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IMPACT OF GEOLOGICAL HETEROGENEITY ON EARLY-STAGE CO_2 PLUME MIGRATION

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Summary. In an effort to determine the influence of geological heterogeneity on CO_2 storage efficiency, we study injection and early-stage migration of CO_2 in 54 different realizations of a shallow-marine reservoir.

1 INTRODUCTION

Academic studies of CO2 injection frequently employ simplified or conceptualized reservoir descriptions in which the medium is considered nearly homogeneous. However, geological knowledge and experience from petroleum production show that the petrophysical characteristics of potential CO2 sequestration sites can be expected to be heterogeneous on the relevant physical scales, regardless of whether the target formation is an abandoned petroleum reservoir or a pristine aquifer. Geological uncertainty introduces tortuous subsurface flow paths, which in turn influence reservoir behavior during injection. It is paramount that the effect of the geological heterogeneity is quantified by the research community. This will facilitate both improved understanding of subsurface flow at operational CO2 injection sites, and allow comparison with simulated flow in ideal homogeneous models and upscaled versions of these.

Within oil recovery, the impact of geological uncertainty on production forecast has been thoroughly investigated in the SAIGUP project [2, 3, 4] focusing on shallow-marine reservoirs. To study different factors, synthetic realistic models were made and several thousand cases were run for different production scenarios. The results showed that realistic heterogeneity in the structural and sedimentological description had a strong influence on the production responses.