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Scale dependency of hydraulic properties in a fractured carbonatic aquifer - an example from the Eastern Alps (Austria)

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Flow in fractured aquifers is strongly influenced by the aquifer heterogeneity. This includes the lithological and structural (fracture network) variability at various scales. The hydraulic properties of the formation are therefore dependent on the investigation scale. Standard hydraulic testing methods like packer tests give information of the hydraulic properties in the vicinity of wells (local scale). Pumping tests are often used as an important investigation method to determine averaged hydraulic properties of fractured aquifers at larger scale. To investigate scale effects within fractured aquifers piezometers at different distances to the pumping well are needed. For this case study a fractured, carbonatic aquifer is chosen. The aquifer is built up by permomesozoic dolo-/ limestones of the Semmering - Wechsel complex in the Eastern Alps (Austria) belonging to the Lower Austro-Alpine. The carbonatic hard rocks show a distinctive fracture network with only a slight corrosive enlargement of the fractures. The fracture network of the dolo-/limestones can be recorded and characterized at exposures on the surface, where the formation strikes out. The test site is situated within a tunnel gallery having pumping wells and several observation wells with distances between some meters to over 1 km to the pumping wells. Data loggers were installed in observation wells at different distances to the pumping sections measuring the piezometric head and the water temperature. In a first step the hydraulic conductivity is determined from long-term pumping test data (steady state), considering different distances between pumping well and observation wells. Next unsteady state pumping tests will be analysed and evaluated. In addition, hydraulic pulses through the aquifer stimulated by varying the pumping rates will be monitored and interpreted in terms of hydraulic

aquifer properties. The outcome of these analyses will be compared to earlier results of packer tests within the same tectonic and lithological formation. As a result, it will be possible to assess the scale dependency of hydraulic properties in this type of carbonatic formation. At a later stage it is planned that the results will be integrated into a numerical simulation to evaluate the relationship between recharge processes and the variability of the flow.