Bibliography

- [1] ABRAMOWITZ, M., AND STEGUN, I., A. Handbook of Mathematical Functions with Formulas, Graphs, and Mathematical Tables. New York: Dover, 1965. 1.9.2
- [2] ALKAN, H., CINAR, Y., AND ÜLKER, E. Impact of capillary pressure, salinity and in situ conditions on co 2 injection into saline aquifers. *Transport in porous media 84*, 3 (2010), 799–819. 1.7.1
- [3] ALLEN, F., AND PUCKETT, D. Theoretical and experimental studies of rate-dependent two-phase immiscible flow. *SPE Production Engineering 1*, 1 (1986), 62–74. 1.7.1
- [4] ARWADE, S., MORADI, M., AND LOUHGHALAM, A. Variance decomposition and global sensitivity for structural systems. *Engineering Structures* 32, 1 (2010), 1–10. 1.9.3
- [5] BACHU, S. Sequestration of CO₂ in geological media: criteria and approach for site selection in response to climate change. *Energy Conversion and Management* 41, 9 (2000), 953–970. 1.1, 1.5.1
- [6] BASHORE, W., ARAKTINGI, U., LEVY, M., AND SCHWELLER, W. The importance of the geological model for reservoir characterization using geostatistical techniques and the impact on subsequent fluid flow. In SPE Annual Technical Conference and Exhibition (1993). 1.1
- [7] BEAR, J. Dynamics of fluids in porous media. Dover publications, 1988. 1.6.1
- [8] BENSON LAB, S. U. Relative pereability explorer(rpe). http://pangea.stanford.edu/research/bensonlab/relperm/index.html. 1.6.2
- [9] BENTSEN, R. Effect of neglecting viscous coupling and dynamic capillary pressure on the one-dimensional flow of two immiscible phases through a porous medium. *SPE paper*, 026016 (1993). 1.7.1, 1.7.1
- [10] BINNING, P., AND CELIA, M. Practical implementation of the fractional flow approach to multi-phase flow simulation. *Advances in water resources* 22, 5 (1999), 461–478. 1.6.2
- [11] BRADSHAW, J., AND COOK, P. Geological sequestration of carbon dioxide. *Environmental Geosciences* 8, 3 (2001), 149. 1.1
- [12] CAERS, J., AND ZHANG, T. Multiple-point geostatistics: a quantitative vehicle for integrating geologic analogs into multiple reservoir models. AAPG (2002). 1.5
- [13] CELIA, M., AND NORDBOTTEN, J. Geological Storage of CO₂: Modeling Approaches for Large-Scale Simulation. Wiley, 2011. 1.6.1, 1.2, 1.3
- [14] CHANGE, I. P. O. C. IPCC Second Assessment. A Synthesis Report. Geneva: WMO (1995).
 1.2

- [15] CHEN, Z., BODVARSSON, G., AND WITHERSPOON, P. An integral equation for two-phase flow and other nonlinear flow problems through porous media. In SPE Annual Technical Conference and Exhibition (1990). 1.7.1
- [16] CRESTAUX, T., ET AL. Polynomial chaos expansion for sensitivity analysis. *Reliability Engineering & System Safety 94*, 7 (2009), 1161–1172. 1.9.3
- [17] DONG, M., AND DULLIEN, F. Effect of capillary forces on immiscible displacement in porous media. In SPE Annual Technical Conference and Exhibition (1999). 1.7.1, 1.7.1
- [18] DUAN, Z., AND ZHANG, Z. Equation of state of the H₂O, CO₂, and H₂O-CO₂ systems up to 10 GPa and 2573.15 K: Molecular dynamics simulations with ab initio potential surface. *Geochimica et cosmochimica acta* 70, 9 (2006), 2311–2324. 1.6.2
- [19] EATON, T. On the importance of geological heterogeneity for flow simulation. *Sedimentary Geology 184*, 3-4 (2006), 187–201. 1.1, 1.5
- [20] ELENIUS, M., AND JOHANNSEN, K. On the time scales of nonlinear instability in miscible displacement porous media flow. *Computational Geosciences* (2012), 1–11. 1.7.2
- [21] ELENIUS, M., TCHELEPI, H., AND JOHANNSEN, K. CO₂ trapping in sloping aquifers: High resolution numerical simulations. In XVIII International Conference on Water Resources, CIMNE, Barcelona (2010). 1.7.2
