

# Louis J. Durlafsky

*Otto N. Miller Professor in Earth Sciences, Department of Energy Science and Engineering,  
Green Earth Sciences Building, Room 50  
Stanford University, Stanford, CA 94305-2220  
email: [lou@stanford.edu](mailto:lou@stanford.edu)  
website: <https://profiles.stanford.edu/louis-durlafsky>*

## Professional Experience

- 2003 – present Professor of Petroleum Engineering / Professor of Energy Resources Engineering / Professor of Energy Science and Engineering, Stanford University
- 2006 – 2012 Chair, Department of Energy Resources Engineering, Stanford University
- 2001 – 2003 Associate Professor of Petroleum Engineering, Stanford University
- 1998 – 2001 Associate Prof. (Research) of Petroleum Engineering, Stanford University
- 1987 – 2004 Various positions in Reservoir Simulation Research Group (most recently Senior Staff Research Scientist) at Chevron Energy Technology Company, San Ramon, California
- 1986 – 1987 Postdoctoral Fellow, California Institute of Technology

## Education

- |      |                            |                                       |
|------|----------------------------|---------------------------------------|
| 1986 | Ph.D. Chemical Engineering | Massachusetts Institute of Technology |
| 1982 | M.S. Chemical Engineering  | Massachusetts Institute of Technology |
| 1981 | B.S. Chemical Engineering  | Pennsylvania State University         |

## Research Areas and Programs

Research interests include general reservoir/subsurface flow simulation for oil/gas production and geological carbon storage, optimization of subsurface flow processes, deep-learning-based and reduced-order flow modeling, data assimilation/history matching, upscaling of detailed geological models for flow simulation, energy systems optimization. Codirector of Stanford Smart Fields Consortium, Stanford Center for Carbon Storage, and Stanford Reservoir Simulation Research Consortium.

## University Service

- 2006 – 2012 First Department Chair of Energy Resources Engineering (following shift from Petroleum Engineering)
- 2000 – present Codirector of Stanford Reservoir Simulation Affiliate Program (SUPRI-B)
- 2010 – present Codirector of Stanford Smart Fields Consortium (SFC)
- 2021 – present Codirector of Stanford Center for Carbon Storage (SCCS)
- 2014 – 2021 Member of Executive Committee and Scientific Steering Committee for the Stanford-Chevron Center of Research Excellence
- 2018 – present Member of Governance Group for Stanford Center for Computational Earth and Environmental Sciences
- 2018 – 2021 Member of Provost's University Capital Plan Committee

2018 – present	Member of ERE/ESE Admissions Committee
2016 – 2020	Associate Chair for Diversity and Inclusion
2017	Member of Dean Search Committee, Stanford School of Earth, Energy & Environmental Sciences
2006 – 2015	Member of Stanford School of Earth Sciences Core Council
1998 – 2010	Codirector of Stanford Advanced Wells Affiliate Program (SUPRI-HW)
2005	Interim Department Chair, January 2005 – June 2005
2004	Chair of Petroleum Engineering Admissions Committee

### **Significant External Editorial / Committee Work**

Member, from 2002–2022, of the Scientific Committee for ECMOR (European Conference on the Mathematics of Geological Reservoirs, formerly European Conference on the Mathematics of Oil Recovery). Co-organized the 2017 UCLA Institute of Pure and Applied Mathematics long program on *Computational Issues in Oil Field Applications*. Member of the editorial boards of the journals *Computational Geosciences* and *Mathematical Geosciences*. Associate Editor of *Multiscale Modeling and Simulation* from 2011–2013, and member of *SPE Journal* editorial board from 1996–2006. Technical chair of 2001 SPE Reservoir Simulation Symposium and 2005 SPE Advanced Technology Workshop on Modeling and Optimization of Smart Wells. Served on External Review Committees for Pennsylvania State University Petroleum and Natural Gas Engineering Program (2018) and TU Delft (The Netherlands) Geo-Cluster (2015–2016).

