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Analysis of Generation of Mechanical Pressure due to High-Power Electrical Current in Porous Two-Phase Geological Medium

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Analysis of possible mechanism of seismicity triggered by high-power electric pulses based on generation of mechanical pressure in the porous two-phase geophysical medium was carried out. It was shown that calculation of mechanical pressure impulse due to high-power electrical current in the porous two-phase medium may be performed neglecting thermal conductance by means of solving the nonstationary equation of piezoconductivity with Joulean heat generation. For calculation of heat generation the known solution of the task of current spreading from spherical or elliptic electrode submerged into unbounded medium. Pressure increase due to electric current us determined by voltage of the current source and the medium parameters, and it does not depend on the electrode radius. The pressure increase is proportional to parameter $\eta\sigma_f/r^2$, where η is viscosity factor, σ_f is electric conductivity of liquid in pores, r is average radius of capillaries. This parameter may vary for different media and fluids in the pores by many orders of magnitude. The pressure increase for water is insignificant. If a strong mineralized fluid is fed previously into the medium, the parameter may increase by several orders. In that case the pressure may obtain tens kilobars, and an intergrowth of cracks will be possible in the medium exposed to high-power electric current.