

# Dr. Jonathan B. Ajo-Franklin

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Geological Staff Scientist, Energy Geoscience Division, Earth & Environmental Science Area

## BACKGROUND

- Applied geophysics with a focus on problems related to energy and the environment.
- Core expertise in seismic imaging algorithms, novel timelapse measurements, borehole seismology, distributed acoustic sensing, experimental rock-physics, and synchrotron imaging techniques.
- Broad knowledge of coupled subsurface processes including hydrogeology, geochemistry, and reservoir microbiology, as relevant to geophysical monitoring.

## EDUCATION

Ph.D.	2005	Geophysics	Stanford University	(Advisor Jerry M. Harris)
M.S.	2003	Geophysics	Stanford University	(Advisor Jerry M. Harris)
B.A.	1998	Computer Science & History	Rice University	

## PROFESSIONAL POSITIONS

2017 - Present	Geophysics Dept. Head	Lawrence Berkeley National Laboratory
2013 - Present	Staff Scientist	Lawrence Berkeley National Laboratory
2007 - 2013	Research Scientist	Lawrence Berkeley National Laboratory
2005 - 2007	Post-Doctoral Fellow	Earth Resources Laboratory, MIT

## JOURNAL PUBLICATIONS

1. Deng, H., Voltolini, M., Molins, S., Steefel, C., DePaolo, D., **Ajo-Franklin, J.**, and L. Yang, "Fracture coating development and erosion in a carbonate-rich shale," submitted April 2017, in review at *Environmental Science and Technology*.
2. Voltolini, M., Haboub, A., Dou, S., Kwon, T-H., MacDowell, A., Parkinson, D.Y., and **J. Ajo-Franklin**, "The Emerging Role of 4D Synchrotron X-Ray Micro-Tomography for Climate and Fossil Energy Studies: Present Capabilities at Beamline 8.3.3 at the Advanced Light Source" submitted April 2017, in review, at the *Journal of Synchrotron Radiation*.
3. Saltiel, S., Bonner B.P., Mittal, T., Delbridge, B., and **J.B. Ajo-Franklin**, "Experimental evidence for dynamic friction on rock fractures from frequency-dependent nonlinear hysteresis and harmonic generation," submitted April 2017, in review at *Journal of Geophysical Research – Solid Earth*.
4. Dou, S., Lindsey, N., Wagner, A.M., Daley, T.M., Freifeld, B., Robertson, M., Peterson, J., Ulrich, C., Martin, E.R., and J.B. Ajo-Franklin, "Distributed Acoustic Sensing for Seismic Monitoring of the Near Surface: A Traffic-Noise Interferometry Case Study," submitted March 2017, in review at *Scientific Reports*.
5. Marchesini, P, **Ajo-Franklin, J.B.**, and T. Daley, "In-situ measurement of velocity-stress sensitivity with crosswell CASSM," submitted March 2017, in review at *Geophysics*.
6. Voltolini, M., T-H. Kwon, and **J. Ajo-Franklin**, "Visualization and Prediction of Supercritical CO<sub>2</sub> Distribution in Sandstones during Drainage: An in situ Synchrotron X-Ray micro-Computed Tomography Study," submitted March 2017, in review at the *International Journal of Greenhouse Gas Control (IJGGC)*.
7. Zhu, T., **Ajo-Franklin, J.**, and T. Daley, "Spatio-temporal changes in seismic attenuation caused by injected CO<sub>2</sub> at the Frio-II pilot site, Dayton TX, USA," accepted/in revision April 2017 in *Journal of Geophysical Research – Solid Earth*.
8. Cheng, Y., Hubbard, C., Zheng, L., Arora, B., Li, L., Karaoz, U., **Ajo-Franklin, J.B.**, and N. Bouskill, 2017, "Next Generation Modeling of Microbial Souring – Parameterization through Genomic Information," accepted/in revision, *International Biodeterioration and Biodegradation*.
9. Saltiel, S., Bonner, B.P., and **J. Ajo-Franklin**, 2017, "Strain-dependent partial slip on rock fractures under seismic-frequency torsion," in press at *Geophysical Research Letters*.

