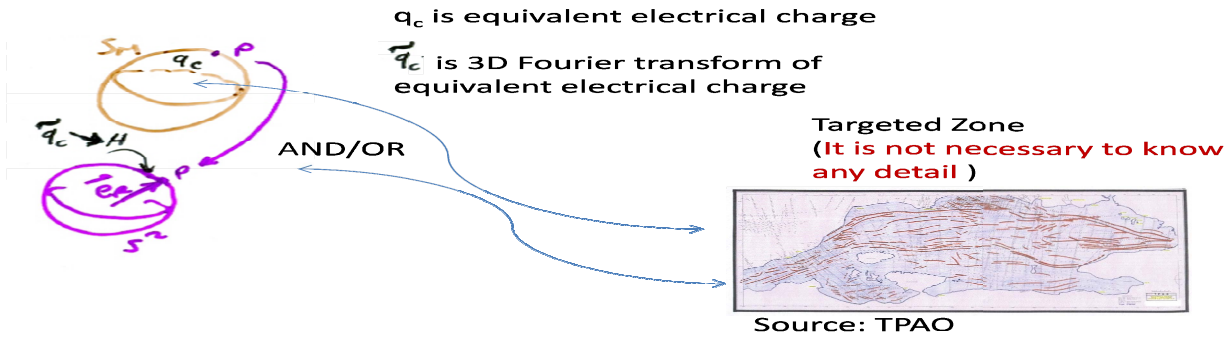

Figure 2.4. Equivalent measuring surface.

The variations of Earth velocity on (equivalent) measuring surface are given in Figure 2.5. The first and second rows illustrate the far zone and the near zone, respectively.

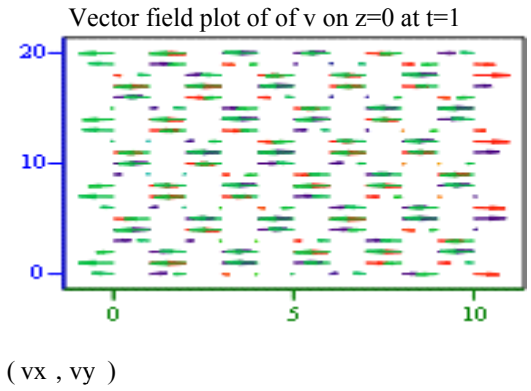

Figure 2.5. Variations of Earth Velocity on (Equivalent) Measuring Surface.

3. The Coupling between Underground and Ionospheric Activities

The electromagnetic fields, which are generated by the electromagnets used in accelerating and redirecting the particles during the LHC experiment of CERN, can redirect both of the earthquake processes and climatic events what the Earth has. Besides, this EM field can trigger the uncaused major and big earthquakes, natural hazards generated due to atmospheric phenomena all around the Globe, potentially. So that, these uncausality effects may not be involved and processed in current possible expectation calculations, observations, probabilitistical approaches related to earthquakes and climatic hazards as great floods, thunderstorms, outbreaks, catastrophes, and etc. These results may occur after the experiment was ended, too. A better understanding of the physical mechanisms through theoretical and/or observational studies including modeling of possible correlations related to the interactions of the electromagnetic field and/or wave sources with the seismic and/or climatic phenomena is given. Whole of the Earth should be considered as one, but complex system up to the outer space from the center of the globe to understand the compact reasons behind the natural phenomena in macroscopic scale [1]-[3].

4. Conclusion

The modeling of the seismicity-related geo-data as the self-optimization process of an electromagnetically equivalent device model of the complete system of earth (EEDMCSE) and developing a less accurate but fast model. A mapping is established between the parameter space of the geo-data and the characteristics of the EEDMCSE. The temporal variations of the geo-data are correlated to the self-optimizing the specific characteristics of the EEDMCSE. Application related to the Marmara Sea and Aegean Sea EQ regions are discussed. The relationship said here gives a possibility of predicting the geo-data. Using the inverses of the mapping generates the evaluations giving the predictability conditions involving restrictions. The inversion of the mapping exploits a fine model at predicting the natural iterations of the geo-data at future on both the region under the observation and some locations non-related to the observation region either geologically or seismically or phenomenologically relating to the earth [6].

5. References

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