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Spitak Earthquake and the Concept of Earthquake Nucleation and Evolution Process

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The problem of earthquake prediction has multidisciplinary character and includes the stages of:

1) Determination of precursors

2) Calculation of earthquake parameters:

Elastic Rebound Theory (ERT) declared the whole process as a response to an ongoing rise of tension between tectonic blocks. It assumed that tectonic forces should reach maximum levels just before the strike. However, an increase of forces between tectonic blocks prior to strong earthquakes was never measured. As a result, the speed of the "tension accumulation process" was not determined. The revealed "precursors" show a different morphology and time appearance prior to each new event. This makes them impossible to use for prediction.

ERT theory assumed that the number of precursors should increase just before the strike. Earthquakes are assumed to be an anomaly impulse event. Precursors are also expected to be in the form of an anomaly or to have a tendency to be more evident close to the main event. However, a search for those anomalies did not succeed. Stein's laboratory experiments declared earthquakes as Self Organized Critical (SOC) processes and are considered unpredictable by many scientists.

The newly discovered geochemical precursors during the study of the Spitak event are called geochemical quiescence and show that the final stage of earthquake preparation takes a relatively short time period of several years and has several stages. Changes in the statistical characteristics of measured data during the monitoring period proved to be a more reliable precursor. The constant character of newly discovered precursors makes them possible to use in the early determination of the TLM of an upcoming strong event.

The study of hydro-geochemical precursors of the Spitak earthquake and other strong events in the region leads to the determination of the character of the earthquake preparation process in general. We were able to see that this process has different stages and is well reflected in the statistical characteristics of measured parameters. The determination of different preparation stages will help in precursor search in other studies.

Biography

Dr. Armen Kazarian is a senior geologist at MDVIA. He is Founder of Geosurper which is an international research company. Geosurper is specialized in the field of geochemical monitoring and geochemical data statistical analysis. Geosurper has intensive background in geological consultations.