10. **Ajo-Franklin, J.**, Voltolini, M., Molins, S., and L. Yang, "Coupled Processes in a Fractured Reactive System: A Dolomite Dissolution Study with Relevance to GCS Caprock Integrity," 2017, in review, *Caprock Integrity in Geological Carbon Storage [AGU Monograph]*, accepted, in press.
11. Beekingham, L.E., Steefel, C., Swift, A.M., Voltolini, M., Yang, L., Anovitz, L.M., Sheets, J.M., Cole, D.R., Kneafsey, T., Mitnick, E.H., Zhang, S., Landrot, G., **Ajo-Franklin, J.B.**, DePaolo, D.J., Mito, S., and Z. Xue, 2017, "Evaluation of accessible mineral surface areas for improved prediction of mineral reaction rates in porous media," *Geochemica et Cosmochimica Acta*, Vol. 205, pp. 31-49.
12. Zuo, L., **Ajo-Franklin, J.B.**, Voltolini, M., Geller, J.T., and S.M. Benson, 2017, "Pore-scale multiphase flow modeling and imaging of CO<sub>2</sub> exsolution in Sandstone," *Journal of Petroleum Science and Engineering*, accepted August 2016, in press.
13. Garing, C., de Chalendar, J.A., Voltolini, M., **Ajo-Franklin, J.B.**, and S.M. Benson, 2017, "Pore-scale capillary pressure analysis using multi-scale X-ray microtomography," *Advances in Water Resources*, Vol. 104, pp. 223-241.
14. Saltiel, S., Selvadurai, P.A., Bonner, B.P., Glaser, S.D., and **J.B. Ajo-Franklin**, 2017, "Experimental development of low-frequency shear modulus and attenuation measurements in mated rock fractures: shear mechanics due to asperity contact area changes with normal stress," *Geophysics*, Vol. 82, No. 2, pp. M19-M36.
15. Dou, S., Nakagawa, S., Dreger, D., and **J.B. Ajo-Franklin**, 2017, "An effective-medium model for P-wave velocities of saturated, unconsolidated permafrost," *Geophysics*, Vol. 82, No.3, pp. EN33-EN50.
16. Deng, H., Molins, S., Steefel, C., DePaolo, D., Voltolini, M., Yang, L., and **J.B. Ajo-Franklin**, 2016, "A 2.5 D Reactive Transport Model for Fracture Alteration Simulation," *Environmental Science and Technology*, Vol. 50, No. 14, pp. 756407571, DOI: 10.1021/acs.est.6b02184.
17. Cheng, Y., Hubbard, C., Li, L., Bouskill, N., Molins, S., Zheng, L., Sonnenthal, E., Engelbrekston, A., Coates, J.D., and **J.B. Ajo-Franklin**, 2016, "Understanding microbial reservoir souring and remediation: a reactive transport model of sulfur cycling as impacted by nitrate and perchlorate treatments," *Environmental Science and Technology*, Vol. 50, No. 13, pp. 7010-7018, DOI: 10.1021/acs.est.6b00081
18. Beekingham, L., Mitnick, E., Zhang, S., Voltolini, M., Swift, A.M., Yang, L., Cole, D.R., Sheets, J.M., Steefel, C.I., **Ajo-Franklin, J.B.**, DePaolo, D.J., Mito, S., and Z. Xue, 2016, "Evaluation of mineral reactive surface area estimates for prediction of reactivity of multi-mineral sediment," in review, *Geochemica et Cosmochimica Acta*, Vol. 188, No. 1, pp. 310-329.
19. Noh, D-H., **Ajo-Franklin, J.B.**, Kwon, T-H., and B. Mhunthan, 2016, "P- and S-wave Responses of Bacterial Biopolymer Formation in Unconsolidated Porous Media," *Journal of Geophysical Research – Biogeoscience*, Vol. 121, No. 4, pp. 1158-1177, DOI: 10.1002/2015JG003118
20. Dou, S., Dreger, D., Nakagawa, S., and **J.B. Ajo-Franklin**, 2016, "A rock physics investigation of unconsolidated saline permafrost: P-wave properties from laboratory ultrasonic measurements," *Geophysics*, [Cryosphere Special Issue], Vol. 81, No. 1, pp. WA233-WA245.
21. Berryman, J.G., Kwon, T.-H., Dou, S., **Ajo-Franklin, J.B.**, and S.S. Hubbard, 2015, "Analysis of laboratory data on ultrasonic monitoring of permeability reduction due to biopolymer formation in unconsolidated granular media," *Geophysical Prospecting*, doi: 10.1111/1365-2478.12295
22. Peet, K.C., Freedman, A.J.E., Hernandez, H.H., Britto, V., Boreham, C., **Ajo-Franklin, J.B.**, and J.R. Thompson, 2015, "Microbial growth under supercritical CO<sub>2</sub>," *Applied and Environmental Microbiology*, Vol. 81, No. 8, pp. 2881-2892, doi:10.1128/AEM.03162-14.
23. Molins, S., Trebotich, D., Yang, L., **Ajo-Franklin, J.B.**, Ligocki, T.J., Shen, C., and C. Steefel, 2014, "Pore-scale controls on calcite dissolution rates from flow-through laboratory and numerical experiments," *Environmental Science and Technology*, Vol. 48, No. 13, pp. 7453-7460.
24. Hubbard, C.H., Cheng, Y., Engelbrekston, A., Druhan, J.L., Li, L., **Ajo-Franklin, J.B.**, Coates, J.D., and M.E. Conrad, 2014, "Isotopic insights into microbial sulfur cycling in oil reservoirs," *Frontiers in Microbiology*, Vol. 5, doi: 10.3389/fmicb.2014.00480
25. Dou, S. and **J.B. Ajo-Franklin**, 2014, "Full-wavefield inversion of surface waves for mapping embedded low-velocity zones in permafrost," *Geophysics*, Vol. 79, No. 6, pp. EN107-EN124.
26. Li, L., V. Surasani, **J. Ajo-Franklin**, C. Hubbard, S. Hubbard, Y. Wu, 2013, "Reactive Transport Modeling of Selective Bioclogging by *L. mesenteroides* at the Reservoir Scale," *Energy & Fuels*, Vol. 27, No. 11, pp. 6538-6551.