### **Key Awards**

- Election to National Academy of Engineering, 2022
- Best Paper Award, *Mathematical Geosciences*, 2016
- Otto N. Miller Chair in Earth Sciences, Stanford University, 2009
- Best Paper Award, *Mathematical Geosciences*, 2009
- Society of Petroleum Engineers (SPE) Distinguished Member, 2007
- SPE Lester C. Uren Award (for distinguished achievement before age 45), 2007
- SPE Outstanding Technical Editor Award, *SPE Journal*, 2004
- SPE Reservoir Engineering Award, 2002
- Stanford University School of Earth Sciences Excellence in Teaching Award, 2001
- Chevron Corporation Chairman’s Award (highest corporate award in Chevron), 1999
- Chevron Petroleum Technology Company R&D Award, 1995

### **Professional Activities (Invited Talks, Short Courses, Conference Organization, External Reviews) and Undergraduate and Graduate Courses Taught**

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## Publications

(also listed on google scholar, see <https://scholar.google.com/citations?user=lb7BrecAAAAJ&hl=en>)

## Book Chapters

1. Jiang, S., Durlofsky, L.J.: “Deep-neural-network surrogate flow models for history matching and uncertainty quantification,” in *Machine Learning Applications in Subsurface Energy Resource Management, State of the Art and Future Prognosis*, pp. 271-290, S. Mishra, ed., Taylor & Francis Group/CRC Press (2023).
2. Cameron, D.A., Durlofsky, L.J.: “Optimization and data assimilation for geological carbon storage,” in *Computational Models for CO<sub>2</sub> Sequestration and Compressed Air Energy Storage*, pp. 357-388, R. Al-Khoury and J. Bundschuh, eds., Taylor & Francis Group/CRC Press (2014).
3. Zhou, X., Karimi-Fard, M., Durlofsky, L.J., Aydin, A.: “Fluid flow through porous sandstone with overprinting and intersecting geological structures of various types,” in *Advances in the Study of Fractured Reservoirs*, Geological Society, London, Special Publications, **374**, pp. 211-249, G.H. Spence et al., eds. (2014).
4. Wen, Z., Durlofsky, L.J., Van Roy, B., Aziz, K.: “Approximate dynamic programming for optimizing oil production,” in *Reinforcement Learning and Approximate Dynamic Programming for Feedback Control, IEEE Press Series on Computational Intelligence*, pp. 560-581, F. Lewis, D. Liu, eds., Wiley – IEEE Press (2013).
5. Durlofsky, L.J., Chen, Y.: “Uncertainty quantification for subsurface flow problems using coarse-scale models,” in *Numerical Analysis of Multiscale Problems, Lecture Notes in Computational Science and Engineering*, **83**, pp. 163-202, I.G. Graham, T.Y. Hou, O. Lakkis, R. Scheichl, eds., Springer (2012).
6. Echeverría Ciaurri, D., Mukerji, T., Durlofsky, L.J.: “Derivative-free optimization for oil field operations,” in *Computational Optimization and Applications in Engineering and Industry, Studies in Computational Intelligence*, **359**, pp. 19-55, X.-S. Yang, S. Koziel, eds., Springer-Verlag (2011).
7. Gerritsen, M.G., Durlofsky, L.J.: “Modeling fluid flow in oil reservoirs,” in *Annual Review of Fluid Mechanics*, **37**, 211-238 (2005).

## Refereed Journal Articles

1. Zou, A., Durlofsky, L.J.: “Integrated framework for constrained optimization of horizontal/deviated well placement and control for geological CO<sub>2</sub> storage,” *SPE Journal* (2023) (also SPE paper 212228).
2. Crain, D.M., Benson, S.M., Saltzer, S.D., Durlofsky, L.J.: “An integrated framework for optimal monitoring and history matching in CO<sub>2</sub> storage projects,” *Computational Geosciences* (2023).
3. Nasir, Y., Durlofsky, L.J.: “Practical closed-loop reservoir management using deep reinforcement learning,” *SPE Journal* (2023) (also SPE paper 212237).
4. Kim, Y.D., Durlofsky, L.J.: “Neural network surrogate for flow prediction and robust optimization in fractured systems,” *Fuel*, **351**, 128756 (2023).

