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Data from the Flowing Fluid Electrical Conductivity Logging of Heletz CO_2 Injection Well and their Analysis

Prabhakar Sharma (1), Chin-Fu Tsang (1), Auli Niemi (1), and Jacob Bensabat (2)

(1) Uppsala University, Department of Earth Sciences, Uppsala, Sweden , (2) Environmental & Water Resources Engineering Ltd., Haifa, Israel

A complete background information such as porosity, permeability, aquifer thickness, hydraulic head, geometry of cap-rocks, salinity are necessary for the successful planning of the field injection or for modeling the flow and transport of injected supercritical CO_2 in the target formation. In the EU FP7 MUSTANG project, two new wells have been drilled and will be used for the study of the effects of CO_2 injection for geological storage. There is a plan to inject in the first phase a small volume and later, a large volume of supercritical CO_2 at Heletz, Israel at a depth of 1625 meters in a controlled manner for studying of their fate and transport in the subsurface zone. The detailed hydraulic conductivity structure at the reservoir layer of the injection level is important to obtain prior to CO_2 injection operation. The Flowing Fluid electric conductivity (FFEC) method is being applied to evaluate these detailed hydraulic structures. In this method, the wellbore fluid electrical conductivity (FEC) is measured over depth for a series of time periods under pumping condition, after replacement of wellbore water with deionized water or water of salinity distinctly different from that of the formation. At depth locations where water enters the borehole, the logs display peaks. These FEC profiles are analyzed by fitting to a one-dimensional advection-dispersion equation. Analysis of the time evolution and skewness of these peaks allows estimation of the flow rate and salinity, and further, if two or more logs are taken at different well flow rates, the initial ambient pressure heads of each individual inflow/feed point can also be estimated. The depth resolution of the inflow locations is typically of order of well diameter. These data can be used to define the detailed transmissivity/permeability structure of the reservoir layer. In the present presentation, data from FFEC logging will be presented from the Heletz site and model analysis results will be presented and compared with those from core samples.