27. Kwon, T.L., and **J.B. Ajo-Franklin**, 2013, "High-frequency seismic response during permeability reduction due to biopolymer clogging in unconsolidated porous media," *Geophysics*, Vol. 78, No. 6, pp. EN117-EN127.
28. Daley, T.M., B.M. Friefeld, **J. Ajo-Franklin**, S. Dou, R. Pevzner, V. Shulakova, S. Kashikar, D. Miller, J. Goetz, J. Henniges, and S. Lueth, 2013, "Field testing of fiber-optic distributed acoustic sensing (DAS) for subsurface seismic monitoring," *The Leading Edge*, Vol. 32, No. 6, pp. 699-706.
29. Doetsch, J., M.B. Kowalsky, C. Doughty, S. Finsterle, **J.B. Ajo-Franklin**, C.R. Carrigan, X. Yang, S. D. Hovorka, and T.M. Daley, 2013, "Constraining CO<sub>2</sub> Simulations by coupled modeling and inversion of ERT and gas composition data," *International Journal of Greenhouse Gas Control (IJGGC)*, 2013, Vol. 18, pp. 510-522.
30. **Ajo-Franklin**, J.B., Peterson, J., Doetsch, J., and T.M. Daley, 2013, "High-Resolution Characterization of a CO<sub>2</sub> Plume Using Crosswell Seismic Tomography: Cranfield, MS," *International Journal of Greenhouse Gas Control (IJGGC)*, 2013, Vol. 18, pp. 497-509.
31. Kneafsey, T., Silin, D., and **J.B. Ajo-Franklin**, 2013, "Supercritical CO<sub>2</sub> flow through a layered silica sand/calcite sand system: Experiment and modified Maximal Inscribed Spheres analysis," *International Journal of Greenhouse Gas Control (IJGGC)*, Vol. 14, pp. 141-150
32. Landrot, G., **Ajo-Franklin, J.B.**, Cabrini, S., and C.I. Steefel, 2012, "Measurement of the Reactive Surface Area Relevant to CO<sub>2</sub> Mineralization in a Reservoir," *Chemical Geology*, Vol. 318-319, p. 113-125
33. Noiriell, C., Steefel, C.I., Yang, L., and **J.B. Ajo-Franklin**, 2012, "Upscaling calcium carbonate precipitation rates from pore to continuum scale," *Chemical Geology*, Vol. 318-319, p. 60-74
34. Wu, Y., **Ajo-Franklin, J.B.**, Spycher, N., Hubbard, S., Zhang, G., Williams, K., Taylor, J., Fujita, Y., and R. Smith, 2011, "Geophysical monitoring and reactive transport modeling of ureolytically-driven calcium carbonate precipitation," *Geochemical Transactions*, Vol. 12, No. 7
35. Armstrong, R. and **J.B. Ajo-Franklin**, 2011, "Investigating biomineralization using synchrotron based x-ray computed microtomography," *Geophysical Research Letters*, Vol. 38, No. L08406
36. Daley, T., **Ajo-Franklin, J.B.**, and C. Doughty, 2011, "Constraining the reservoir model of an injected CO<sub>2</sub> plume with crosswell CASSM at the Frio-II Brine Pilot," *International Journal of Greenhouse Gas Control (IJGGC)*, Vol. 5, No. 2, pp. 1022-1030.
37. Minsley, B.J., **Ajo-Franklin, J.B.**, Mukhopadhyay, A. and Morgan, F.D. 2011, "Hydrogeophysical Methods for Analyzing Aquifer Storage and Recovery Systems," *Ground Water*, Vol. 49, No. 2, pp. 250-269
38. Wu, Y., Hubbard, S.S., Williams, K.H., and **Ajo-Franklin, J.B.**, 2010, "On the complex conductivity signatures of calcite precipitation," *JGR-Biosciences*, Vol. 115, No. G00G04
39. **Ajo-Franklin, J.B.**, 2009, "Optimal Experiment Design for Timelapse Traveltime Tomography," *Geophysics*, Vol. 74, No.4, p. Q27-Q40
40. Lu, R., Willis, R.E., Campman, X., **Ajo-Franklin, J.B.**, and Toksoz, M.N. 2008, "Redatuming through a Salt Canopy and Target Oriented Salt Flank Imaging," *Geophysics*, Vol. 73, No. 3, p. S63-S71
41. Daley, T.M., Solbau, R.D., **Ajo-Franklin, J.B.**, and Benson, S.M. 2007, "Continuous Active-Source Seismic Monitoring of CO<sub>2</sub> Injection in a Brine Aquifer," *Geophysics*, Vol. 72, No. 5, p. A57-A61
42. **Ajo-Franklin, J.B.**, Minsley, B.J., and Daley, T.M. 2007, "Applying Compactness Constraints to Differential Traveltime Tomography," *Geophysics*, Vol. 72, No. 4, p. R67-R75
43. **Ajo-Franklin, J.B.**, Geller, J.T., and Harris, J.M. 2007. "The Ultrasonic Properties of Granular Media Saturated With DNAPL/Water Mixtures," *Geophysical Research Letters*, Vol. 34, No. 17, L07404
44. **Ajo-Franklin, J.B.**, Urban, J.A., and Harris, J.M. 2006. "Using Resolution-Constrained Adaptive Meshes For Traveltime Tomography," *Journal Of Seismic Exploration*, Vol.14, pp. 371-390
45. **Ajo-Franklin, J.B.**, Geller, J.T., and Harris, J.M. 2006. "A Survey Of The Geophysical Properties of Dense Chlorinated Solvents," *Journal Of Applied Geophysics*, Vol. 59, No.3, pp. 177-189
46. **Ajo-Franklin, J.B.**, Geller, J.T., and Harris, J.M. 2004. "The Dielectric Properties of Granular Media Saturated With DNAPL/Water Mixtures," *Geophysical Research Letters*, Vol. 31, No. 17, L17501

47. **Franklin, J.B.** and Harris, J.M. 2001. "A High-Order Fast Marching Scheme for the Linearized Eikonal Equation," *Journal of Computational Acoustics*, Vol.9, No.3, pp. 1095-1109

