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Effect of well configurations on CO2 geological storage

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Storage of carbon dioxide into underground geological formation is a promising technology for reducing anthropogenic CO2 emissions, and therefore, it is crucial to select a suitable basin for CO2 Storage. The target storage formation may have a various thickness characteristics which basically affect the storage capacity. In this study, we investigated the effect of well configurations by comparing the vertical to horizontal injection wells on storage efficiency. The model in this study considered the cases of open system and closed system, the depth of injection well, and the length of injection well for aquifers having various thicknesses. Another issue that has been considered in this study is injectivity. CO2 injection into saline aquifers may cause salt-precipitation at dry-out zone and consequently deteriorates injectivity. The CO2 was injected at a constant rate for 10 years, followed by 90 years of monitoring period. The modeling results showed that when aquifer thickness was small, there was a rapid pressure build-up for vertical injection well while the pressure build-up was not severe when horizontal well was used. Model cases revealed that extending the length of horizontal well decreased the pressure build-up and improved the injectivity. The dissolved CO2 in the horizontal well model showed higher concentration compared to the vertical well model indicating larger regions that gas-phase CO2 has contacted.