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Classification of bleaching patterns and controlling factors in reservoir-cap rock system: an example from SE Utah, USA

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Recently, many studies on geological CO_2 storage are being actively carried out to reduce the effect of global warming. For successful geological CO_2 storage, it is important to understand the mechanisms of natural CO_2 leakage. Especially, the characteristics of natural fluid flow are mainly controlled by faults and fractures, and it is one of the most important issues for geological CO_2 storage projects. For this study, we studied various bleaching patterns around Green river, SE Utah, which can provide some evidences for fluid flow and leakage within geological media.The study area is consisted of Jurassic and Cretaceous sedimentary rocks. These sedimentary rocks are characterized by alternative layers of sand (reservoir rock) and mud/shale (cap rock). For the purpose of this study, we described and classified various bleaching patterns in the study area and we tried to find controlling factors related for each pattern.
Based on the preliminary results, we divided the described bleaching patterns into three main categories; Dot Type, Line Type and Area Type. Our field observations indicate that the pattern of natural bleaching is strongly controlled by primary and secondary structures of the geological media. Bleached layers generally show much higher fracture density and higher permeability values than those of unbleached layers. Also, the more bleached layers, the more permeable layers. However, the layers with well-developed deformation bands tend to decrease permeability compared with the layers with well-developed fractures.
The results of our preliminary study indicate that the fluid flow (CO_2 leakage to the surface) characteristics are strongly dependent on lithological porosity and geologic structures such as mainly fracture density and aperture. Our results must be very useful in evaluation for site selection of CO_2 sequestration, in particularly when assess CO_2 leakage in a reservoir and cap rock system.