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Is Pressure Stimulated Current relaxation in amphibolite a case of non-extensivity ?

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The application of uniaxial stress on rocks is accompanied by the production of an electric signal which is described by the term Pressure Stimulated Current (PSC) (Vallianatos et al., 2004). In this work the High Rate Step Stress (HRSS) technique (Alexandridis et al., 2012) is applied, and the PSC relaxation in amphibolite samples from KTB drilling, is studied, presented and commented in the frame of non-extensive statistical mechanics (Tsallis 2009). After the application of an abrupt stress step, a PSC spike is recorded at a PSCmax value, and the PSC decreases gradually right after the stress stabilization.
PSCs relaxation in uniaxial compressed rocks follows a generalized exponential function which explicitly introduces hierarchically constrained dynamics and macroscopic interactions. The interactions are associated with the non-extensive entropy parameter q and exhibit a behavior indicating a dependence with normalized uniaxial stress $\Sigma=\sigma/\sigma y$, where σy is the yield stress where deviation from the elastic region starts in a stress-strain curve. The stress-dependent q-estimation leads to the conclusion that fracturing is a subextensive process with strong interaction.

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