THMC 7.1 simulation of fluid exchange due to CO_2 leakage along faults during CO_2 geo-sequestration in saline aquifer

Presenter: Gia-Huy Lam
Advisor: Prof. Jui-Sheng Chen
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Abstract

The urgency of climate change has spotlighted CO_2 geo-sequestration within saline aquifers as a key strategy for carbon dioxide storage. Understanding fluid dynamics and leakage risks through faults is crucial for ensuring the method's safety and effectiveness. The THMC 7.1 model, developed by CAMRDA at NCU, is a pivotal tool for simulating the complex interplay of thermal, hydrological, mechanical, and chemical processes underground, essential for addressing CO_2 storage challenges. However, hurdles like leakage risks, monitoring complexities, site location limitations, and financial burdens persist, underlining the necessity for sophisticated models like THMC 7.1 to enhance the security and reliability of geo-sequestration efforts. This research employs THMC 7.1 to scrutinize fluid movements and leakage potentials along faults in caprock layers, initially focusing on the CO_2 plume's horizontal spread. Subsequent fault simulations aim to pinpoint leakage pathways, improving the precision and predictive power of model. Future directions include expanding fault simulations and validating outcomes against existing literature to bolster CO_2 geo-sequestration knowledge. This work aims to address CO_2 storage concerns and support climate change mitigation by ensuring geo-sequestration's environmental viability and effectiveness.

Keywords: CO_2 leakage, CO_2 geo-sequestration, fault , fluid exchange, THMC 7.1.