Abstract

The purpose of this thesis is to understand the temporal variations of subsurface water flows at the local scale in periglacial environment as well as the influence of buried ice blocks on these variations. The study site is located at the foot of the Otemma glacier, which lies in the southwest of the Swiss Alps. Through a geophysical approach, using electrical resistivity tomography (ERT) methods over a given period of time, it is possible to observe spatial and temporal variations of the saturated underground zone, in particular in terms of flow course. By combining these methods with a tracer, it becomes possible to determine whether preferential patterns emerge and change over time in terms of direction of underground flows. A comparison with invasive in situ measurement methods using wells, also conducted at the same study site, can determine the accuracy of the results. Where appropriate, ERT provides a significant advantage since this method interferes very little in the flow processes, unlike the invasive methods and allows to obtain less localized information than the invasive methods. The tracer used here (salt water) changes the resistivity of the soil where it is injected and therefore becomes visible as a plume in the continuous ERT study, thus allowing an estimate of the speed and direction of the local underground water flow. The processes involved in the variations observed have important roles in periglacial environment, they are in particular intimately linked to the rate of sedimentation in the alluvial plain. The observed head of flows also helps to highlight the importance of river and underground geometry in the system.

Keywords : ERT / Timelapse survey / Salty tracer / Forward modelling / Piezometric measurements