5. Kim, Y.D., Durlofsky, L.J.: "Convolutional – recurrent neural network proxy for robust optimization and closed-loop reservoir management," *Computational Geosciences*, **27**, 179-202 (2023).
6. Nasir, Y., Durlofsky, L.J.: "Deep reinforcement learning for optimizing well settings in subsurface systems with uncertain geology," *Journal of Computational Physics*, **477**, 111945 (2023).
7. Jiang, S., Durlofsky, L.J.: "Use of multifidelity training data and transfer learning for efficient construction of subsurface flow surrogate models," *Journal of Computational Physics*, **474**, 111800 (2023).
8. Ma, Z., Kim, Y.D., Volkov, O., Durlofsky, L.J.: "Optimization of subsurface flow operations using a dynamic proxy strategy," *Mathematical Geosciences*, **54**, 1261-1287 (2022).
9. Tang, H., Durlofsky, L.J.: "Use of low-fidelity models with machine-learning error correction for well placement optimization," *Computational Geosciences*, **26**, 1189-1206 (2022).
10. Deucher, R.H., Durlofsky, L.J.: "A new flow-kinematics-based model for time-dependent effective dispersion in mixing-limited reactions," *Water Resources Research*, **58**, e2022WR032156 (2022).
11. Zou, A., Ye, T., Volkov, O., Durlofsky, L.J.: "Effective treatment of geometric constraints in derivative-free well placement optimization," *Journal of Petroleum Science and Engineering*, **215**, 110635 (2022).
12. Tang, M., Ju, X., Durlofsky, L.J.: "Deep-learning-based coupled flow-geomechanics surrogate model for CO<sub>2</sub> sequestration," *International Journal of Greenhouse Gas Control*, **118**, 103692 (2022).
13. Ma, Z., Volkov, O., Durlofsky, L.J.: "Multigroup strategy for well control optimization," *Journal of Petroleum Science and Engineering*, **214**, 110448 (2022).
14. Nasir, Y., Volkov, O., Durlofsky, L.J.: "A two-stage optimization strategy for large-scale oil field development," *Optimization and Engineering*, **23**, 361-395 (2022).
15. Jiang, S., Durlofsky, L.J.: "Treatment of model error in subsurface flow history matching using a data-space method," *Journal of Hydrology*, **603**, 127063 (2021).
16. Kim, Y.D., Durlofsky, L.J.: "A recurrent neural network-based proxy model for well-control optimization with nonlinear output constraints," *SPE Journal*, **26**, 1837-1857 (Aug. 2021) (also SPE paper 203980).
17. Jiang, S., Hui, M., Durlofsky, L.J.: "Data-space inversion with a recurrent autoencoder for naturally fractured systems," *Frontiers in Applied Mathematics and Statistics*, **7**, 686754 (2021).
18. Orsini, R.M., Brodrick, P.G., Brandt, A.R., Durlofsky, L.J.: "Computational optimization of solar thermal generation with energy storage," *Sustainable Energy Technologies and Assessments*, **47**, 101342 (2021).
19. Liu, Y., Durlofsky, L.J.: "3D CNN-PCA: A deep-learning-based parameterization for complex geomodels," *Computers & Geosciences*, **148**, 104676 (2021).
20. De Brito, D.U., Durlofsky, L.J.: "Field development optimization using a sequence of surrogate treatments," *Computational Geosciences*, **25**, 35-65 (2021).

