Potentiels électriques spontanés liés à certains cas d'écoulements naturels ou provoqués

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Electrokinetics potentials are natural potentials caused by the movement of fluid, generally water, in a porous media. Therefore, their practical use is linked to water circulation anomalies or variations of the piezometric level, like in convection areas of volcanoes or geothermic fields, leakage in earth works, earth dams and the like, water outlets, landslides and pumping wells.

In Switzerland, where the requirement in water is increasingly important and the demographic pressure more insistent in areas of instability, a better understanding of these three last applications is fundamental. This study presents mainly measurements in the field to illustrate the kind of results one can effectively expect and the interpretations one can draw from them.

The study of water outlets has shown that not only are the electrokinetic potentials sensitive to small, quite localized, flows, but that they were also able to underscore geological structures associated with the karstic system of a spring. The study of seven landslides in different areas of Switzerland has shown that it was practically impossible to formulate any generalities on their analysis by electrokinetic potentials. However, it is possible to state that they do not detect the lateral limits of the landslides but rather delineate the areas of resurgence and infiltration, thus allowing a better understanding of the mechanisms of the landslide, extension or compression, and the importance of the water parameter in it, especially in view of any decision to remediate.

Finally, although the measurements of potentials during well pumping in a tank did not give any useful results, the electrokinetic potentials measurements in the field, before, during and after pumping in a well, have shown that the potentials are linearly dependent on the hydraulic pressure during the whole experiment, thus allowing to obtain the coupling coefficient of the rocks. This opens a number of perspectives, one of which is the indirect determination of the particular degree of permeability of the rocks surrounding the well.