## SELECTED EXTENDED ABSTRACTS

1. Dou, S., **Ajo-Franklin, J.**, Daley, T., Robertson, M., Wood, T., Freifeld, B., Pevzner, R., Correa, K.T., Urosevic, M., and B. Gurevich, (2016), "Surface orbital vibrator (SOV) and fiber-optic DAS: Field demonstration of economical continuous seismic time-lapse monitoring from the Australian CO2CRC Otway site," Extended abstract presented at the *Society of Exploration Geophysics Annual Meeting 2016*, Dallas, TX, Oct. 16-20.
2. **Ajo-Franklin, J.**, Lindsey, N., Dou, S., Daley, T.M. Freifeld, B., Martin, E.R., Robertson, M., Ulrich, C., Wagner, A., (2015), "A Field Test of Distributed Acoustic Sensing for Ambient Noise Recording," Extended abstract presented at the *Society of Exploration Geophysics Annual Meeting 2015*, New Orleans, LA., Nov. 4-8.
3. Martin, E.R., **Ajo-Franklin, J.**, Dou, S., Lindsey, N., Daley, T.M., Freifeld, B., Robertson, M., Wagner, A., and C. Ulrich, (2015), "Interferometry of ambient noise from a trenched distributed acoustic sensing array," Extended abstract presented at the *Society of Exploration Geophysics Annual Meeting 2015*, New Orleans, LA., Nov. 4-8.
4. Dou, S. and **Ajo-Franklin, J.** (2012), "Seismic Surface Wave Investigations of Deep Low-Velocity Zones in Arctic Coastal Permafrost near Barrow, Alaska," Extended abstract, presented at the the *SEG/AGU Cryosphere Workshop*, Boise, ID, Jan. 6-8.
5. Dou, S., and **Ajo-Franklin, J.** (2012), "Application of Surface-Wave Methods to Imaging Subsurface Properties in Permafrost Soils," Extended abstract presented at the *Society of Exploration Geophysics Annual Meeting 2012*, Las Vegas, NV., Nov. 4-8.
6. D.M. Ushizima, D. Parkinson, P. Nico, **J.B. Ajo-Franklin**, A. MacDowell, B. Kocar, W. Bethel, and J. Sethian (2011), "Statistical segmentation and porosity quantification of 3D x-ray microtomography," Society of Photo-Optical Instrumentation Engineers (SPIE).
7. Kwon, T.H. and **J.B. Ajo-Franklin** (2011), "Seismic monitoring of permeability reduction due to biopolymer formation in unconsolidated materials," *Society of Exploration Geophysicists Annual Meeting 2011*
8. **Ajo-Franklin, J.B.**, T.M. Daley, B. Butler-Veytia, J. Peterson, Y. Wu, B. Kelley, and S. Hubbard (2011), "Multi-level continuous active source seismic monitoring (ML-CASSM): Mapping shallow hydrofracture evolution at a TCE contaminated site," *Society of Exploration Geophysicists Annual Meeting 2011*, [Selected as *Best Paper* from Conference]
9. Hovorka, S.D., T.A. Meckel, R.H. Trevino, J. Lu, J-P. Nicot, J.W. Choi, D. Freeman, P. Cook, T.M. Daley, **J.B. Ajo-Franklin**, B.M. Freifeld, C. Doughty, C.R. Carrigan, D. La Brecque, Y.K. Kharaka, J.J. Thordsen, T.J. Phelps, C. Yang, K.D. Romanak, T. Zhang, R. M. Holt, J.S. Lindler, and R. Butsch (2011), "Monitoring a large volume CO<sub>2</sub> injection: Year two results from SECARB project at Denbury's Cranfield, Mississippi, USA," *Energy Procedia*, Vol. 4, 2011, pp. 3478-3485, *Proceedings of the 10<sup>th</sup> International Conference on Greenhouse Gas Control Technologies*
10. Silin, D., T.J. Kneafsey, **J.B. Ajo-Franklin**, and P. Nico (2011), "A Multimodal Imaging Study of Natural Gas Flow in Tight Sands," *SPE Annual Technical Conference and Exhibition*, to appear Oct. 2011
11. Daley, T.M., **Ajo-Franklin, J.B.**, and C. Doughty (2008), "Integration of crosswell CASSM (Continuous Active Source Seismic Monitoring) and flow modeling for imaging of a CO<sub>2</sub> plume in a brine aquifer," *78<sup>th</sup> Ann. Internat. Mtg. Soc. Of Expl. Geophys. (SEG)*.
12. Zhang, Y., **Ajo-Franklin, J.B.**, and M.N. Toksoz (2007), "Relative particle motions of fluid and solid phases in porous media: A numerical study of seismic scattering in digitized granular models," *77<sup>th</sup> Ann. Internat. Mtg. Soc. Of Expl. Geophys. (SEG)*.
13. Lu, R., Willis, M.E., Campman, X., **Ajo-Franklin, J.**, and M.N. Toksoz (2007), "Redatumming through a salt canopy – Another salt-flank imaging strategy," *77<sup>th</sup> Ann. Internat. Mtg. Soc. Of Expl. Geophys. (SEG)*.
14. **Ajo-Franklin, J.B.**, Urban, J., and Harris, J.M. (2005), "Temporal Integration of Seismic Travelttime Tomography," *75<sup>th</sup> Ann. Internat. Mtg. Soc. Of Expl. Geophys. (SEG)*.

15. **Ajo-Franklin, J.B.**, Geller, J.T., Majer, E.L., Peterson, J.E., Williams, K., and Harris, J.M. (2003), "Preliminary Characterization of a NAPL-Contaminated Site using Borehole Geophysical Techniques," *Symp. App. Geop. Envi. Eng. Prob. (SAGEEP), EEGS*
16. **Franklin, J.**, (1997), "Minimum travelttime calculations in anisotropic media using graph theory." *67<sup>th</sup> Ann. Internat. Mtg, Soc. Of Expl. Geophys. (SEG).*

## RECENT INVITED PRESENTATIONS

**Ajo-Franklin, J.B.**, "Advancing time-lapse seismic acquisition with semi-permanent source and receiver arrays: CASSM and DAS for seismic monitoring," Jan. 2016, Invited talk at Lawrence Livermore National Laboratory, Seismology Group.

**Ajo-Franklin, J.B.**, "Monitoring Thermo-mechanical Alteration of Source Rock at the Micron Scale," Jan. 2016, Invited Talk, Stanford University (STEMS Workshop, ERE).

**Ajo-Franklin, J.B.**, "Advancing time-lapse seismic acquisition with semi-permanent source and receiver arrays: CASSM and DAS for seismic monitoring," Mar. 2015, Invited talk at Sandia National Laboratory, Geophysics Dept.

**Ajo-Franklin, J.B.**, "Continuous Active Source Seismic Monitoring (CASSM): Applications in Monitoring CO<sub>2</sub> Sequestration and Hydraulic Fracture Evolution [2 Case Studies]," Feb. 2015, Invited talk at Stanford University (Department of Geophysics).

**Ajo-Franklin, J.B.**, "Coupled Multiphase Flow and Chemistry at the Micron Scale Research in Pore-Scale Processes Conducted at Center for Nanoscale Control of Geologic CO<sub>2</sub> (NCGC)," Feb. 2013, Invited Plenary Speaker, Montana State University (Annual Earth Science Colloquium)

**Ajo-Franklin, J.B.**, "Continuous Active Source Seismic Monitoring (CASSM): Applications In Monitoring CO<sub>2</sub> Sequestration and Hydraulic Fracture Evolution [2 Case Studies]," June 2012, Invited talk at Stanford University (Environmental Fluid Mechanics and Hydrology Laboratory)

**Ajo-Franklin, J.B.**, "Continuous Active Source Seismic Monitoring (CASSM): Applications In Monitoring CO<sub>2</sub> Sequestration and Hydraulic Fracture Evolution [2 Case Studies]," June 2012, Invited talk at the University of California, Berkeley (Berkeley Seismological Laboratory)

**Ajo-Franklin, J.B.**, "Using Synchrotron Micro Tomography for Pore-Scale Monitoring of Super-Critical CO<sub>2</sub> Flow: Challenges for Dynamic Datasets," October, 2012, Invited talk at the Advanced Light Source User Meeting (Workshop on Microtomography)

**Ajo-Franklin, J.B.**, "Using Synchrotron Micro Tomography for Pore-Scale Monitoring of scCO<sub>2</sub> Flow and CaCO<sub>3</sub> Precipitation: Implications for Rock Physics," Invited Talk at the SEG Annual Meeting Workshop, San Antonio, TX, Sept. 22, 2011

