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The electromagnetic radiation mechanism in faults: aperture antenna array in fractal structure

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1 Abstract

The electromagnetic radiation processes guiding the seismic activity before the earthquake has been occurred are given in this paper. The radiation processes are related to the structure of fault. The fault structures are modelled as suitable aperture antenna generating the electromagnetic radiation. This antenna is constructed with fractal arrays. The results are suitable to classify several seismic activities.

There exist several sources generating electromagnetic waves on the earth [1] beside the electromagnetic phenomena in the geo-dynamo. The induction mechanisms generate surface currents and charges on the surfaces of the fault due to these electromagnetic sources [2]. The deviations of all the plate structure of the earth due to seismicity impress these surface currents to generate electromagnetic wave variations with ultra extra low – ultra low - extra low – low - audio frequencies (UEUELAF). The frequency spectrum of these seismicity related and seismicity modulated waves is within the frequency range from 0 Hz to 2 kHz around the active earthquake zones. This frequency range goes up to 12 GHz for the phenomena occurred over the active zone by the propagation chains in the ionosphere. The deviation characteristics in this class of some faults are considered and the electromagnetic radiation coming from fault modelled fractal antenna arrays due to these deviations are simulated in some fault zones.

The region of sudden, non-smooth, and non-uniform change of electric charges coincides with possible source of waves (SE), to threshold a suitable mechanism triggering

the earthquake at the earthquake region [3]. The Lorentz's forces, which are applied on irregularly vibrating currents due to the geo-electromagnetic field, appear at least. A new force additional to Lorentz's force has to be observed, too. This additional force has to have a very small magnitude around SE, but it has to have an irregularly oscillating character and non-uniform. So, it propagates with growing in magnitude by some transfer rules of forces in the bodies and it prepares another new earthquake, which is great in magnitude then the previous one according to the population of minor disguise signals [2]. If the charges move non-uniformly and suddenly then the electromagnetic forces grow. Let us consider the region, where the charges are distributed non-uniformly, change suddenly, and move irregularly. Let some regions, where the charges are distributed uniformly and moves regularly and/or neutral remain among such regions. These growing electromagnetic forces make great pressure on the previous regions, where non-uniform charges exist.

The fault structure is in a shape like fractal tree antenna. The fractal tree antenna is extended involving three-dimensional structures. The planar case is considered in this study. We call the model twin-band dual random fractal 3D-plate-tree antenna. The electromagnetic induction mechanisms generate electric currents flowing on the surface parts of above-mentioned antenna. The surface currents influence each other generating the forces cited in above and result the irregular vibrations in the active zone.

The relationship between these threshold-triggering mechanisms and radiation simulations explained in above are derived in time domain.

2 References

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