



Contribution ID: 136

Type: **Poster Presentation**

# Numerical simulation CO<sub>2</sub> sequestration in deep saline aquifers coupled with enhanced reservoir water and geothermal energy system recovery

*Wednesday, 15 May 2024 16:10 (1h 30m)*

Deep saline aquifers are ideal geological storage sites for CO<sub>2</sub>, containing abundant water and geothermal resources. Injecting CO<sub>2</sub> into deep saline aquifers while simultaneously extracting reservoir water can slow down the rise in reservoir pressure, increasing the safety of storage. This approach also extracts water resources to offset the cost gap incurred during the storage process. Simultaneously, the heat in the reservoir water (geothermal energy) can be directly used for power generation and heating, further enhancing the resource utilization efficiency of deep saline aquifers. Therefore, a coordinated development approach for deep saline aquifers involving CO<sub>2</sub> injection, water extraction, geothermal energy extraction, and carbon storage is proposed. This approach is divided into two phases: the first phase involves extracting formation water and geothermal energy during CO<sub>2</sub> injection, and the second phase involves using CO<sub>2</sub> as a heat medium to extract geothermal energy after depleting formation water. A numerical simulation model coupling gas-water two-phase heat flow is established to verify the advantages of this new development approach. Additionally, optimal injection methods, well pattern, and injection-production parameters for the new approach are provided.

The research results indicate that simultaneous water and geothermal extraction during CO<sub>2</sub> injection can delay the rise in formation pressure, providing more storage space for CO<sub>2</sub> and increasing the amount of sequestration. Continuing geothermal extraction after depleting formation water not only retrieves more heat but also further increases geological storage capacity. CO<sub>2</sub> injection induces geochemical reactions, increasing porosity and connectivity, creating favorable conditions for sustained CO<sub>2</sub> injection, and the extraction of formation water and geothermal energy. Intermittent injection is the optimal injection method to maximize the delay in formation pressure rise. Production wells and injection wells should be located in the same layer, with more injection wells placed in structurally lower positions. Taking the Qing 3rd member of the deep saline aquifer in the Daqing Oilfield, Jilin Province, as an example. The optimal injection parameters are an injection rate of 10,000 m<sup>3</sup>/d, an injection-production ratio of 0.8, a cyclic injection time of 3 months, and a cyclic injection-production time ratio of 1.

The new development approach provides a novel method and perspective for geological storage of CO<sub>2</sub> in deep saline aquifers. Its aim is to establish a theoretical foundation and scientific basis for the efficient utilization of resources in deep saline aquifers. This research is of reference significance for supporting the "Dual Carbon" goals and promoting efficient resource coordination.

## Acceptance of the Terms & Conditions

[Click here to agree](#)

## Student Awards

I would like to submit this presentation into both awards

## Country

China

## Porous Media & Biology Focused Abstracts

## References

## Conference Proceedings

I am interested in having my paper published in the proceedings.

**Primary authors:** XIE, Zehao (Southwest Petroleum University); Prof. ZHAO, Yulong (Southwest Petroleum University); Prof. CAO, Cheng (Southwest Petroleum University); Mr LUO, Ruike (Southwest Petroleum University); Prof. WEN, Shaomu (Petrochina Southwest Oil and Gas Field Company); Prof. HU, Yong (Petrochina Southwest Oil and Gas Field Company); Prof. PENG, Xian (Exploration and Development Research Institute, Southwest Oil and Gas Field Company, petrochina); Prof. ZHAO, Zihan (Exploration and Development Research Institute, Southwest Oil and Gas Field Company, petrochina); Prof. ZHANG, Liehui (Southwest Petroleum University)

**Presenter:** XIE, Zehao (Southwest Petroleum University)

**Session Classification:** Poster

**Track Classification:** (MS17) Complex fluid and Fluid-Solid-Thermal coupled process in porous media: Modeling and Experiment