

MATTHIAS MORZFELD, LIST OF PUBLICATIONS

JOURNAL PUBLICATIONS

1. D. Hodyss, M. Morzfeld, *Using Diffusion Models to do Data Assimilation*, Monthly Weather Review, in press (2025).
2. R. Gjini, M. Morzfeld, O.R.A. Dunbar, T. Schneider, *The Ensemble Kalman Inversion Race*, under review, arXiv:2511.15853 (2025).
3. V. Wright, M. Morzfeld, M. Manga, *Reply to Xiao et al.: A wet or dry Martian mid-crust, that is only part of the question*, Proceedings of the National Academy of Sciences 122 (34) e2505168122 (2025).
4. E. Vargas Huitzil, M. Morzfeld, Steven Constable, *RamBO: randomized blocky Occam, a practical algorithm for generating blocky models and associated uncertainties*, Geophysical Journal International 241(1), 567-579 (2025).
5. C. Constable, M. Morzfeld, *Weather at the core: defining and categorizing geomagnetic excursions and reversals*, Geophysical Journal International 240(1), 747-762 (2025).
2024
6. D.N. Vishny, M. Morzfeld, K. Gwartz, E. Bach, O.R.A. Dunbar, D. Hodyss, *High-dimensional covariance estimation from a small number of samples*, Journal of Advances in Modeling Earth Systems, 16, e2024MS004417 (2024).
7. V. Wright, M. Morzfeld, M. Manga, *Liquid water in the Martian mid-crust*, Proceedings of the National Academy of Sciences 121 (35), e2409983121 (2024).
2023
8. M. Morzfeld, D. Hodyss, *A theory for why even simple covariance localization is so useful in ensemble data assimilation*, Monthly Weather Review 151(3), 717-736 (2023).
9. D. Hodyss, M. Morzfeld, *How sampling errors in covariance estimates cause bias in the Kalman gain and impact ensemble data assimilation*, Monthly Weather Review 151(9), 2413-2426 (2023).
10. X.T. Tong, M. Morzfeld, *Localized ensemble Kalman inversion*, Inverse Problems 39 064002 (2023).
11. E.J. Vavra, H. Qiu, B. Chi, P.-E. Share, A. Allam, M. Morzfeld, F. Vernon, Y. Ben-Zion, Y. Fialko. (2023). Active dipping interface of the Southern San Andreas fault revealed by space geodetic and seismic imaging. Journal of Geophysical Research: Solid Earth, 128, e2023JB026811.
12. B.J. Cych, M. Morzfeld, D. Heslop, S.M. Maher, J.S. Gee, Lisa Tauxe, *Thermal Resolution of Unblocking Temperatures (TROUT): A method for “unmixing” multi-component magnetizations*, Geochemistry, Geophysics, Geosystems, 24, e2023GC010920 (2023).
2022
13. D. Blatter, M. Morzfeld, K. Key, S. Constable, *Uncertainty quantification for regularized inversion of electromagnetic geophysical data—Part I: motivation and theory*, Geophysical Journal International, 231(2), 1057–1074 (2022).

14. D. Blatter, M. Morzfeld, K. Key, S. Constable, *Uncertainty quantification for regularized inversion of electromagnetic geophysical data – Part II: application in 1-D and 2-D problems*, *Geophysical Journal International*, 231(2), 1075–1095 (2022).
15. K. Gwartz, T. Davis, M. Morzfeld, C. Constable, A. Fournier, G. Hulot, *Can machine learning reveal precursors of reversals of the geomagnetic axial dipole field?*, *Geophysical Journal International*, 231(1), 520–535 (2022).

