Geophysical Research Abstracts
Vol. 14, EGU2012-8193, 2012
EGU General Assembly 2012

On the relevance of the acquisition configuration for seismoelectric recording

P. Sénéchal and C. Bordes

Laboratoire des Fluides Complexes et de leurs Réservoirs, Université de Pau et des Pays de l'Adour, France
(pascale.senechal@univ-pau.fr,clarisse.bordes@univ-pau.fr)

The seismo-electric method consists in measuring electric field induced by seismic wave propagation in porous media. The characterization of transfer functions obtained by the ratio of electric field and seismic grain acceleration for the longitudinal fast P wave presents the potential to characterize physico-chemical properties of the medium. Laboratory and field acquisitions are performed by measuring seismic signals and its associated electric field respectively recorded by an accelerometer (or a geophone) and by an electrical dipole composed of two electrodes. When the acquisition configuration must be chosen, several questions arise, in particular, about the optimum dipole length and the location of the corresponding accelerometer. It is necessary to verify whether these parameters induce variations on (1) amplitude, (2) spectral content and (3) propagation time related to seismoelectric first arrival or not. For this purpose, we perform laboratory experiments in order to characterize seismoelectric signals for various dipole lengths and locations. The data are recorded with a reference electrode allowing for a recombination of all dipole configurations. Experimental data are obtained in the laboratory with a specifically designed experimental device including an acoustic source (0-20 kHz), 10 accelerometers (0.0001-17 kHz), 10 stainless steel electrodes (and their home-made pre-amplifiers), placed in a container (57 cm x 30 cm x 15 cm) full of sand (99% silica). This sand is uncompacted, homogeneous and partially saturated (around 60 %). The amplitude and the propagation time of seismoelectric signal are obtained by picking respectively the maximum of first lobe and the first arrival time. In order to analyse only the frequency content of longitudinal P wave without the effects due to the other waves, we chose to perform spectral analysis of the first lobe by using a Continuous Wavelet Transform (CWT). The results clearly show that the dipole length and the location of the corresponding accelerometer induce variations of the electric field characteristics and so, influence the measured transfer function.