



Full wave analysis of earthquake sequences with waveguide and cavity effects: application in Aegean Sea – Izmir earthquakes of 2005 related to the coupling of great earthquakes of 2004

T. Sengor

Department of Electronics and Communication Engineering, Technical University of Yildiz, Istanbul, Turkey, sengor@yildiz.edu.tr / Fax:+90 212-2594967 Phone: +90 212-2597070

1 Abstract

The full wave approach of electromagnetically equivalent modelling of earthquake mechanism [1]-[2] is presented for earthquake sequences and storms in this paper. The approach [3] is applied to earthquake zones as modelled with interconnected circuits of waveguides and cavities.

The above said equivalent modelling addresses the extraction of a model appropriate for the electromagnetic phenomenon from the extension of electromagnetism to irregular and non-uniform cases and presents a compact contribution to the analytical syntheses of phenomena related with earthquake. These analytical syntheses give electromagnetically generated interaction processes, which prepare the earthquake.

Propagation and resonance rules of both the electromagnetic and mechanical waves related to the earthquakes around the crusts and faults close to each other are derived. The transportation mechanism of electrical charges and currents with irregular and non-smooth distributions are studied. The analytical conditions that the irregular and non-smooth deviations of these charges should trigger an earthquake are obtained.

The areas among close faults create resonators covered with non-smooth surfaces and edges in electromagnetic sense. The earthquake explorer [2]-[4] reaches to a fault zone and feeds the resonator remaining among the faults close the previous fault. It

propagates from the initial fault surface onto the surface of other faults as amplified and/or attenuated and returns to the initial fault within the cavity. That propagating wave creates some electromagnetic forces with resonance character on some parts of these faults. The unbalance between these irregular forces pushes or pulls the faults zone. The repetitions of these push-pull processes generate a resonance around the natural frequency related with the wave phenomenon explained here.

The fault zone is modelled as cavities involving the fractal boundaries like three-dimensional fractal tree [5]. We call the model random fractal 3D-plate-tree cavity. The time domain solutions of electromagnetic wave resonance effects are discussed.

The analytical syntheses of the sequential earthquakes occurred at Aegean Sea – Izmir area in 2005 is given by the above-mentioned approach. The analytical details of coupling effects among the neighbour faults are evaluated. The triggering mechanism of irregular and non-smooth charge deviations in these earthquakes are reached as a result of experimental data obtained from the great earthquakes occurred in 2004 by use of the earthquake genetics [4].

2 References

[1] T. Sengor, "The mechanism of interactions of irregularly oscillating bodies by electromagnetic waves," paper in *Electromagnetic Phenomena Related to Earthquake Prediction*, Hayakawa and Fujinawa (Eds.), pp. 647-666, TERRAPUB: Tokyo, 1994.

[2] T. Sengor, "On the exact interaction mechanism of electromagnetically generated phenomena with significant earthquakes and the observations related the exact predictions before the significant earthquakes at July 1999-May 2000 period," *Helsinki Univ. Tech. Electrom. Lab. Rept.* 368, May 2001.

[3] T. Sengor, "The Observational Findings Before The Great Earthquakes Of December 2004 And The Mechanism Extraction From Associated Electromagnetic Phenomena," *Book of XXVIIIth URSI GA 2005*, pp. 191, EGH.9 (01443) and *Proceedings 2005 CD*, New Delhi, India, Oct. 23-29, 2005.

[4] T. Sengor, "The interaction mechanism among electromagnetic phenomena and geophysical-seismic-ionospheric phenomena with extraction for exact earthquake prediction genetics," *10th SA of the IAGA 2005, Abst. CD.*, GAI, C109, No.: IAGA2005-A-0134, Toulouse, France, July18-29, 2005.

[5] T. Sengor, "The electromagnetic radiation mechanism in faults: aperture antenna array in fractal structure," *Geophysical Research Abstracts*, Vol. 8, 00945, 2006.