- [22] ELENIUS, M. T., NORDBOTTEN, J. M., AND KALISCH, H. Effects of a capillary transition zone on the stability of a diffusive boundary layer. *IMA Journal of Applied Mathematics* 77, 6 (2012), 771–787. 1.7.2
- [23] FAJRAOUI, N., RAMASOMANANA, F., YOUNES, A., MARA, T. A.AND ACKERER, P., AND GUADAGNINI, A. Use of Global Sensitivity Analysis and Polynomial Chaos Expansion for Interpretation of Non-reactive Transport Experiments in Laboratory-Scale Porous Media. *Water Resour. Res.* (2011), doi: 10.1029/2010WR009639. 1.9.2
- [24] FARAJZADEH, R., AND BRUINING, J. An Analytical Method for Predicting the Performance of Gravitationally-Unstable Flow in Heterogeneous Media. In SPE EUROPEC/EAGE Annual Conference and Exhibition (2011). 1.7.1
- [25] FAYERS, F., AND SHELDON, J. The effect of capillary pressure and gravity on two-phase fluid flow in a porous medium. *TRANS AIME 216* (1959), 147. 1.7.1, 1.7.1
- [26] FLETT, M., GURTON, R., AND WEIR, G. Heterogeneous saline formations for carbon dioxide disposal: Impact of varying heterogeneity on containment and trapping. *Journal of Petroleum Science and Engineering* 57, 1-2 (2007), 106–118. 1.5.1
- [27] FOO, J., AND KARNIADAKIS, G. Multi-element probabilistic collocation method in high dimensions. *Journal of Computational Physics* 229, 5 (2010), 1536–1557. 1.9.2
- [28] FÖRSTER, A., NORDEN, B., ZINCK-JØRGENSEN, K., FRYKMAN, P., KULENKAMPFF, J., SPANGENBERG, E., ERZINGER, J., ZIMMER, M., KOPP, J., BORM, G., ET AL. Baseline characterization of the CO2SINK geological storage site at ketzin, germany. *Environmental Geosciences* 13, 3 (2006), 145–161. 1.5.1
- [29] FOUKAL, P., FRÖHLICH, C., SPRUIT, H., AND WIGLEY, T. Variations in solar luminosity and their effect on the earth's climate. *Nature* 443, 7108 (2006), 161–166. 1.2

- [30] GHANEM, R., AND SPANOS, P. A stochastic galerkin expansion for nonlinear random vibration analysis. *Probabilistic Engineering Mechanics* 8 (1993), 255–264. 1.9.2
- [31] GREENWOOD, H. The compressibility of gaseous mixtures of carbon dioxide and water between 0 and 500 bars pressure and 450 and 800 centigrade. *American Journal of Science* 267 (1969), 191–208. 1.6.2
- [32] GUNTER, W., WIWEHAR, B., AND PERKINS, E. Aquifer disposal of CO₂-rich greenhouse gases: extension of the time scale of experiment for CO₂-sequestering reactions by geochemical modelling. *Mineralogy and Petrology* 59, 1 (1997), 121–140. 1.3, 1.7.2
- [33] HADLEY, G., AND HANDY, L. A theoretical and experimental study of the steady state capillary end effect. In *Fall Meeting of the Petroleum Branch of AIME* (1956). 1.7.1
- [34] HASSANZADEH, H., POOLADI-DARVISH, M., AND KEITH, D. Modelling of convective mixing in CO₂ storage. *Journal of Canadian Petroleum Technology* 44, 10 (2005). 1.7.2
- [35] HITCHON, B., GUNTER, W., GENTZIS, T., AND BAILEY, R. Sedimentary basins and greenhouse gases: a serendipitous association. *Energy Conversion and Management 40*, 8 (1999), 825–843. 1.1
- [36] HOUGHTON, J., ET AL. Climate change 2001: the scientific basis, vol. 881. Cambridge University Press Cambridge, 2001. 1.1
- [37] HOVORKA, S. D., DOUGHTY, C., BENSON, S. M., PRUESS, K., AND KNOX, P. R. The impact of geological heterogeneity on CO₂ storage in brine formations: a case study from the Texas Gulf Coast. *Geological Society, London, Special Publications* 233, 1 (2004), 147–163. 1.5.1