**Ajo-Franklin, J.** and Daley, T., "Using Optimal Design to Improve CO<sub>2</sub> Sequestration Monitoring Strategies," Geologic Carbon Sequestration Site Integrity: Characterization and Monitoring Workshop, Columbus OH, June. 7-8, 2010

**Ajo-Franklin, J.**, Magnant, Z, and Daley, T., "Using Optimal Design to Improve CO<sub>2</sub> Sequestration Geophysical Monitoring Strategies," CO<sub>2</sub> Sequestration Geophysics: SEG 2009 Summer Research Workshop Banff, Canada, August 23-27, 2009

## WHITE PAPERS, TECHNICAL REPORTS, & BOOK CHAPTERS

1. **Ajo-Franklin, J.**, L. Anovitz, I. Bourg, A. Chialvo, D. Cole, T.W. Kim, G. Rother, G. Sposito, T. Tokunaga, L. Vlcek, and J. Wan, (2011), "Caprock Integrity in the Geologic Sequestration of Carbon Dioxide," Center for the Nanoscale Control of Geologic CO<sub>2</sub>, Whitepaper #1
2. Silin, D., T.J. Kneafsey, **J.B. Ajo-Franklin**, and P. Nico (2010), "Pore-scale mechanisms of gas flow in tight sand reservoirs," Technical Report LBNL-4103E, Nov. 2010

- Nico, P. S., **Ajo-Franklin, J. B.**, Benson S. M., MacDowell, A., Silin, D. B., Tomutsa, L. and Wu, Y. Synchrotron X-ray Micro-Tomography and Geological CO<sub>2</sub> Sequestration.. In *Advances in Computed Tomography for Geomaterials, GeoX 2010*. Ed. Khalid. A. Alshibi and Allen H. Reed. Wiley, & Sons, Hoboken, NJ, p. 374-380, 2010, [Book Chapter]

## SELECTED CONFERENCE ABSTRACTS & POSTERS

Dou, S., Dreger, D.S., Peterson, J., Ulrich, C., Dafflon, B., Hubbard, S.S., and **J.B. Ajo-Franklin**, "Wavefield Inversion of Surface Waves for Delineating Seismic Structure in Saline Permafrost: A Case History from the Barrow Peninsula, AK," American Geophysical Union, Fall Meeting, 2014.

Beckingham, L.E., Zhang, S., Mitnick, E., Cole, D.R., Yang, L., Anovitz, L.M., Sheets, J., Swift, A., Kneafsey, T.J., Landrot, G., Mito, S., Xue, Z., Steefel, C, DePaolo, D.J., and **J.B. Ajo-Franklin**, "The role of advanced reactive surface area characterization in improving predictions of mineral reaction rates," American Geophysical Union, Fall Meeting, 2014.

Voltolini, M., Yang, L., and **J.B. Ajo-Franklin**, "The Evolution of a Fracture in a Dolomite Sample During Dissolution Induced by a CO<sub>2</sub>-Saturated Solution Flow at Reservoir Conditions: a Dynamic Synchrotron X-Ray Microtomography Study," American Geophysical Union, Fall Meeting, 2014.

**Ajo-Franklin, J.B.**, Daley, T.M., Freifeld, B.M., Tang, D.G., Zhang, R., Wagner, A.M., Dou, S., Bjella, K., and R. Pevzner, "Development of a surface-wave imaging system for geotechnical applications based on distributed acoustic sensing (DAS) and ambient noise interferometry," American Geophysical Union, Fall Meeting, 2014.

Dou, S., and **Ajo-Franklin, J.** (2012), "Mapping Deep Low Velocity Zones in Alaskan Arctic Coastal Permafrost using Seismic Surface Waves," Abstract presented at *2012 Fall Meeting, American Geophysical Union*, San Francisco, CA., Dec. 2-7.

J. Doetsch, M.B. Kowalsky, C. Doughty, S. Finsterle, **J.B. Ajo-Franklin**, X. Yang, C.R. Carrigan, and T.M. Daley (2012) "Fully coupled hydrogeophysical inversion of CO<sub>2</sub> migration data in a deep saline aquifer" SEG-AGU Hydrogeophysics workshop in Boise, ID, July 2012

MacDowell, A., Parkinson, D., Haboub, A., Schaible, E., Nasiatka, J., Bale, H., Ritchie, R., and **J. Ajo-Franklin** (2012), "X-ray micro-Tomography at the Advanced Light Source," SPIE

Beyer, J.H., **Ajo-Franklin, J.**, Ali, S., and Burton, E., (2011), "WESTCARB Geologic Characterization Well in Northern California's Natural Gas Province," *10<sup>th</sup> Annual Conference on Carbon Capture, Utilization, and Sequestration*, Pittsburgh, PA, May, 2012.

Daley, T.M., **J.B. Ajo-Franklin**, C. Doughty, and S. Hovorka (2011), "Seismic Monitoring at SECARB's Phase-III Cranfield Site – Initial Results," *10<sup>th</sup> Annual Conference on Carbon Capture and Sequestration*, Pittsburgh, PA, May, 2011.

**Ajo-Franklin, J.**, Daley, T., Butler-Veytia, B., Peterson, J.E., Gasperikova, E., Wu, Y., Kelley, B., and S. Hubbard, (2011), "Acquisition and integrated inversion of a continuous active source seismic monitoring (CASSM) dataset: Application to shallow hydrofracture evolution," Abstract H52C-03, presented at *2011 Fall Meeting, American Geophysical Union*, San Francisco, Calif., 5-9 Dec.

Daley, T.M., **Ajo-Franklin, J.B.**, and F. Niu, (2011), "Recent Results from Crosswell CASSM (Continuous Active-Source Seismic Monitoring)," Abstract T51I-04, presented at *2011 Fall Meeting, American Geophysical Union*, San Francisco, Calif., 5-9 Dec.

Freedman, A.J., Peet, K.C., **Ajo-Franklin, J.B.**, Ajo-Franklin, C., Cappuccio, J.A., and J.R. Thompson (2011), "Characterization of microbe-mineral interaction under supercritical CO<sub>2</sub>: Possible roles for bacteria during geologic carbon sequestration," Abstract B51J-0546, presented at *2011 Fall Meeting, American Geophysical Union*, San Francisco, Calif., 5-9 Dec.

