



Comments about the combination of electrical and mechanical stimulations on rocks to boost frequency related characteristics of current emissions during cracking

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Experiments on a variety of rock geomaterials have been conducted using the experimental procedure known as Pressure Stimulated Current (PSC) technique. In this work an innovative measuring technique was considered to provide a more reliable frequency oriented analysis of pressure stimulated currents compared to the conventional PSC technique.

The emitted electric current due to cracking is measured by a pair of electrodes perpendicularly positioned with respect to the stress axis. Another pair of electrodes is positioned parallel to the former and electric current due to cracking is measured while an electric field is applied simultaneously to the sample through a new current loop created by a separate measuring channel. The analysis of the two separately recorded signals has given a variety of interesting clues.

First of all the coupling between electrodes that measure electric currents of mechanically stressed rocks is quantitatively determined because the measuring channels measure signals differing mutually by up to three orders of magnitude. Therefore the secure distance between the positions of electrodes, as well as details of positioning, were clarified.

The existence of detectable currents due to cracking regardless of electric treatment of the sample was verified. This new measuring technique allows the boosting of electrical phenomena related to cracking and verifies the scale free universality of frequency related characteristics of Pressure Stimulated Currents.

This experimental technique can provide reasonable conductivity values that can be used for the deterministic electric modeling of a mechanical-electrical phenomenon towards the differentiation between deformation stages of the same material.