2021

16. K. Gwartz, M. Morzfeld, W. Kuang, A. Tangborn, *A testbed for geomagnetic data assimilation*, *Geophysical Journal International*, 227(3), 2180–2203 (2021).
17. B. Cych, M. Morzfeld, L. Tauxe, *Bias Corrected Estimation of Paleointensity (BiCEP): An improved methodology for obtaining paleointensity estimates*, *Geochemistry, Geophysics, Geosystems*, 22, e2021GC009755 (2021).
18. S. Swierczek, M.R. Mazloff, M. Morzfeld, J.L. Russell, *The effect of resolution on vertical heat and carbon transports in a regional ocean circulation model of the Argentine Basin*, *Journal of Geophysical Research: Oceans*, 126(7), e2021JC017235 (2021).
19. S. Lunderman, M. Morzfeld, D.J. Posselt, *Using global Bayesian optimization in ensemble data assimilation: parameter estimation, tuning localization and inflation, or all of the above*, *Tellus A: Dynamic Meteorology and Oceanography*, 73(1), 1-16 (2021).
20. T. Harty, M. Morzfeld, C. Snyder, *Eigenvector-spatial localization*, *Tellus A: Dynamic Meteorology and Oceanography* 73(1), 1-18 (2021).
21. K. Gwartz, M. Morzfeld, A. Fournier, G. Hulot, *Can one use Earth's magnetic axial dipole field intensity to predict reversals?*, *Geophysical Journal International* 225(1), 277-297 (2021). *Geophysical Journal International Student Author Award*.
22. J. Adams, J. Pillow, K. Joyce, M. Brennan, M.I. Español, M. Morzfeld, S. Breckling, D. Champion, E. Clarkson, R. Coffee, A. Gehring, M. Lund, D. Smalley, A. Williams, J. Zier, D. Frayer, M. Howard, E. Machorro, *An approach to characterizing spatial aspects of image system blur*, *Statistical Analysis and Data Mining: The ASA Data Science Journal*, 1-13 (2021).
23. J. Adams, M. Morzfeld, K. Joyce, M. Howard, A. Luttmann, *A blocking scheme for dimension-robust Gibbs sampling in large-scale image deblurring*, *Inverse Problems in Science and Engineering*, 1-22 (2021).

2020

24. X.T. Tong, M. Morzfeld and Y.M. Marzouk, *MALA-within-Gibbs samplers for high-dimensional distributions with sparse conditional structure*, *SIAM Journal of Scientific Computing*, 42(3), A1765–A1788 (2020).
25. S. Lunderman, M. Morzfeld, F. Glassmeier and G. Feingold, *Estimating parameters of the non-linear cloud and rain equation from a large-eddy simulation*, *Physica D*, 410, 123500 (2020).
26. M. Van Lier-Walqui, H.C. Morrison, M.R. Kumjian, K.J. Reimel, O.P. Prat, S. Lunderman and M. Morzfeld, *A Bayesian approach for statistical-physical bulk parameterization of rain microphysics, Part II: Idealized Markov chain Monte Carlo experiments*, *Journal of the Atmospheric Sciences*, 77:3, 1043–1064 (2020).

2019

27. M. Morzfeld and D. Hodyss, *Gaussian approximations in filters and smoothers for data assimilation*, Tellus A: Dynamic Meteorology and Oceanography, 71:1, 1-27 (2019).
28. M. Morzfeld, X.T. Tong and Y.M. Marzouk, *Localization for MCMC: sampling high-dimensional posterior distributions with local structure*, Journal of Computational Physics, 380, 1–28 (2019).
29. M. Morzfeld and B.A. Buffett, *A comprehensive model for the kyr and Myr time scales of Earth's axial magnetic dipole field*, Nonlinear Processes in Geophysics, 26, 123-142 (2019).
30. J.B. Bell, M.S. Day, J. Goodman, R.W. Grout and M. Morzfeld, *A Bayesian approach to calibrating hydrogen flame kinetics using many experiments and parameters*, Combustion and Flame 205, 305–315 (2019).
31. T.M. Harty, W.F. Holmgren, A.T. Lorenzo, M. Morzfeld, *Intra-hour cloud index forecasting with data assimilation*, Solar Energy 185, 270-282 (2019).