21. Jiang, S., Durlofsky, L.J.: "Data-space inversion using a recurrent autoencoder for time-series parameterization," *Computational Geosciences*, **25**, 411-432 (2021).
22. Tang, M., Liu, Y., Durlofsky, L.J.: "Deep-learning-based surrogate flow modeling and geological parameterization for data assimilation in 3D subsurface flow," *Computer Methods in Applied Mechanics and Engineering*, **376**, 113636 (2021).
23. Tang, M., Liu, Y., Durlofsky, L.J.: "A deep-learning-based surrogate model for data assimilation in dynamic subsurface flow problems," *Journal of Computational Physics*, **413**, 109456 (2020).
24. Jin, Z.L., Liu, Y., Durlofsky, L.J.: "Deep-learning-based surrogate model for reservoir simulation with time-varying well controls," *Journal of Petroleum Science and Engineering*, **192**, 107273 (2020).
25. Jiang, S., Sun, W., Durlofsky, L.J.: "A data-space inversion procedure for well control optimization and closed-loop reservoir management," *Computational Geosciences*, **24**, 361-379 (2020).
26. Kostakis, F., Mallison, B.T., Durlofsky, L.J.: "Multifidelity framework for uncertainty quantification with multiple quantities of interest," *Computational Geosciences*, **24**, 761-773 (2020).
27. De Brito, D.U., Durlofsky, L.J.: "Well control optimization using a two-step surrogate treatment," *Journal of Petroleum Science and Engineering*, **187**, 106565 (2020).
28. Liu, Y., Durlofsky, L.J.: "Multilevel strategies and geological parameterizations for history matching complex reservoir models," *SPE Journal*, **25**, 81-104 (Feb. 2020) (also SPE paper 193895).
29. Jin, Z.L., Garipov, T., Volkov, O., Durlofsky, L.J.: "Reduced-order modeling of coupled flow and quasistatic geomechanics," *SPE Journal*, **25**, 326-346 (Feb. 2020) (also SPE paper 193863).
30. Liu, Y., Sun, W., Durlofsky, L.J.: "A deep-learning-based geological parameterization for history matching complex models," *Mathematical Geosciences*, **51**, 725-766 (2019).
31. Jiang, R., Durlofsky, L.J.: "Implementation and detailed assessment of a GNAT reduced-order model for subsurface flow simulation," *Journal of Computational Physics*, **379**, 192-213 (2019).
32. Sun, W., Durlofsky, L.J.: "Data-space approaches for uncertainty quantification of CO<sub>2</sub> plume location in geological carbon storage," *Advances in Water Resources*, **123**, 234-255 (2019).
33. Volkov, O., Buxhtynov, V., Durlofsky, L.J., Aziz, K.: "Gradient-based Pareto optimal history matching for noisy data of multiple types," *Computational Geosciences*, **22**, 1465-1485 (2018).
34. Trehan, S., Durlofsky, L.J.: "Machine-learning-based modeling of coarse-scale error, with application to uncertainty quantification," *Computational Geosciences*, **22**, 1093-1113 (2018).
35. Brodrick, P.G., Brandt, A.R., Durlofsky, L.J.: "Optimal design and operation of integrated solar combined cycles under emissions intensity constraints," *Applied Energy*, **226**, 979-990 (2018).

36. Jin, Z.L., Durlofsky, L.J.: "Reduced-order modeling of CO<sub>2</sub> storage operations," *International Journal of Greenhouse Gas Control*, **68**, 49-67 (2018).
37. Hui, M., Karimi-Fard, M., Mallison, B., Durlofsky, L.J.: "A general modeling framework for simulating complex recovery processes in fractured reservoirs at different resolutions," *SPE Journal*, **23**, 598-613 (April 2018) (also SPE paper 182621).
38. Shirangi, M.G., Volkov, O., Durlofsky, L.J.: "Joint optimization of economic project life and well controls," *SPE Journal*, **23**, 482-497 (April 2018) (also SPE paper 182642).
39. Brodrick, P.G., Brandt, A.R., Durlofsky, L.J.: "Operational optimization of an integrated solar combined cycle under practical time-dependent constraints," *Energy*, **141**, 1569-1584 (2017).
40. Sun, W., Hui, M., Durlofsky, L.J.: "Production forecasting and uncertainty quantification for naturally fractured reservoirs using a new data-space inversion procedure," *Computational Geosciences*, **21**, 1443-1458 (2017).
41. Trehan, S., Carlberg, K., Durlofsky, L.J.: "Error modeling for surrogates of dynamical systems using machine learning," *International Journal for Numerical Methods in Engineering*, **112**, 1801-1827 (2017).
42. Sun, W., Durlofsky, L.J.: "A new data-space inversion procedure for efficient uncertainty quantification in subsurface flow problems," *Mathematical Geosciences*, **49**, 679-715 (2017).
43. Jansen, J.D., Durlofsky, L.J.: "Use of reduced-order models in well control optimization," *Optimization and Engineering*, **18**, 105-132 (2017).
44. Aliyev, E., Durlofsky, L.J.: "Multilevel field development optimization under uncertainty using a sequence of upscaled models," *Mathematical Geosciences*, **49**, 307-339 (2017).
45. Rabinovich, A., Li, B., Durlofsky, L.J.: "Analytical approximations for effective relative permeability in the capillary limit," *Water Resources Research*, **52**, 7645-7667 (2016).
46. Trehan, S., Durlofsky, L.J.: "Trajectory piecewise quadratic reduced-order model for subsurface flow, with application to PDE-constrained optimization," *Journal of Computational Physics*, **326**, 446-473 (2016).
47. Shirangi, M.G., Durlofsky, L.J.: "A general method to select representative models for decision making and optimization under uncertainty," *Computers & Geosciences*, **96**, 109-123 (2016).
48. Karimi-Fard, M., Durlofsky, L.J.: "A general gridding, discretization, and coarsening methodology for modeling flow in porous formations with discrete geological features," *Advances in Water Resources*, **96**, 354-372 (2016).
49. Vo, H.X., Durlofsky, L.J.: "Regularized kernel PCA for the efficient parameterization of complex geological models," *Journal of Computational Physics*, **322**, 859-881 (2016).
50. Kang, C.A., Brandt, A.R., Durlofsky, L.J., Jayaweera, I.: "Assessment of advanced solvent-based post-combustion CO<sub>2</sub> capture processes using a bi-objective optimization technique," *Applied Energy*, **179**, 1209-1219 (2016).

