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Integrated assessment of global carbon capture, utilization, and storage projects

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ABSTRACT

In recent decades, Carbon Capture, Utilization, and Storage (CCUS)/Carbon Capture and Storage (CCS) projects at commercial scale have been evaluated from economic, technical, and operational approaches. However, there is a lack of research comprising both the technical aspects and the geological properties. In this investigation, we have developed a full description of active commercial CCUS/CCS projects in terms of technical guidelines and geological properties of reservoirs and caprocks. In addition, we built letter-value plots and cross-plots for 43 pairs of reservoirs and caprocks used for CO_2 geological storage. Then, Principal Component Analysis (PCA) was performed to assess correlations among reservoir and caprock parameters and understand which parameters are more relevant. Thus, our findings suggested that peripheral foreland and post-rift sag basins may contain suitable carbon storage sites, with Carboniferous and Cretaceous as the prevalent reservoir ages. We also noted that reservoirs have mostly been deposited in transitional and marine environments, with shale representing the prevalent caprock lithology. From the multivariate analysis, caprock and reservoir ages, reservoir porosity, reservoir depth, reservoir lithology, and caprock porosity exhibited the highest parameter weight. To finish, an integrated model correlating all geological and petrophysical parameters with classifications based on reservoir depositional environment and basin tectonic sub-regime is presented. Thus, significant correlations regarding reservoir rock and caprock parameters and tectonic regimes were found, which may contribute to future assessments of carbon storage sites.