- [38] HOWELL, J., SKORSTAD, A., MACDONALD, A., FORDHAM, A., FLINT, S., FJELLVOLL, B., AND MANZOCCHI, T. Sedimentological parameterization of shallow-marine reservoirs. *Petroleum Geoscience 14*, 1 (2008), 17–34. 1.3, 1.5.2
- [39] IEA. Key World Energy Statistics 2009. doi: 10.1787/9789264039537-en. 1.2
- [40] IPPISCH, O., VOGEL, H.-J., AND BASTIAN, P. Validity limits for the van genuchten-mualem model and implications for parameter estimation and numerical simulation. *Advances in water resources* 29, 12 (2006), 1780–1789. (document), 1.21
- [41] ISUKAPALLI, S., S., ROY, A., AND GEORGOPOULOS, P., G. Stochastic response surface methods (srsms) for uncertainty propagation: Application to environmental and biological systems. *Risk Analysis 18*, 3 (1998), 351–363. 1.9.2
- [42] JANG, Y., S., SITAR, N., AND KIUREGHIAN, A., D. Reliability analysis of contaminant transport in saturated porous media. *Water Resources Research* 30, 8 (1994), 2435–2448. 1.9.3
- [43] KEESE, A., AND MATTHIES, H. G. Sparse quadrature as an alternative to Monte-Carlo for stochastic finite element techniques. *Proceedings in Applied Mathematics and Mechanics 3* (2003), 493–494. 1.9.2
- [44] LI, H., AND ZHANG, D. Probabilistic collocation method for flow in porous media: Comparisons with other stochastic methods. *Water Resources Research* 43 (2007), 44–48. 1.9.2
- [45] LINDEBERG, E. Escape of CO₂ from aquifers. *Energy Conversion and Management 38* (1997), S235–S240. 1.5.1

- [46] LUCKNER, L., VAN GENUCHTEN, M. T., AND NIELSEN, D. A consistent set of parametric models for the two-phase flow of immiscible fluids in the subsurface. *Water Resources Research* 25, 10 (1989), 2187–2193. (document), 1.21
- [47] MANZOCCHI, T., CARTER, J., SKORSTAD, A., FJELLVOLL, B., STEPHEN, K., HOWELL, J., MATTHEWS, J., WALSH, J., NEPVEU, M., BOS, C., ET AL. Sensitivity of the impact of geological uncertainty on production from faulted and unfaulted shallow-marine oil reservoirs: objectives and methods. *Petroleum Geoscience 14*, 1 (2008), 3–11. (document), 1.5.2, 1.5
- [48] MATTHEWS, J., CARTER, J., STEPHEN, K., ZIMMERMAN, R., SKORSTAD, A., MANZOCCHI, T., AND HOWELL, J. Assessing the effect of geological uncertainty on recovery estimates in shallow-marine reservoirs: the application of reservoir engineering to the SAIGUP project. *Petroleum Geoscience 14*, 1 (2008), 35–44. 1.5.2, 1.5.2
- [49] MATTHIES, H., G., AND KEESE., A. Galerkin methods for linear and nonlinear elliptic stochastic partial differential equations. *Computer Methods in Applied Mechanics and Engineering 194* (2005), 1295–1331. 1.9.2
- [50] MELICK, J., GARDNER, M., AND ULAND, M. Incorporating geologic heterogeneity in 3d basin-scale models for CO₂ sequestration: Examples from the powder river basin, ne wyoming and se montana. In SPE International Conference on CO₂ Capture, Storage, and Utilization (2009). 1.1
- [51] MILLIKEN, W., LEVY, M., STREBELLE, S., AND ZHANG, Y. The effect of geologic parameters and uncertainties on subsurface flow: deepwater depositional systems. In SPE Western Regional and Pacific Section AAPG Joint Meeting (2008). 1.1
- [52] MORRIS, M., D. Morris factorial sampling plans for preliminary computational experiments. *Technometrics*, 33 (1991), 161–174. 1.9.3
- [53] NILSEN, H.M., SYVERSVEEN, A.R., LIE, K.A., TVERANGER, J., AND NORDBOTTEN, J.M. Impact of top-surface morphology on CO₂ storage capacity. *International Journal of Greenhouse Gas Control 11* (2012), 221–235. 2.2
- [54] NORDBOTTEN, J.M., CELIA, M.A., AND BACHU, S. Injection and storage of CO₂ in deep saline aquifers: Analytical solution for CO₂ plume evolution during injection. *Transport in Porous Media* 58, 3 (2005), 339–360. 1.7.1
