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# Improving Caprock Integrity Assessment Workflows for CCUS Operations

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## Summary

Geological carbon capture, utilization, and storage (CCUS) is among the most promising emission reduction technologies today. Several CCUS projects are already in operation and many others have been announced all around the world from the US and Europe to China, Middle East and Australia. The main intention of CCUS projects is ensuring that $CO_2$ remains underground for unlimited time since its leakage can result in different environmental, health and safety, economic and socio-political risks.

While different processes maybe responsible for the long-term trapping of $CO_2$, hydraulic sealing of the caprock is considered the primary trapping mechanism. Therefore, evaluation of caprock integrity before, during and even after ceasing $CO_2$ injection has critical importance for site selection, feasibility assessment, and operational optimization of the CCUS projects. The workflows developed and applied for the assessment of caprock integrity of CCUS projects have been advancing considerably during the last two decades. Nevertheless, substantial challenges are still facing these workflows. This study will review a number of these complexities including complexity of $CO_2$ plume, influence of low temperature of $CO_2$, geochemical effects of CO2 on rock mechanics and fluid flow, response of fracture networks and faults to $CO_2$ injection, mechanical difference of production and injection for $CO_2$-EOR or storage in depleting and depleted hydrocarbon reservoirs. This study proposes methodologies for improving the commonly used workflows for caprock integrity assessment.

### References

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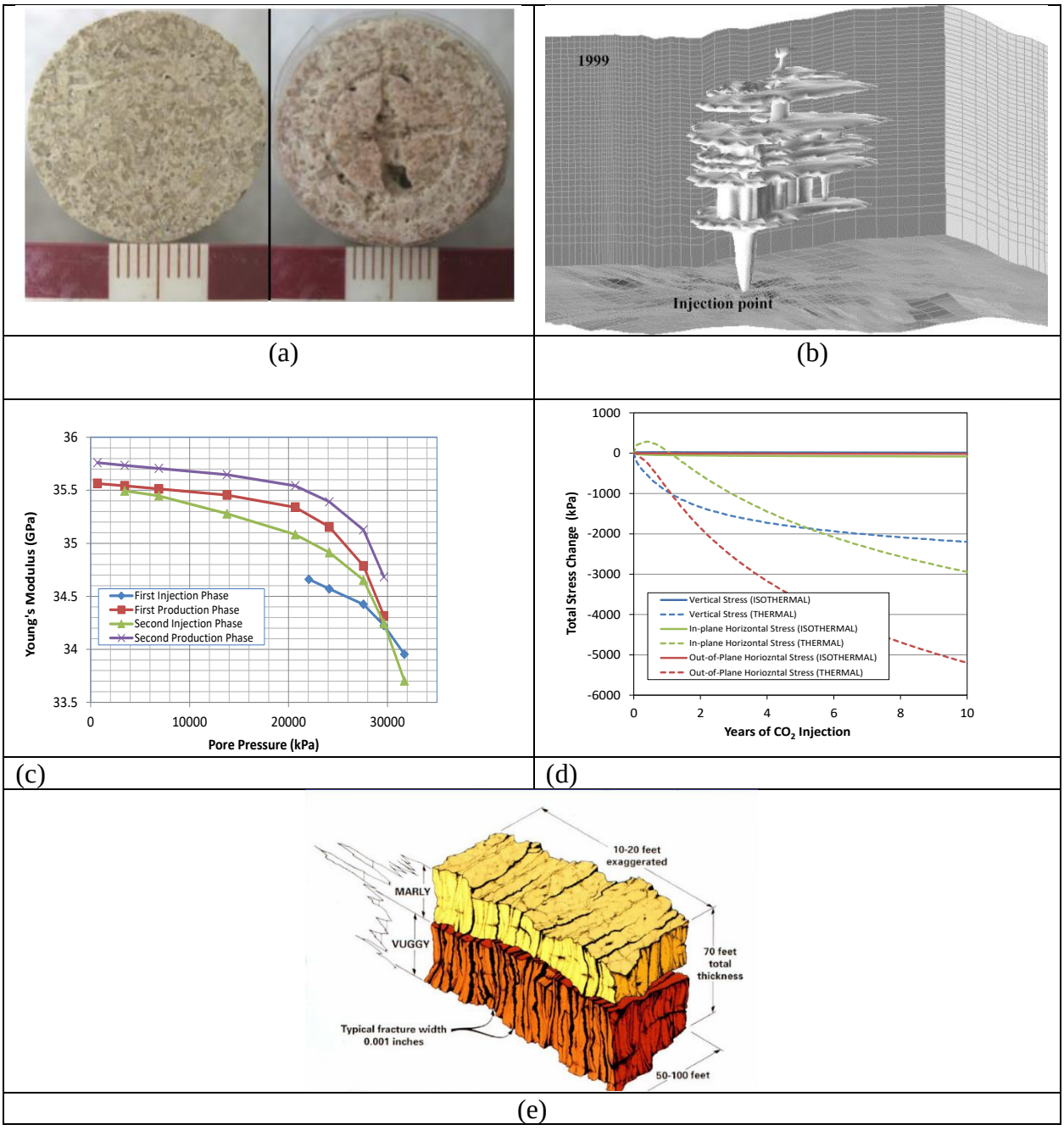


**Figure 1. (a) influence of co2 flooding on a carbonate sample (Zhou, 2011) (b) complexity of CO2 plume in Sleipner field, North Sea (Arts et al., 2004) (c) influence of cycles of injection and production on Young's modulus of the rock (Soltanzadeh, 2016) (d) influence of low-temperature of CO2 on the in-situ stresses in the rock (Soltanzadeh, 2009) (e) Complexity of fractures in Midale field in Saskatchewan (2004)**