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## A neural network model with physics constraints for simulating CO<sub>2</sub> storage in deep saline aquifers during and after injection

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The exploration of CO<sub>2</sub> capture and storage has become a crucial element in strategies aimed at mitigating climate change, where deep saline aquifers are of particular interest due to their extensive storage capacity and widespread availability. The complexities involved in effectively monitoring and simulating CO<sub>2</sub> behavior within these geological formations present significant challenges. To address these challenges, our research introduces a specialized neural network, designed to simulate and monitor CO<sub>2</sub> storage in deep saline aquifers during both the injection and post-injection phases. This neural network represents an integration of physics-based principles and advanced deep learning techniques. This integration facilitates the modeling of CO<sub>2</sub>'s complex movement and distribution under diverse conditions. The network's ability to process and analyze spatial data, coupled with key geological characteristics, significantly enhances the accuracy of its simulations. This aspect is crucial for understanding the heterogeneous nature of subsurface systems and the dynamic behavior of CO<sub>2</sub>. The architecture of this network, encompassing various computational layers and physics-informed constraints, is designed to ensure comprehensive and precise modeling of CO<sub>2</sub> storage processes. This approach aims to contribute to the existing body of knowledge in the field of carbon capture and storage, offering a new perspective in the simulation and understanding of CO<sub>2</sub> behavior in subsurface systems.

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### References

### Conference Proceedings

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**Primary author:** ZHAO, Mengjie

**Co-authors:** Dr WANG, Yuhang (China University of Geosciences (Wuhan)); Dr GERRITSMA, Marc (TU Delft); Prof. HAJIBEYGI, Hadi (TU Delft)

**Presenter:** ZHAO, Mengjie

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