# Geothermal systems as natural analogues for geological storage of $CO_2$: implications for trapping mechanisms from hydrogeochemistry of western Anatolian fluids (Turkey)

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Carbon Capture and Storage (CCS) is a widely accepted strategy to reduce the unfavourable effects of $CO_2$ emission on global warming. Natural analogues provide a valuable source for the investigation of the behaviour of $CO_2$ at subsurface after its injection. Geothermal fields, representing deep saline aquifers, are considered as natural analogues for $CO_2$ storage sites.

This study focuses on the geothermal systems of western Anatolia (Turkey) to investigate the possible $CO_2$-fixation mechanisms by using the published hydrogeochemical data relevant to these systems. The investigation is performed with the assistance of various geochemical approaches including speciation-solubility calculations and modelling studies (such as inverse modelling, dedolomitization modelling). The results lead to the recognition of two different groups of geothermal systems with respect to the trapping mechanisms: mineral trapping and mineral + solubility trapping. In the high-enthalpy fields of western Anatolia, mineral trapping seems to be the major mechanism, while the others show the effects of both mineral and solubility trapping; a special mechanism named dedolomitization (dolomite dissolution accompanied by calcite precipitation) is also identified as a potential mechanism for one of the geothermal fields. Being relevant to $CO_2$ storage in deep saline aquifers, the conclusions from this study point to the importance of temperature control on the types of trapping mechanisms, high temperatures promoting mineral precipitation and hence increasing the security of storage.