Relationship between petrophysical properties and hydrothermal reservoir characteristics of Calcalpine carbonates (Goeller Nappe at the base of the Vienna Basin)

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A compilation of the spatial distribution of geothermal reservoir characteristics of Calcalpine carbonates under the Neogene Vienna Basin and a correlation between thermal and pore space properties considering the sedimentary and diagenetic conditions took place. The southern Goeller Nappe contains a carbonate body consisting of Dachstein limestone and Wetterstein dolomite in a stratigraphical thickness of 2-3 km, steeply inclined to depths of 2500 to 6000 m below surface. The attribution of an aquifer potential to the dolomitic succession bases on fracture porosity, thermal- and hydrological parameters as well as lithofacial, mineralogical and structural properties. Thermal properties (e.g. thermal conductivity, thermal capacity) are related to facial characteristics reflected by sedimentary and diagenetic structures, intensity of dolomitization, size and habitus of crystals, types of cements and the qualitative and quantitative rations of mineral phases. Concerning the thermal conductivity a relationship to the facial variability of the dolomites exists apart from the influence of porosity. The impact of pressure increase with depth showed no considerable effect. A rock-fabrics analyses (fracture porosity and interparticle porosity) led to an estimation of the permeabilities and the occurrence of special fluid pathways. The parameters indicating geothermal key values provide a base for a reservoir description and deliver input data for a reservoir modelling focused on a hydrothermal utilization.

Evidence for post-glacial surface rupture and classification of fault rocks along the Altenmarkt-Forstau segment of the Salzach-Enns-Mariazell-Puchberg fault (Austria)

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The WSW-ENE trending, sinistral Salzach-Enns-Mariazell-Puchberg (SEMP) fault plays a key role in the Neogene tectonic evolution of Eastern Alps, and here we present evidence for post-glacial activity and surface rupture along the SEMP fault near Altenmarkt, Salzburg Province. There, gravels of the last deglaciation cycle exposed ca. 100 m above the present valley floor are affected by rupture along the SEMP fault, and an oblique normal fault component of > 0.5 m (southern block down) was detected. Unfortunately, dating of the fault activity by the 14C-method failed. Nevertheless, geologic and morphological aspects argue for a postglacial activity of the SEMP and could have resulted from a superposition of accumulated tectonic stresses during last maximum glaciation and differential post-glacial unloading of the thick ice-sheet.
We also investigated the wide variety of fault rocks along the SEMP fault with its juxtaposition of incompetent lithologies of the Wagrain Phyllite to the heavily cataclastically deformed Wetterstein Dolomite of the Mandling wedge. Microprobe analyses of the Wetterstein Dolomite showed that the carbonates reacted during the fault activity with a Fe-rich fluid by segregation and became slightly calcitic but clearly more sideritic. XRD-analyses of the clay fractions from SEMP fault gouge as well as EDX-analyses proved as new formed minerals illite, iron-rich chlorite and secondarily precipitated pyrite. The presence of two different fluids of higher pressure and temperature during the fault activity generated new clay minerals, segregated a sideritic calcite and led to the precipitation of pyrite.
Paleostress analysis offered a sequence of five distinguishable deformation events, which confirm and replenish already known deformation stages along the fault.