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Hydraulic tests to identify the CO_2 saturation at a geological site

L. Martinez-Landa (1), T.S. Roetting (1), J. Carrera (2,3)

(1) Technical University of Catalonia, Civil Engenier, Barcelona, Spain (lurdesm.landa@gmail.com), (2) Instituto de Diagnóstico Ambiental y Estudios del Agua (IDÆA, CSIC), Barcelona, España., (3) Fundación Ciudad de la Energía (CIUDEN), Programa de Almacenamiento Geológico de CO_2, Ponferrada (León, España).

Hydraulic tests will be performed at Hontomin to derive local and regional transmissivity as well as connectivity patterns. In addition, CO_2 push-pull tests will be performed to characterize dissolution kinetics and trapping efficiency. However, estimating the volume of CO_2 trapped in the aquifer after the push-pull test is hard. We propose to use hydraulic tests to estimate this volume. Supercritical CO_2 is quite compressible. Therefore, the storage coefficient of the aquifer with trapped CO_2 should be much larger than that without. Another effect that should be expected is a decrease in permeability caused by trapped CO_2 that blocks the largest pores.
These two effects can be measured by means of hydraulic testing. This would require carrying out different field campaigns before and after the injection of CO_2 in order to be able to assess changes in the hydraulic parameters. This work presents a synthetic modeling exercise where both the storage coefficient and hydraulic conductivity vary depending on the percentages of trapped CO_2. Simulations have considered conditions similar to a real repository, i.e. 60°C temperature and 150 bars pressure. The results show that this technique is effective to detect and quantify the CO_2 trapped in the aquifer.