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An estimation of electromagnetic field variations due to the thermoelectric effect accompanying a point heat source gene

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Thermoelectric effect which couples both the temperature gradient and the electric field to both the heat flow and the electric current density can cause, in principle, coseismic electromagnetic field variations due to fault motions with frictions. The present study attempts to estimate the field variations.

Assuming a point heat source with spherical symmetry which is regarded to be generated by a point dislocation with friction in a homogeneous whole space, the equation of the temperature is separated. The magnetic field variation is not excited.

Expanding the self-consistent system of the equations with spherical symmetry, the temperature satisfies a non-linear diffusion equation, for the coupling between the heat flow and the electric field depends on the temperature.

By a kinematic approach which considers the contribution of the temperature gradient to the electric current density and neglects the contribution of the electric field to the heat flow, the resultant electric field and the temperature variations with respect to time both show increase, maximum and decay. However, order estimations with realistic quantities of physical properties suggest that the arrival time of the maximum amplitude at kilometers away from the heat source amounts to years. The maximum amplitude of the electric field does not exceed the observable level in realistic situations.