Geophysical Research Abstracts
Vol. 12, EGU2010-6011-1, 2010
EGU General Assembly 2010


# Long-term effect of a seasonal thermal storage on the subsurface: a case study from the Upper Muschelkalk, SW Germany

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The thermal effect on the subsurface of a solar-coupled district heating system with a borehole heat exchanger system as a seasonal thermal storage has been simulated over a time span of 30 years using a FEFLOW model. The thermal storage system consists of 80 borehole heat exchangers arranged in squared raster model within a circle of 30 m in diameter. The borehole heat exchangers have a depth of 55 m and are located predominantly in Middle Triassic carbonates (Upper Muschelkalk). The thermal storage is loaded from April to September and discharged from October to March. The model is based on three 80 m core sections (GWM1-3) drilled at the project site. Each core has been analysed in detail with respect to lithology, facies and stratigraphy. The thermal conductivity, specific heat capacity, and permeability have been measured on 76 representative samples from well GWM3 using pointwise measurement techniques. Additionally, the main joint directions have been recorded in two reference outcrop sections and have been incorporated into the model. The results contribute to a detailed prognosis of possible thermal changes in the surrounding subsurface.