51. Cameron, D.A., Durlofsky, L.J., Benson, S.M.: "Use of above-zone pressure data to locate and quantify leaks during carbon storage operations," *International Journal of Greenhouse Gas Control*, **52**, 32-43 (2016).
52. Li, H., Durlofsky, L.J.: "Upscaling for compositional reservoir simulation," *SPE Journal*, **21**, 873-887 (June 2016) (also SPE paper 173212).
53. Li, H., Durlofsky, L.J.: "Ensemble level upscaling for compositional flow simulation," *Computational Geosciences*, **20**, 525-540 (2016).
54. Kang, C.A., Brandt, A.R., Durlofsky, L.J.: "A new carbon capture proxy model for optimizing the design and time-varying operation of a coal-natural gas power station," *International Journal of Greenhouse Gas Control*, **48**, 234-252 (2016).
55. Li, H., Durlofsky, L.J.: "Local-global upscaling for compositional subsurface flow simulation," *Transport in Porous Media*, **111**, 701-730 (2016).
56. Shirangi, M.G., Durlofsky, L.J.: "Closed-loop field development under uncertainty by use of optimization with sample validation," *SPE Journal*, **20**, 908-922 (Oct. 2015) (also SPE paper 173219).
57. Bukshtynov, V., Volkov, O., Durlofsky, L.J., Aziz, K.: "Comprehensive framework for gradient-based optimization in closed-loop reservoir management," *Computational Geosciences*, **19**, 877-897 (2015).
58. Vo, H.X., Durlofsky, L.J.: "Data assimilation and uncertainty assessment for complex geological models using a new PCA-based parameterization," *Computational Geosciences*, **19**, 747-767 (2015).
59. Rabinovich, A., Itthisawatpan, K., Durlofsky, L.J.: "Upscaling of CO<sub>2</sub> injection into brine with capillary heterogeneity effects," *Journal of Petroleum Science and Engineering*, **134**, 60-75 (2015).
60. He, J., Durlofsky, L.J.: "Constraint reduction procedures for reduced-order subsurface flow models based on POD-TPWL," *International Journal for Numerical Methods in Engineering*, **103**, 1-30 (2015).
61. Brodrick, P.G., Kang, C.A., Brandt, A.R., Durlofsky, L.J.: "Optimization of carbon-capture-enabled coal-gas-solar power generation," *Energy*, **79**, 149-162 (2015).
62. Kang, C.A., Brandt, A.R., Durlofsky, L.J.: "Optimizing heat integration in a flexible coal-natural gas power station with CO<sub>2</sub> capture," *International Journal of Greenhouse Gas Control*, **31**, 138-152 (2014).
63. He, J., Durlofsky, L.J.: "Reduced-order modeling for compositional simulation by use of trajectory piecewise linearization," *SPE Journal*, **19**, 858-872 (Oct. 2014) (also SPE paper 163634).
64. Isebor, O.J., Echeverría Ciaurri, D., Durlofsky, L.J.: "Generalized field-development optimization with derivative-free procedures," *SPE Journal*, **19**, 891-908 (Oct. 2014) (also SPE paper 163631).
65. Vo, H.X., Durlofsky, L.J.: "A new differentiable parameterization based on Principal Component Analysis for the low-dimensional representation of complex geological models," *Mathematical Geosciences*, **46**, 775-813 (2014).

