A New Vectoral Monopolar Electrode System For Measurement of Earthquake Precursory Electric Field Patterns

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Anisotropic minerals are highly common in nature and they have the property of piezoelectricity. It is known that electric potential variation over a standard cubic rock sample is directly proportional to the stress change $(d\sigma/dt)$ under time varying mechanical load. Both the piezoelectricity and changes in the dielectrical structure under mechanical load can remotely be measured by means of electrical methods. Although differential electrode systems can be used in measurement on laboratory test samples it is practically not possible to apply them effectively in vertical direction over the Earth's upper crust. Another problem of differential self-potential based field measurement methods is hardness of filtering the disturbing effects due to changes in soil properties. A high sensitive, monopolar electric field (MEF) probe has been developed that enables us to measure the electric field changes with respect to its internal capacity instead of a second probing point requirement. This patented new device basically converts the charge induced by external electric field displacement on a monopolar electrode into bipolar voltage. MEF measurement is intended to be used in tracking the regional stress differences over a fault where the probing points are in 10s of kilometers or higher distance. Electric field measures are acquired at a center. Both the localstructural anomalies and regional stress differentiations are calculated using computational methods.

Superposition of the attenuated electric field changes from further regions should also be considered. This fact requires vectoral measurement using a group of stations and adaptive filtering for the removal of the atmospheric noises. A vectoral MEF probe system, that is also isolated from the ground, has been successful in finding of direction of the electric field displacement vector at the laboratory experiments. Earthquake precursory, probable instability processes are aimed to be observed by using vectoral MEF probes.