



Depth- and facies-specific dependency of the well productivity in the karstic aquifer of the Upper Jurassic (Malm)

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In previous years various deep geothermal wells were drilled in the karstic aquifer of the Upper Jurassic located in the South German (e.g. Unterhaching) and Upper Austrian Molasse. The karstic aquifer consists mainly of three different facies: (1) massive limestone, (2) bedded limestone and (3) reef facies. The latter is often karstified and shows the highest production rates. Hence, the reef facies is the primary target zone for potential geothermal wells. The main objective of the current study was to examine the spatial distribution of the various facies improving the ability to predict well productivity and fluid temperatures. Both parameters are essential for the evaluation of the exploration risk of deep geothermal wells. A total of 40 wells were studied to assess the spatial distribution of the temperature gradient and the production rates. The temperature gradients in the Molasse basin indicate often major deviation of the standard geothermal gradient of 3.3°C per 100 metres. The average temperature gradient in the wells of the Swabian facies with 4.8°C per 100 metres is slightly higher than the gradient observed in the wells of the Franconian facies, with 4.1°C per 100 metres. However, the carbonates of the Swabian facies are shallower than the Franconian facies; hence the absolute observed temperatures are not sufficient for geothermal use. Though no relation between the production rates and depth of the karstic aquifer could be detected, a relation between production rates and paleogeography exists. For example, no wells in the Swabian facies, which are influenced by the influx of clays of the London-Brabant Massif, show production rates higher than 50 l/s. In contrast, the Franconian facies, which are less influenced by the influx of clays, indicates higher production rates up to 150 l/s. Furthermore, the differences in production rates are also be influenced by the degree of karstification, which was also investigated.