Kowalsky, M.B., Commer, M., **Ajo-Franklin, J.B.**, Doughty, C., Daley, T.M., and S. Finsterle, (2012), "Feasibility of coupled hydrogeophysical inversion for characterization and monitoring of subsurface CO<sub>2</sub> injection," Abstract H42F-02, presented at *2011 Fall Meeting, American Geophysical Union*, San Francisco, Calif., 5-9 Dec. (invited)

Steeffel, C., Yang, L., Noiriél, C.N., and **J.B. Ajo-Franklin**, (2011), Upscaling Carbonate Precipitation associated with CO<sub>2</sub> Sequestration from Pore to Continuum Scale, Abstract H53L-03, presented at *2011 Fall Meeting, American Geophysical Union*, San Francisco, Calif., 5-9 Dec. (invited)

**Ajo-Franklin, J.B.**, T.M. Daley, B. Butler-Veytia, J. Peterson, E. Gasperikova, and S.S. Hubbard (2010), "Multi-level continuous active source seismic monitoring (ML-CASSM): Application to shallow hydrofracture monitoring," Abstract NS44A-04 presented at *2010 Fall Meeting, American Geophysical Union*, San Francisco, CA, Dec. 13-17.

Noiriél, C., L. Yang, **J. Ajo-Franklin**, and C. Steeffel, (2010), "Impact of carbonate precipitation on flow and reactive transport in porous media," Abstract H13B-0961 presented at *2010 Fall Meeting, American Geophysical Union*, San Francisco, CA, Dec. 13-17.

Silin, D., **J.B. Ajo-Franklin**, S. Cabrini, T.J. Kneafsey, A. MacDowell, P.S. Nico, and V. Radmilovic (2010), "Pore-scale studies of gas shale," Abstract MR22C-03 presented at *2010 Fall Meeting, American Geophysical Union*, San Francisco, CA, Dec. 13-17.

Wu, Y., S.S. Hubbard, **J.B. Ajo-Franklin**, and K.H. Williams (2010), "Pore fluid chemistry and spectral induced polarization signatures of calcium carbonate," Abstract NS33A-06 presented at *2010 Fall Meeting, American Geophysical Union*, San Francisco, CA, Dec. 13-17.

Molins, S., **J.B. Ajo-Franklin**, R.T. Armstrong, P.S. Nico, and D. Silin (2010), "Biogeochemically-driven evolution of pore structures and flow paths: experimental studies and modeling," Abstract H14D-1110 presented at *2010 Fall Meeting, American Geophysical Union*, San Francisco, CA, Dec. 13-17.

Steeffel, C., C.N. Noiriél, L. Yang, D. Trebotich, S. Molins, and **J.B. Ajo-Franklin** (2010), "Integrating Experiments, Characterization, and Modeling to Understand Carbonate Precipitation at the Pore Scale," Abstract H11K-03 presented at *2010 Fall Meeting, American Geophysical Union*, San Francisco, CA, Dec. 13-17 [invited].

Meckel, T., Hovorka, S. D., **Ajo-Franklin, J.**, and Reiter, D., 2010, "Downhole passive microseismic observations during continuous CO<sub>2</sub> injection at Cranfield, Mississippi" (abs.): *American Association of Petroleum Geologists Annual Convention & Exhibition*, v. 19, p. 169.

Daley, T.M., Majer, E., Hoversten, M., Gritto, R. and **Ajo-Franklin, J.**, 2010, "Borehole Seismic Monitoring of Sequestration Pilots," *Geologic Carbon Sequestration Site Integrity: Characterization and Monitoring Workshop*, Columbus, Ohio, June 7-8, 2010.

Silin, D., Kneafsey, T., **Ajo-Franklin, J.**, and Nico, P. 2010, "Three-Dimensional Imaging of Tight Gas Host Rock – Observations and Conceptual Models." *Goldschmidt 2010 Conference*, Knoxville, TN, June 13-18, 2010.

Wu, Y., Ajo-Franklin, J., Armstrong, R., and Hubbard S.S., 2010, Noninvasive Geophysical Imaging of Ureolytic CaCO<sub>3</sub> Precipitation, *Goldschmidt 2010 Conference*, Knoxville, TN, June 13-18, 2010.

**Ajo-Franklin, J.**, Magnant, Z, and Daley, T. 2009, "Using Optimal Design to Improve CO<sub>2</sub> Sequestration Geophysical Monitoring Strategies," *CO<sub>2</sub> Sequestration Geophysics: SEG 2009 Summer Research Workshop*, Banff, Canada, August 23-27, 2009

Armstrong, R.T. and **Ajo-Franklin J.B.**, 2009, Probing the Dynamics of Biomineralization at the Pore Scale Using X-ray Computed Tomography, *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract H13C-0976

Silin, D., **Ajo Franklin, J. B.**, Cabrini, S., Kneafsey, T. J., MacDowell, A. Nico, P. S., and Tomutsa, L., 2009, Pore-scale studies of unconventional reservoir rocks. *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract H23F-1018, 2009

Wu, Y., Hubbards, S.S., Williams, K.H., and **Ajo-Franklin J.B.**, 2009, Complex conductivity signatures of CaCO<sub>3</sub> precipitation and its mixture with FeS, *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract H43C-1042

Hubbard, S.S., Wu, Y., Chen, J., **Ajo-Franklin, J.B.**, Li, L., Tugulus, C., and Williams, K.H., 2009, Assessing Feedbacks between Remediation-Induced Biogeochemical Transformations and Flow Characteristics using Multi-Scale Geophysical Approaches, *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract H53J-02

Daley, T.M., Niu, F., **Ajo-Franklin, J.B.**, Solbau, R., Silver, P.G., 2009, Crosswell CASSM (Continuous Active-Source Seismic Monitoring): Recent Developments, *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract NG22A-06,

**Ajo-Franklin, J.B.**, MacDowell, A., and Nico, P.S., 2009, "Evolution of Pore Structures and Flowpath Challenge: Dynamic Synchrotron Imaging of Pore Structure Evolution," ERSP PI Meeting, Lansdowne, Va, April 20-23, 2009