2018

32. M. Morzfeld, D. Hodyss and J. Poterjoy, *Variational particle smoothers and their localization*, Quarterly Journal of the Royal Meteorological Society, 144, 806-825 (2018).
33. M. Morzfeld, J. Adams, S. Lunderman, and R. Orozco, *Feature-based data assimilation in geophysics*, Nonlinear Processes in Geophysics, 25, 355-374 (2018).
34. M. Morzfeld, M.S. Day, R.W. Grout, G.S.H. Pau, S.A. Finsterle, and J.B. Bell, *Iterative Importance Sampling Algorithms for Parameter Estimation*, SIAM Journal on Scientific Computing 40:2, B329-B352 (2018).
35. A. Leach, K.K. Lin, M. Morzfeld, *Symmetrized importance samplers for stochastic differential equations*, Communications in Applied Mathematics and Computational Science 13 (2), 215–241 (2018).
36. D.T. Kawano, R.G. Salsa Jr., F. Ma, and M. Morzfeld, *A canonical form of the equation of motion of linear dynamical systems*, Proceedings of the Royal Society A 474: 20170809 (2018).

2017

37. M. Morzfeld, D. Hodyss, and C. Snyder *What the collapse of the ensemble Kalman filter tells us about particle filters*, Tellus A: Dynamic Meteorology and Oceanography, 69:1, 1283809 (2017).
38. M. Morzfeld, A. Fournier, G. Hulot, *Coarse predictions of dipole reversals by low-dimensional modeling and data assimilation*, Physics of Earth and Planetary Interiors **262**, 8–27 (2017).
39. A.T. Lorenzo, M. Morzfeld, W.F. Holmgren, A. Cronin, *Optimal interpolation of satellite and ground data for irradiance nowcasting at city scales*, Solar Energy **144**, 466–474 (2017).

2016

40. D. Hodyss, C.H. Bishop, and M. Morzfeld, *To what extent is your data assimilation scheme designed to find the posterior mean, the posterior mode or something else?*, Tellus A: Dynamic Meteorology and Oceanography, 68:1, 30625 (2016).

41. A.J. Chorin, F. Lu, R.N. Miller, M. Morzfeld, and X. Tu, *Sampling, feasibility, and priors in data assimilation*, *Discrete and Continuous Dynamical Systems* **36**(8), special issue dedicated to Peter D. Lax on the occasion of his ninetieth birthday, (2016).
- 2015**
42. M. Morzfeld, *Implicit sampling for path integral control, localization, and SLAM*, *ASME Journal of Dynamical Systems, Measurement and Control* **137**, 051016-1 – 051016-14 (2015).
43. M. Morzfeld, X. Tu, J. Wilkening, and A.J. Chorin *Implicit sampling for parameter estimation*, *Communications in Applied Mathematics and Computational Science* **10**(2), 205–225 (2015).
44. C. Snyder, T. Bengtsson and M. Morzfeld, *Performance bounds for particle filters using the optimal proposal*, *Monthly Weather Review* **143**, 4750 – 4761 (2015).
45. J. Goodman, K.K. Lin, and M. Morzfeld, *Small-noise analysis and symmetrization of implicit Monte Carlo samplers*, *Communications on Pure and Applied Mathematics*, doi: 10.1002/cpa.21592 (2015).
46. F. Lu, M. Morzfeld, X. Tu, and A.J. Chorin, *Limitations of polynomial chaos expansions in the Bayesian solution of inverse problems*, *Journal of Computational Physics* **282** 138–147 (2015).
- 2013**
47. A.J. Chorin and M. Morzfeld, *Conditions for successful data assimilation*, *Journal of Geophysical Research: Atmospheres* **118**(20), 11522–11533 (2013).
48. E. Atkins, M. Morzfeld, X. Tu, and A.J. Chorin, *Implicit particle methods and their connection with variational data assimilation*, *Monthly Weather Review* **141**, 1786–1803 (2013).
49. A.J. Chorin, M. Morzfeld, and X. Tu, *Implicit sampling, with applications to filtering and data assimilation*, *Chinese Annals of Mathematics* **34B**, 89–98 (2013).
50. M. Morzfeld, D.T. Kawano, and F. Ma, *Characterization of damped linear dynamical systems in free motion*, *Numerical Algebra, Control and Optimization* **3**(1), 49–62 (2013).
51. D.T. Kawano, M. Morzfeld, and F. Ma, *The decoupling of second-order linear systems with a singular mass matrix*, *Journal of Sound and Vibration* **332**(25), 6829–6846 (2013).
- 2012**
52. M. Morzfeld, X. Tu, E. Atkins, and A.J. Chorin, *A random map implementation of implicit filters*, *Journal of Computational Physics* **231**, 2049–2066 (2012).
53. M. Morzfeld and A.J. Chorin, *Implicit particle filtering for models with partial noise, and an application to geomagnetic data assimilation*, *Nonlinear Processes in Geophysics* **19**, 365–382 (2012).
- 2011**
54. M. Morzfeld, F. Ma, and B.N. Parlett, *The transformation of second-order linear systems into independent equations*, *SIAM Journal on Applied Mathematics* **71**(4), 1026–1043 (2011).
55. M. Morzfeld and F. Ma, *The decoupling of damped linear systems in configuration and state spaces*, *Journal of Sound and Vibration* **330**(2), 155–161 (2011).

