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Complex Geothermal Basin Analysis of the Southern Vienna Basin

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The Vienna Basin, situated at the north-eastern margin of the Austroalpine Orogeny represents an active bull-apart basin with maximum subsidence during Miocene. Depression combined with translatory movement of Alpine rock mass led to the development of sequential basin floors. Although crustal thickening and cooling effects due to fast deposition result in average to slightly sub-average thermal conditions (overall heat flux approx. 65 to 75 mW/m^2), the Vienna Basin is gaining importance for geothermal supply of an increasing energy demand of the million-strong city Vienna. Potential geothermal reservoirs, represented by porous Neogene sediments and Triassic carbonates can be expected in depths up to 7000 meter below surface. Nevertheless geothermal exploitation is still limited to some balneology utilization focused on the southern part of the Vienna Basin (e.g. thermal spas Baden, Bad Voeslau and Wien – Oberlaa).

At the central and northern parts of the Vienna Basin hydraulic conditions are dominantly stagnant, characterized by highly mineralized, connate formation fluids, which are primarily conjugated to hydrocarbon deposits. In contrast active hydraulic circulation can be observed at the southern part of the Vienna Basin leading to a strong spatial alternation of thermal and hydrochemical conditions. Inflow- and exfiltration paths are still only partly known and are expected to be related to conjugated fault systems in combination with highly permeable carbonates, which are hydraulically connected to the main recharge areas at the eastern margin of the Northern Calcareous Alps. The hydrogeothermal conditions at the Southern Vienna Basin offer great

geothermal utilization chances and sustainability risks at the same time. It has to be assumed, that over-exploitation will have a non reversible impact on these sensitive geothermal reservoirs.

Due to an intensive hydrocarbon exploration during the last decades structural, petrophysical and hydraulic conditions are partly well known at the Vienna Basin. The presented study aimed to process existing hydrocarbon well data in combination with additionally gained hydrological survey-data in order to enable a geothermal zoning of the southern Vienna Basin with focus on hydraulic circulation. Afford has been set on combined analyses of hydrological and thermal data based on geostatistical methods and coupled thermal hydraulic modeling. The achieved results indicate great impact of fault systems on circulation paths resulting in strongly alternating positive and negative geothermal anomalies within the Mesozoic basement of the southern Vienna Basin. The presented investigations are part of the project THERMALP funded by the Austrian Academy of Science.