**Ajo-Franklin, J.**, Wu, Y., Hubbard, S.S., and Nico, P., 2008, Using Synchrotron Micro-CT To Monitor Microbially-Induced Calcite Precipitation on the Pore Scale, AGU Biogeophysics Chapman Conference, Portland, ME, Oct. 13-16, 2008

Wu, Y., **Ajo-Franklin, J.**, Williams, K., Hubbard, S.S., 2008, Geoelectrical signatures from ureolytically driven calcite precipitation processes---- Part I: low level precipitation and role of ion exchange, AGU Biogeophysics Chapman Conference, Portland, ME, Oct. 13-16, 2008

Daley, T.M., Sherlock, D., Freifeld, B., **Ajo-Franklin, J.**, and Sharma, S., 2008, "Monitoring of CO<sub>2</sub> Sequestration in a Depleted Gas Reservoir: The Otway Project," SEG/EAGE Summer Research Workshop, Vancouver, September

## AWARDS AND FELLOWSHIPS

Best Paper Award, GRC (2016): (Lead author H. Knox)

R&D 100 Award for development of CASSM (2015): w. T. Daley and E. Majer

Best Paper Award, SEG Annual Meeting (2011)

Founding Member Fellow, Earth Resources Laboratory, MIT (2005-2007)

Chair's Fellowship for Intergroup Research, Stanford (2002-2003)

EPA STAR Fellow (2001-2004)

Samuel P. Worden Award for Geophysical Research, Rice University, (1997)

## PROFESSIONAL ACTIVITIES

Society for Exploration Geophysics: District 3 Representative, SEG Council (2015-present)

Associate Editor for *Geophysics* (2011 - 2016)

Special Editor for *Geophysics* (2009 - 2011)

AGU Near-Surface Geophysics Focus Group, Committee Member

AGU Hydrogeophysics Technical Committee, Member

Reviewer for: *Geophysics*, *Geophysical Research Letters*, *Geophysical Journal International*

Member of SEG, AGU (Near-Surface Focus Group)

## RECENTLY FUNDED PROPOSALS (EXTERNAL)

1. "Dynamic Micro-Tomographic Imaging of Thermomechanical Fracture Networks During Type I Source Rock Maturation and Oil Shale Pyrolysis," Lead PI, \$287K/yr, 2015-2017 (WFO, Total E&P).
2. "Imaging Fracture Networks Using Joint Seismic and Electrical Change Detection Techniques," Co-PI (H. Knox, Lead PI), \$1000K/yr (\$220K/yr Task Budget), 2016-2017 (DOE EERE/GTO)
3. "Engineering thermophilic microorganisms to selectively extract strategic metals from low temperature geothermal brines," Co-PI (C. Ajo-Franklin, Lead PI), \$243K/yr (80 K/yr Task Budget), 2015-2017 (DOE EERE/GTO)
4. "Developing Smart Infrastructure for a Changing Arctic Environment using Distributed Fiber-Optic Sensing Methods," Lead PI, \$667K/yr, 2014-2018 (DOD/SERDP)



5. "Modeling and Monitoring Core: Sourced Systems Biology Program," Lead PI, \$550K/yr, 2012-2017, (WFO Energy Bioscience Institute/BP)
6. "Fossil Fuel Microbiology: Investigational Biosurfactant Studies," Lead PI, \$84K/yr, 2015, (WFO Energy Bioscience Institute/BP)
7. "Geophysical Characterization of Microbial Activity in Reservoir Rocks for Enhanced Hydrocarbon Recovery" Lead PI, \$330K/yr, 2009-2011 (WFO, Energy Bioscience Institute/BP)
8. "Geophysical Imaging for Investigating the Delivery and Distribution of Amendments in the Heterogeneous Subsurface of the FE. Warren AFB," Co-PI with S. Hubbard, \$414k/yr, 2008-2012 (DOD/ESTCP)
9. "Big Sky Regional Sequestration Partnership, Kevin Dome Pilot: LBNL," Co-I, Lab/MVA Lead(Curt Oldenburg, Lead PI), Task Budget, \$135K/yr, 2009-2016. (DOE FE)
10. "Next-Generation Ecosystem Experiment - Arctic," Co-I (Stan Wullshlager, Lead PI), Task Budget, \$110k/yr, 2012-2014 (DOE BER)
11. "Center for the Nanoscale Control of Geologic CO<sub>2</sub>," Theme Leader (D. DePaulo, Lead PI), Task Budget \$220k/yr, 2008-2013 (DOE BES)
12. "Center for the Nanoscale Control of Geologic CO<sub>2</sub>: Phase 2," Thrust Leader (D. DePaulo, Lead PI), Task Budget \$220k/yr, 2014-2018 (DOE BES)
13. "Crosswell EM System Development Project," Lead PI. \$80K/yr 2012-2013 (WFO, Advanced Energy Consortium)
14. "West Coast Regional Partnership WESTCARB: LBNL," Co-I, Lab/MVA Lead (J. Beyer, Lead PI), \$200 K/yr, 2011-2014, (DOE-FE)
15. "SECARB Phase III Monitoring Project: LBNL," Co-I, (T. Daley, LBNL Lead PI), \$110K/yr, 2010-2012, (DOE FE)

## **FUNDED PROPOSALS (INTERNAL/LDRD)**

Dark Fiber [lead PI Jonathan Ajo-Franklin, Co-PIs B. Freifeld, T. Daley] (2016-2018)

Integrative mapping of soil heterogeneity at the microbial scale. [Lead PI, Eoin Brodie] Co-PI, Jonathan Ajo-Franklin (2012-2014).

