CO2 Storage Trapping Mechanisms Quantification

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Abstract

Introduction
The capture and storage of CO_2 in deep geological formations is one of the proposed solutions to reduce CO_2 emissions to the atmosphere. CO_2 is injected as a supercritical fluid deep below a confining geological formation that prevents its return to the atmosphere. In general, the next four trapping mechanisms are expected, which are of increasing importance through time (1) structural, (2) residual saturation, (3) dissolution, and (4) mineral trapping. The prediction of the mass of CO_2 stored through time in storage systems is an essential parameter in the pre-injection assessment of a geological storage. For safety reasons, it is relevant to know the mass of CO_2 trapped under these different trapping mechanisms.

Use of COMSOL Multiphysics®
In this work, storage quantification (Figure 2) in a synthetic 2D dome (Figure 1) under different injection conditions has been performed by using multiphase transport simulations with COMSOL Multiphysics®. Model results predict well the amount of CO_2 trapped as residual phase and the onset of the formation of CO_2-rich brine fingers and their extent and evolution.

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Figures used in the abstract

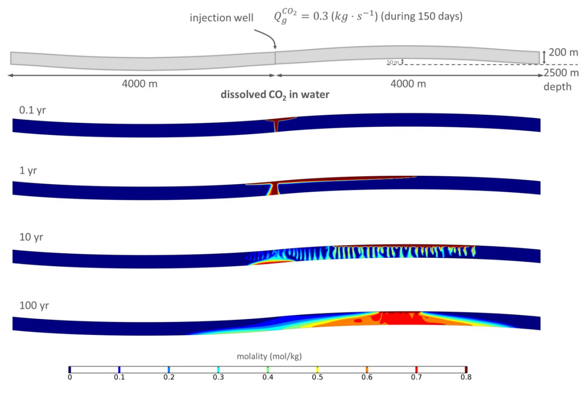

Figure 1: Sketch of the synthetic 2D dome problem and dissolved CO2 in liquid evolution

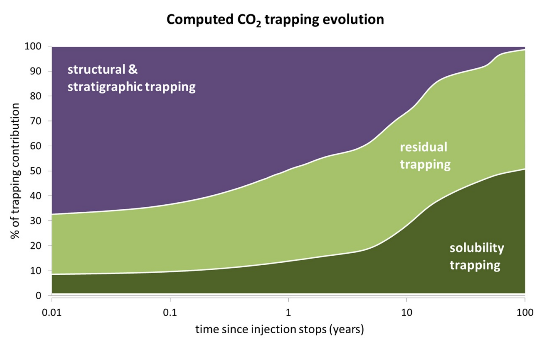

Figure 2: Computed CO2 trapping evolution