66. Rousset, M.A.H., Huang, C.K., Klie, H., Durlofsky, L.J.: "Reduced-order modeling for thermal recovery processes," *Computational Geosciences*, **18**, 401-415 (2014).
67. Isebor, O.J., Durlofsky, L.J., Echeverría Ciaurri, D.: "A derivative-free methodology with local and global search for the constrained joint optimization of well locations and controls," *Computational Geosciences*, **18**, 463-482 (2014).
68. Isebor, O.J., Durlofsky, L.J.: "Biobjective optimization for general oil field development," *Journal of Petroleum Science and Engineering*, **119**, 123-138 (2014).
69. Kourounis, D., Durlofsky, L.J., Jansen, J.D., Aziz, K.: "Adjoint formulation and constraint handling for gradient-based optimization of compositional reservoir flow," *Computational Geosciences*, **18**, 117-137 (2014).
70. Wilson, K.C., Durlofsky, L.J.: "Optimization of shale gas field development using direct search techniques and reduced-physics models," *Journal of Petroleum Science and Engineering*, **108**, 304-315 (2013).
71. He, J., Sarma, P., Durlofsky, L.J.: "Reduced-order flow modeling and geological parameterization for ensemble-based data assimilation," *Computers & Geosciences*, **55**, 54-69 (2013).
72. Karimi-Fard, M., Durlofsky, L.J.: "Accurate resolution of near-well effects in upscaled models using flow-based unstructured local grid refinement," *SPE Journal*, **17**, 1084-1095 (Dec. 2012) (also SPE paper 141675).
73. Bellout, M.C., Echeverría Ciaurri, D., Durlofsky, L.J., Foss, B., Kleppe, J.: "Joint optimization of oil well placement and controls," *Computational Geosciences*, **16**, 1061-1079 (2012).
74. Cameron, D.A., Durlofsky, L.J.: "Optimization of well placement, CO<sub>2</sub> injection rates, and brine cycling for geological carbon sequestration," *International Journal of Greenhouse Gas Control*, **10**, 100-112 (2012).
75. Fan, Y., Durlofsky, L.J., Tchelep, H.A.: "A fully-coupled flow-reactive-transport formulation based on element conservation, with application to CO<sub>2</sub> storage simulations," *Advances in Water Resources*, **42**, 47-61 (2012).
76. Aouizerate, G., Durlofsky, L.J., Samier, P.: "New models for heater wells in subsurface simulations, with application to the in situ upgrading of oil shale," *Computational Geosciences*, **16**, 519-533 (2012).
77. Nakashima, T., Li, H., Durlofsky, L.J.: "Near-well upscaling for three-phase flows," *Computational Geosciences*, **16**, 55-73 (2012).
78. Wang, H., Echeverría Ciaurri, D., Durlofsky, L.J., Cominelli, A.: "Optimal well placement under uncertainty using a retrospective optimization framework," *SPE Journal*, **17**, 112-121 (March 2012) (also SPE paper 141950).
79. Kang, C.A., Brandt, A.R., Durlofsky, L.J.: "Optimal operation of an integrated energy system including fossil fuel power generation, CO<sub>2</sub> capture and wind," *Energy*, **36**, 6806-6820 (2011).
80. Wilson, C.E., Aydin, A., Karimi-Fard, M., Durlofsky, L.J., Sagy, A., Brodsky, E.E., Kreylos, O., Kellog, L.H.: "From outcrop to flow simulation: constructing discrete fracture models from a LIDAR survey," *AAPG Bulletin*, **95**, 1883-1905 (2011).