X-ray Fluorescence Tomography – 3D elemental mapping. [Lead PI, Alastair MacDowell] Co-PI Jonathan Ajo-Franklin (2011-2013)

## **APPROVED USER FACILITY PROPOSALS**

1. Advanced Light Source (LBNL), Beamline 8.3.2, Approved Program Lead-PI (w. P. Nico and C. Steefel), 60 shifts/yr, 2014-2017.
2. Advanced Light Source (LBNL), Beamline 8.3.2, Approved Program Co-PI (w. P. Nico and C. Steefel), 60 shifts/yr, 2009-2013.
3. High Flux Isotope Reactor (ORNL), Beamline CG1-D, Approved Proposal, LPI (w. L. Anovitz), 6 shifts, 2012
4. National Energy Research Science Computing Center (LBNL), Production Run 86249 (2013), 100,000 core hours. "Rock Properties for scCO<sub>2</sub> Transport and Reactions in Geological Systems: Image Processing and Modeling" (LPI)
5. National Energy Research Science Computing Center (LBNL), Production Run 87125 (2014), 250,000 core hours. "Rock Properties for scCO<sub>2</sub> Transport and Reactions in Geological Systems: Image Processing and Modeling" (LPI)
6. Molecular Foundry, User Proposal #1671, "Continued nanometer-scale studies of shales for carbon sequestration and gas recovery (Co-PI w. T. Kneafsey)
7. Molecular Foundry, User Proposal #906, "Investigation of nano-to-micron scale CaCO<sub>3</sub> bioprecipitates: morphology and properties." (LPI)

8. Molecular Foundry, User Proposal #744, "Petrophysical studies of unconventional gas reservoirs using high-resolution rock imaging" (Co-PI w. D. Silin)

## ADVISED STUDENTS & POSTDOCTORAL FELLOWS

**Zhuojun Magnant**, PhD. Student, Emory University (Computer Science), June. 2009 - 2010, Research topic: experiment design methods applied to sparse array optimization, Currently Assoc. Prof., Georgia Southern University

**Ryan Armstrong**, PhD. Student, Oregon State University, June 2009 - Jan. 2010, Research topic: Synchrotron imaging of microbial precipitation and growth processes in porous materials, Currently Asst. Prof., University of New South Wales

**Tae-Hyuk Kwon**, Postdoctoral Scientist, LBNL, 2009 - 2011, Research topic: Geophysical monitoring of microbially-enhanced oil recovery, Currently Asst. Prof., Korea Advanced Institute of Science & Technology (KAIST)

**Lauren Beckingham**, Postdoctoral Scientist, LBNL, 2012 - 2015, Research topic: Reactive surface area of multiminerale systems, Currently Asst. Prof, Auburn University, USA

**Shan Dou**, PhD Student, University of California, Berkeley (EPS), 2011 - 2015, Research topic: Seismic investigation of permafrost properties, Currently Postdoctoral Fellow, Lawrence Berkeley National Laboratory

**Seth Saltiel**, PhD Student, University of California, Berkeley (EPS), 2012 - Present, Research topic: Low-frequency shear measurement techniques for GCS

**Nathaniel Lindsey**, PhD Student, University of California, Berkeley (EPS), 2015 - Present, Research topic: Distributed acoustic sensing methods for near-surface characterization

**Marco Voltolini**, Geological Project Scientist, LBNL, 2012 - Present, Research topic: Synchrotron imaging of scCO<sub>2</sub> flow and reactions in reservoir sandstones

**David Tang**, M.S. Student, University of California, Berkeley (CEE), 2012 - Present, Research topic: Seismic monitoring of scCO<sub>2</sub> injection at the King Island test site, Currently PhD Student, University of Texas, Austin

**Bridget Floyd**, Undergraduate Researcher, University of California, Berkeley (EPS), 2012 - 2013, Currently Staff Geologist, USACE.

**Ruxun Zhang**, Undergraduate Researcher, University of California, Berkeley (EPS), 2013 - Present

**Ian Ekblaw**, Undergraduate Researcher, University of California, Berkeley (EPS), 2016 - Present

## METRICS

45 Peer-reviewed Journal Publications  
992 citations, 812 since 2012 (*Google Scholar*)  
H Factor = 19 (*Google Scholar*)  
i-10 index = 28 (*Google Scholar*)

## TEACHING

2017: Carbon Capture and Sequestration (Berkeley Energy Lectures), Chem Eng 195 (cross-listed in Earth and Planetary Science), University of California Berkeley  
[Co-taught with M. Went, C. Oldenburg, and B. Smit]

2016: Carbon Capture and Sequestration (Berkeley Energy Lectures), Chem Eng 195 (cross-listed in Earth and Planetary Science), University of California Berkeley  
[Co-taught with M. Went, C. Oldenburg, and B. Smit]

2015: Carbon Capture and Sequestration (Berkeley Energy Lectures), Chem Eng 295Z (cross-listed in Earth and Planetary Science), University of California Berkeley

[Co-taught with M. Went, C. Oldenburg, J. Reimer and B. Smit].

2014: Carbon Capture and Sequestration (Berkeley Energy Lectures), Chem Eng 295Z (cross-listed in Earth and Planetary Science), University of California Berkeley  
[Guest Lecturer]

### **LABORATORY & DIVISIONAL SERVICE**

Lab Lead PI: Applied and Environmental Geophysics Laboratory (EAGL)  
EESA/EGD Awards Committee (Chair, 2014-present)  
ESD Divisional Capital Equipment Committee (2010-present)  
ESD Distinguished Seminar Series Committee (2010-present)  
ESD B74 Move Committee, Geophysics Representative (2012-2013)  
LBNL Open House (2011-2012)  
SAC Committee Member for EETD EHS Review (2012)  
SAC Sub-Committee Member for Safety Assurance (2014)  
SAC Sub-Committee Member for Pressure Safety (2014-2016)

### **RECENT FIELD RESEARCH PROJECTS**

SIGMA-V Geothermal Fracture Pilot (Sanford Underground Research Facility, SD, T. Kneafsey PI)  
SERDP Permafrost DAS Pilot (Fairbanks, AK, J. Ajo-Franklin, PI)  
SURF/KisMET SubTER Fracture Pilot (Sanford Underground Research Facility, SD, C. Oldenburg PI)  
Blue Canyon Fracture Pilot (Socorro, NM, H. Knox PI)  
Frio II Brine Sequestration Pilot (Liberty, TX, S. Hovorka PI)  
SECARB Stacked Storage Test, Phase III (Cranfield, MS, S. Hovorka PI)  
Warren AFB Hydraulic Fracture Pilot (Cheyenne, WY, J. Ajo-Franklin & S. Hubbard)  
WESTCARB Sacramento Basin Characterization Project (J.H. Beyer PI)  
Kevin Dome Large Scale Storage Test, Big Sky Partnership (Kevin Dome, MT, L. Spengler, PI)