Dorian HERNANDEZ (2024-2025)

Research project : Assessment of clogging at the Crépieux-Charmy site and its interaction with the aquifer: experimental and numerical approach.

Supervisor : B. Camenen (RiverLy, Eq. River hydraulics)

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Direct pumping of drinking water from groundwater is one of the main sources of supply for humans. Generally recharged by a river, groundwater is influenced by the flow and nature of the riverbed. Due to the presence of organic and inorganic matter in the water, the interaction between groundwater and rivers is in constant evolution and can, in some cases, be subject to clogging phenomena. Partly caused by the deposition of sediments on the surface of a riverbed and the infiltration of finer particles into the substrate, river clogging leads to a decrease in the porosity and permeability of the environment over time. These reductions then impact benthic species and fish, by destroying their habitats, but also reduce the exchange with aquifers, which can lead to pumping difficulties and decreased performance of water extraction fields. Thus, the present work focuses on the study of the Crépieux-Charmy water extraction field, particularly on the identification of clogged areas of the Old-Rhône reach through experimental and numerical methods, in order to better understand the hydro-sedimentary behavior of such a site and its interaction with the aquifer.

To achieve this, a field campaign was initiated to spatialize the areas of fine sediment deposition and clogging, through the application of experimental protocols that allow for a qualitative and quantitative assessment of these phenomena. For exemple, Figure 1 presents the average sub-surface hydraulic conductivity values obtained experimentally along the Old-Rhône reach, highlighting a lightly clogged area upstream, followed by a heavily clogged zone between measurement points 5 and 14.

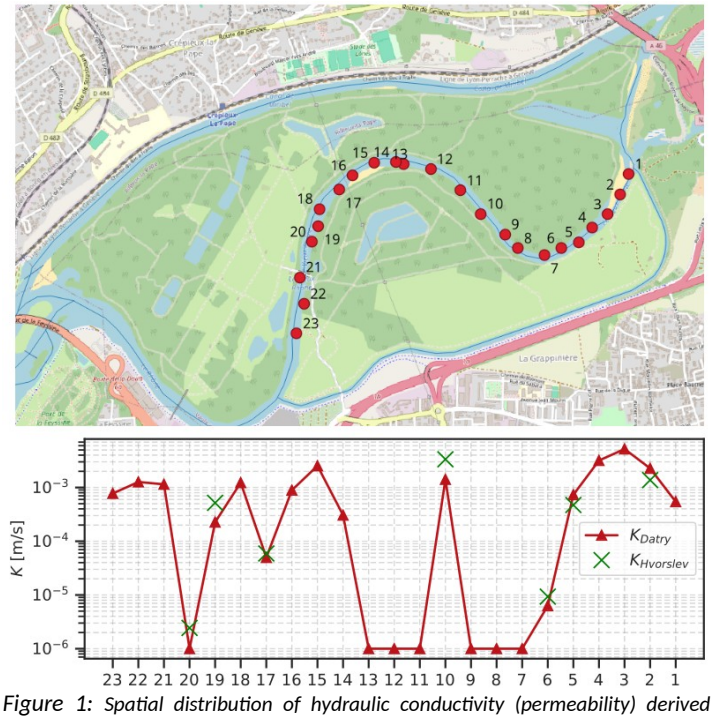

Figure 1: Spatial distribution of hydraulic conductivity (permeability) derived from experimental tests along the Old-Rhône reach in the Crépieux-Charmy water extraction field.

In parallel, a 1D hydro-sedimentary numerical model capable of identifying areas of fine sediment deposition and mobilization was developed. This model will then be used to identify the areas of fine sediment deposition and mobilization under different hydro-sedimentary scenarios typical of the experimental site. Finally, the results will be compared to those of a 3D hydro-geological model of the site to identify the various groundwater-river connections and the impact of clogging on drinking water pumping.