81. Onwunalu, J., Durlofsky, L.J.: "A new well pattern optimization procedure for large-scale field development," *SPE Journal*, **16**, 594-607 (Sept. 2011) (also SPE paper 124364).
82. He, J., Saetrom, J., Durlofsky, L.J.: "Enhanced linearized reduced-order models for subsurface flow simulation," *Journal of Computational Physics*, **230**, 8313-8341 (2011).
83. Wilson, C.E., Aydin, A., Durlofsky, L.J., Boucher, A., Brownlow, D.T.: "Use of outcrop observations, geostatistical analysis, and flow simulation to investigate structural controls on secondary hydrocarbon migration in the Anacacho Limestone, Uvalde, TX," *AAPG Bulletin*, **95**, 1181-1206 (2011).
84. Scheidt, C., Caers, J., Chen, Y., Durlofsky, L.J.: "A multi-resolution workflow to generate high-resolution models constrained to dynamic data," *Computational Geosciences*, **15**, 545-563 (2011).
85. Echeverría Ciaurri, D., Isebor, O.J., Durlofsky, L.J.: "Application of derivative-free methodologies to generally constrained oil production optimisation problems," *International Journal of Mathematical Modelling and Numerical Optimisation*, **2**, 134-161 (2011).
86. Chen, Y., Park, K., Durlofsky, L.J.: "Statistical assignment of upscaled flow functions for an ensemble of geological models," *Computational Geosciences*, **15**, 35-51 (2011).
87. Livescu, S., Durlofsky, L.J., Aziz, K.: "A semianalytical thermal multiphase wellbore flow model for use in reservoir simulation," *SPE Journal*, **15**, 794-804 (Sept. 2010) (also SPE paper 115796).
88. Nakashima, T., Durlofsky, L.J.: "Accurate representation of near-well effects in coarse-scale models of primary oil production," *Transport in Porous Media*, **83**, 741-770 (2010).
89. Cardoso, M.A., Durlofsky, L.J.: "Use of reduced-order modeling procedures for production optimization," *SPE Journal*, **15**, 426-435 (June 2010) (also SPE paper 119057).
90. Fan, Y., Durlofsky, L.J., Tchelep, H.: "Numerical simulation of the in-situ upgrading of oil shale," *SPE Journal*, **15**, 368-381 (June 2010) (also SPE paper 118958).
91. Livescu, S., Durlofsky, L.J., Aziz, K., Ginestra, J.C.: "A fully-coupled thermal multiphase wellbore flow model for use in reservoir simulation," *Journal of Petroleum Science and Engineering*, **71**, 138-146 (2010).
92. Chen, T., Gerritsen, M.G., Lambers, J.V., Durlofsky, L.J.: "Global variable compact multipoint methods for accurate upscaling with full-tensor effects," *Computational Geosciences*, **14**, 65-81 (2010).
93. Onwunalu, J., Durlofsky, L.J.: "Application of a particle swarm optimization algorithm for determining optimum well location and type," *Computational Geosciences*, **14**, 183-198 (2010).
94. Cardoso, M.A., Durlofsky, L.J.: "Linearized reduced-order models for subsurface flow simulation," *Journal of Computational Physics*, **229**, 681-700 (2010).
95. Krogstad, S., Durlofsky, L.J.: "Multiscale mixed-finite-element modeling of coupled wellbore/near-well flow," *SPE Journal*, **14**, 78-87 (March 2009) (also SPE paper 106179).
96. Cardoso, M.A., Durlofsky, L.J., Sarma, P.: "Development and application of reduced-order modeling procedures for subsurface flow simulation," *International Journal for Numerical Methods in Engineering*, **77**, 1322-1350 (2009).

97. Chen, Y., Durlofsky, L.J.: "Ensemble-level upscaling for efficient estimation of fine-scale production statistics," *SPE Journal*, **13**, 400-411 (Dec. 2008) (also SPE paper 106086).
98. Chen, Y., Mallison, B.T., Durlofsky, L.J.: "Nonlinear two-point flux approximation for modeling full-tensor effects in subsurface flow simulations," *Computational Geosciences*, **12**, 317-335 (2008).
99. Sarma, P., Durlofsky, L.J., Aziz, K.: "Computational techniques for closed-loop reservoir modeling with application to a realistic reservoir," *Petroleum Science and Technology*, **26**, 1120-1140 (2008).
100. Sarma, P., Chen, W.H., Durlofsky, L.J., Aziz, K.: "Production optimization with adjoint models under nonlinear control-state path inequality constraints," *SPE Reservoir Evaluation & Engineering*, **11**, 326-339 (April 2008) (also SPE paper 99959).
101. Gong, B., Karimi-Fard, M., Durlofsky, L.J.: "Upscaling discrete fracture characterizations to dual-porosity, dual-permeability models for efficient simulation of flow with strong gravitational effects," *SPE Journal*, **13**, 58-67 (March 2008) (also SPE paper 102491).
102. Sarma, P., Durlofsky, L.J., Aziz, K.: "Kernel principal component analysis for efficient, differentiable parameterization of multipoint geostatistics," *Mathematical Geosciences*, **40**, 3-32 (2008).
103. Ahmadov, R., Aydin, A., Karimi-Fard, M., Durlofsky, L.J.: "Permeability upscaling of fault zones in the Aztec Sandstone, Valley of Fire State Park, Nevada, with a focus on slip surfaces and slip bands," *Hydrogeology Journal*, **15**, 1239-1250 (2007).
104. Durlofsky, L.J., Efendiev, Y., Ginting, V.: "An adaptive local-global multiscale finite volume element method for two-phase flow simulations," *Advances in Water Resources*, **30**, 576-588 (2007).
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