- [55] OLADYSHKIN, S., CLASS, H., HELMIG, R., AND NOWAK, W. A concept for data-driven uncertainty quantification and its application to carbon dioxide storage in geological formations. *Advances in Water Resources 34* (2011), 1508–1518, doi: 10.1016/j.advwatres.2011.08.005. 1.9.2, 1.9.2, 1.9.2, 1.9.3
- [56] OLADYSHKIN, S., CLASS, H., HELMIG, R., AND NOWAK, W. An integrative approach to robust design and probabilistic risk assessment for CO₂ storage in geological formations. *Computational Geosciences* 15, 3 (2011), 565–577, doi: 10.1007/s10596-011-9224-8. 1.9.2, 1.9.2
- [57] OLADYSHKIN, S., DE BARROS, F. P. J., AND NOWAK, W. Global sensitivity analysis: a flexible and efficient framework with an example from stochastic hydrogeology. *Advances in Water Resources In Press* (2011), doi: 10.1016/j.advwatres.2011.11.001. 1.9.3
- [58] RAPOPORT, L., AND LEAS, W. Properties of linear waterfloods. *TRANS AIME 198*, 1953 (1953), 139–148. 1.7.1

- [59] REUTER, U., AND LIEBSCHER, M. Global sensitivity analysis in view of nonlinear structural behavior. In *Proceedings of the 7th LS-Dyna Forum, Bamberg* (2008). 1.9.2, 1.9.3
- [60] RIDDIFORD, F., WRIGHT, I., BISHOP, C., ESPIE, T., AND TOURQUI, A. Monitoring geological storage the In Salah gas CO₂ storage project. In *Proceedings of 7th international conference on greenhouse gas control technologies (GHGT-7), Vancouver, Canada* (2004). 1.5.1
- [61] ROSADO-VAZQUEZ, F., RANGEL-GERMAN, E., AND RODRIGUEZ-DE LA GARZA, F. Analysis of capillary, gravity and viscous forces effects in oil/water displacement. In *International Oil Conference and Exhibition in Mexico* (2007). 1.7.1, 1.7.1
- [62] SAHIMI, M. Flow and transport in porous media and fractured rock: From classical methods to modern approaches. Wiley-VCH, 2011. 1.6.1
- [63] SALTELLI, A. Global sensitivity analysis: the primer. Wiley, 2007. 1.9.3, 1.9.3
- [64] SCHLUMBERGER. Eclipse technical description manual, 2009. 1.8, 1.8.4
- [65] SINTEF ICT. A SAIGUP realization example. http://www.sintef.no/Projectweb/MRST/ Downloadable-Resources/Download-SAIGUP-Data-Set/. 1.5.2
- [66] SINTEF ICT. MRST model of a SAIGUP realization. http: //www.sintef.no/Projectweb/MRST/Tutorials/Realistic-Reservoir-Model-II/. 1.5.2
- [67] SYVERSVEEN, A.R., NILSEN, H.M., LIE, K.A., TVERANGER, J., AND ABRAHAMSEN, P. A Study on How Top-Surface Morphology Influences the Storage Capacity of CO₂ in Saline Aquifers. *Geostatistics* (2012), 481–492. 1.8.2, 1.10.2, 2.2
- [68] VAN DER MEER, L. The CO₂ storage efficiency of aquifers. *Energy Conversion and Management* 36, 6 (1995), 513–518. 1.5.1
- [69] VILLADSEN, J., AND MICHELSEN, M. L. Solution of differential equation models by polynomial approximation. Prentice-Hall, 1978. 1.9.2
- [70] XIU, D., AND KARNIADAKIS, G. E. Modeling uncertainty in flow simulations via generalized polynomial chaos. *Journal of Computational Physics* 187 (2003), 137–167. 1.9.2
- [71] YANG, W. An analytical solution to two-phase flow in porous media and its application to water coning. *SPE Reservoir Eng. J.*, *1* 38 (1992). 1.7.1
- [72] YORTSOS, Y., AND FOKAS, A. An analytical solution for linear waterflood including the effects of capillary pressure. Old SPE Journal 23, 1 (1983), 115–124. 1.7.1, 1.7.1
- [73] ZHANG, D., AND LU, Z. An efficient, high-order perturbation approach for flow in random media via karhunen-loeve and polynomial expansions. *Journal of Computational Physics 194* (2004), 773–794. 1.9.2