the system are defined and calculated for two CO_2 injection scenarios. Geological variations in shallow marine depositional systems are examined by using large number of realizations representing a spectrum of sedimentological and structural parameters. Operational critical values are considered for the defined preventive measures.

Most of the studied responses show a higher relative sensitivity to aggradation, progradation, and faulting. Low aggradation angles keep the flow restricted in a limited space. In cases with low rock quality in injection layers, pressure builds up in the well-bore. Injecting in down dip progradation normally ends up in a higher pressure build-up and a lower injectivity. In the down dip progradation, the majority of the region around injection point is made of low quality rock. Faults change the geometrical structure of the medium and they put different layers in contact. Pressure disturbances can leak through faults to larger distances from the injection point. Closed faults can significantly reduce the injectivity quality.

The workflow of the pressure study demonstrated here can be used in specific studies in the context of geological uncertainty. The workflow can be used for other depositional systems and different values for operational limits can be used, which might lead to outcomes different than the results reported here.

References

[1] M. Ashraf, K.A. Lie, Nilsen, and A. Skorstad. Impact of geological heterogeneity on early-stage CO_2 plume migration: Sensitivity analysis. In *ready for submission*, 2012.

[2] M. Ashraf, K.A. Lie, H.M. Nilsen, J.M. Nordbotten, and A. Skorstad. Impact of geological heterogeneity on early-stage CO_2 plume migration. In *CMWR*, 2010.

[3] Jens Birkholzer, Quanlin Zhou, Jonny Rutqvist, Preston Jordan, Keni Zhang, and Chin-Fu Tsang. Research project on co2 geological storage and groundwater resources: Large-scale hydrological evaluation and modeling of impact on groundwater systems. 2008.

[4] B. Cailly, P. Le Thiez, P. Egermann, A. Audibert, S. Vidal-Gilbert, and X. Longaygue. Geological storage of CO_2: A state-of-the-art of injection processes and technologies. *Oil & Gas Science and Technology*, 60(3):517–525, 2005.

[5] A. Cavanagh and N. Wildgust. Pressurization and brine displacement issues for deep saline formation CO_2 storage. *Energy Procedia*, 4:4814–4821, 2011.

[6] Ethan R Chabora and Sally M Benson. Brine displacement and leakage detection using pressure measurements in aquifers overlying co< sub> 2</sub> storage reservoirs. *Energy Procedia*, 1(1):2405–2412, 2009.

[7] J.A. Howell, A. Skorstad, A. MacDonald, A. Fordham, S. Flint, B. Fjellvoll, and T. Manzocchi. Sedimentological parameterization of shallow-marine reservoirs. *Petroleum Geoscience*, 14(1):17–34, 2008.

[8] T. Le Guenan and J. Rohmer. Corrective measures based on pressure control strategies for CO_2 geological storage in deep aquifers. *International Journal of Greenhouse Gas Control*, 2010.