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Numerical Approaches to CO_2-Sequestration in a Faulted and Low-Permeable Saline Aquifer in NW Germany

M. W. Wuttke and C. M. Sperber

Leibniz Institute for Applied Geophysics (LIAG), Geothermics and Information-Systems, Hannover, Germany (manfred.wuttke@liag-hannover.de)

Stabilisation at an atmospheric CO_2-concentration of 450 ppm (associated with a maximum global temperature increase of 2 °C) requires radical measures. Storage of CO_2 in deep saline aquifers offers a quick and economic solution. In the EU-project MUSTANG (A Multiple Space and Time scale Approach for the quantification of deep saline formations for CO_2 storage), a number of test sites exhibiting a wide range of reservoir properties are investigated for the suitability to CO_2-sequestration.

In this study a particular sandstone reservoir in NW Germany is investigated. This reservoir is complex for a combination of geological features such as its great depth of the targeted saline aquifers of about 3800 m, its structural context of being affected by a complex deep cutting inversion structure, its low permeability of about 1 mD and being surrounded by a large number of wells due to extensive oil and gas exploration within the area.

In this study the effects of CO_2-injection into such a tight reservoir are simulated. Two strategies are simulated employing the TOUGH2 code: (1) an injection−relaxation and (2) an injection−production combination. While the latter strategy dominates over the former the model clearly indicates that both the strategies are uneconomical due to small CO_2-injection rates or amounts which can be accomodated.