56. D.T. Kawano, M. Morzfeld, and F. Ma, *The decoupling of defective linear dynamical systems in free motion*, Journal of Sound and Vibration **330**(21), 5165–5183 (2011).

57. F. Ma and M. Morzfeld, *A general methodology for decoupling damped linear systems*, Procedia Engineering **14**, 2498–2502 (2011).

2010

58. A.J. Chorin, M. Morzfeld, and X. Tu, *Implicit filters for data assimilation*, Communication in Applied Mathematics and Computational Science **5**, 221–240 (2010).

59. F. Ma, M. Morzfeld, and A. Imam, *The decoupling of damped linear systems in free or forced vibration*, Journal of Sound and Vibration **329**(15), 3182–3202 (2010).

2009

60. F. Ma, A. Imam, and M. Morzfeld, *The decoupling of damped linear systems in oscillatory free vibration*, Journal of Sound and Vibration **324** (1-2), 408–428 (2009).

61. M. Morzfeld, N. Avajakom, and F. Ma, *Diagonal dominance of damping and the decoupling approximation in linear vibratory systems*, Journal of Sound and Vibration **320**(1-2), 406–420 (2009).

2008

62. M. Morzfeld, N. Avajakom, and F. Ma, *On the decoupling approximation in damped linear systems*, Journal of Vibration and Control, **14** (12), 1869–1884 (2008).

63. M. Morzfeld, N. Avajakom, and F. Ma, *A remark about the decoupling approximation in damped discrete linear systems*, Mechanics Research Communications **35**, 439–446 (2008).

REPORTS

1. E. Satterfield et al., *NRL Atmospheric Data Assimilation and ONR Code 31: Workshop Proceedings*, NRL/Code/FR–2021, 2021.

BOOK CHAPTERS

1. A.J. Chorin, M. Morzfeld, and X. Tu, *Implicit sampling, with application to data assimilation*, in “Partial Differential Equations: Theory, Control and Approximation” (in honor of the scientific heritage of Jacques-Louis Lions), P.G. Ciarlet, T. Li and Y. Maday (editors), Springer, 2014.
2. A.J. Chorin, M. Morzfeld, and X. Tu, *A survey of implicit particle filters for data assimilation*, in “State Space Models, with Applications in Economics and Finance” Y. Zeng and S. Wu (editors), Springer, 2013.