Fanny Coutelot, Ph.D.

CONTACT INFORMATION

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My website

RESEARCH INTERESTS

I'm particularly interested in the fate and transport of contaminants in redox transition zone of subsurface environment, working with large data sets. My previous work has traversed the periodic table and I'm particularly adept in coupling laboratory experiments, field observations, and geochemical modeling to describe and predict how elements and molecules move in the natural environment. In addition to a broad knowledge of geochemical reactions and transport mechanisms, I'm an expert in geochemical and transport models using sensitivity analysis to answer questions related to transport phenomena and mineral/water interface reactions. On top of my technical strengths, I'm recognized as a natural mentor overseeing scientists across career levels (graduate students to research assistants).

EDUCATION

Ph.D. Université Bordeaux Montaigne, France

Earth Science, Grade: *magna cum laude*, June 2014

- Thesis Title: *Trace Elements leaching study in the unsaturated zone: application to the remediation of contaminated sites.*
- Grade: *magna cum laude*
- Doctoral committee: Olivier Atteia (ENSEGID), Valerie Sappin-Didier (INRA), Michel Mench (INRA), Erik Smolders (Universite Leuven), Philippe Cambier, (INRA), Jean-Louis Morel (Universite de Loraine), Catherine Keller (CEREGE), Yves LeCorfec (EDF).

Master MAEVA, Université P.Cézanne, Marseille, France

Soil science, Grade: *magna cum laude*, June 2010

Bachelor, Earth and life science, Université J.Fourier, Grenoble, France

June 2008

RESEARCH EXPERIENCE

Research Assistant Professor January 2021 - Present
Clemson University, Environmental Engeneering and earth Sciences Department, South Carolina, USA

Research Associate March 2019 - January 2021
Clemson University, Environmental Engeneering and earth Sciences Department, South Carolina, USA

Postdoctoral Research Associate March 2015 - March 2019
Savannah River Ecology Laboratory, University of Georgia, South Carolina, USA
Trace and Radio-Elements fate in concrete and subsurface environment.

Ph.D Student March 2011 - June 2014
InnovaSol Foundation, ENSEGID, INRA - TCEM, Pessac, France
Doctoral thesis research conducted with Olivier Atteia (ENSEGID), Valérie Sappin-Didier (INRA-TCEM). Trace Elements behavior in unsaturated zone: applied to the remediation of contaminated sites.

Engineer trainee January 2010 - August 2010

EDF R&D Departement of Hydrology and Environment (LNHE), Chatou, France,
Master's thesis research conducted with Philippe Ciffroy. Investigated the DGT (Diffusive Gradient in Thin Film) response to the change in composition of a Cu artificially contaminated sediment.

Internship May 2009 - September 2009
European Center for Research and teaching of Environmental Geosciences (CEREGE), Aix-en-provence, France,
Research conducted with Sylvain Rigaud and Jean-Marie Garnier. Nutrients and metals cycles at the water-sediment interface.

Internship January 2009 - May 2009
European center for research and teaching of Environmental Geosciences CEREGE, Aix-en-provence, France,
Combined studies of geophysical tools (resistivity tomography, magnetometry, susceptibility) and geochemical tools to characterize an urban soil: St Pierre tailling.

Refereed Journal Publications

Coutelot, F.M., Matthew Riss, Deborah L. Wang, Daniel T. Olive, Andreas Schnurr, and Brian A. Powell (2025). *Examination of Np(V) sorption to montmorillonite as a function of temperature (25 55 °C) and ionic strength*, Applied Geochemistry, 106466 doi:https://doi.org/10.1016/j.apgeochem.2025.106466

Coutelot, F.M., DI Kaplan, AB Kersting, M Zavarin, BA Powell (2025). *Effect of seasonal anoxia on geochemical cycling in a stratified pond: Comparison to cooler pond conditions 40 years ago*, Science of The Total Environment 976, 179337, doi:https://doi.org/10.1016/j.s

Wasserman N.L., N Merino, DI Kaplan, BA Powell, AB Kersting, M Zavarin (2023). *Sources, seasonal cycling, and fate of plutonium in a seasonally stratified and radiologically contaminated pond* Scientific Reports 13 (1), 11046, doi:https://doi.org/10.1038/s41598-023-37276-w

Merino M., NL Wasserman, **Coutelot, F.M.**, BA Powell, Y Jiao, AB Kersting, M Zavarin (2023). *Microbial community dynamics and cycling of plutonium and iron in a seasonally stratified and radiologically contaminated pond*, Scientific Reports 13 (1), 19697, doi:https://doi.org/10.1038/s41598-023-45182-4

Coutelot, F.M., J Wheeler, N Merino, DI Kaplan, S Owings, M Taillefert, AB Kersting, M Zavarin, BA Powell (2023). *Temporal evolution of Pu and Cs sediment contamination in a seasonally stratified pond*, Science of The Total Environment 857, 159320 , doi:https://doi.org/10.1016/j.scitotenv.2022.159320

Alex Kugler, Robin L Brigmon, Abby Friedman, **F.M. Coutelot**, Shawn W Polson, John C Seaman, Waltena Simpson (2022). *Bioremediation of copper in sediments from a constructed wetland ex situ with the novel bacterium Cupriavidus basilensis SRS*, Scientific Reports 12 (1), 17615, doi:https://doi.org/10.1038/s41598-022-20930-0

Rhodes O., **F.M. Coutelot**, et al. (2020). *Integration of ecosystem science into radioecology: A consensus perspective*, Science of the Total Environment 740, 140031

Coutelot, F.M., R.J Thomas, J.C. Seaman (2019). *Using Porous Iron Composite (PIC) Material to Immobilize Rhenium as an Analogue for Technetium*, Environment international 128, 379-389

Baker, M, **Coutelot, F.M.**, J.C. Seaman (2019). *Phosphate Amendments for Chemical Immobilization of Uranium in Contaminated Soil*, Environment international 129, 565-572

Coutelot, F.M., V. Sappin-Didier, H. Prommer, O. Atteia. *On the Scalability of Soil Leaching Tests.* Applied geochemistry.

Coutelot, F.M., J.C. Seaman, M.R. Baker. *Uranium(VI) Adsorption and Surface Complexation Modeling onto Background Sediment from the Saltstone Facility, Savannah River Site.* Environmental Earth Science, doi:10.1007/s12665-018-7316-7

Simner, S.P., **F.M. Coutelot**., H. Chang, J.C. Seaman, (2017) *Technetium Leaching from Cementitious Materials.* MRS Advances, doi:1-6. 10.1557/adv.2017.35

Atteia, O., **F.M. Coutelot**, Y. Le Corfec, M. Franceschi, (2014) *Une Méthode de Changement d'Echelle dans les Essais de Lixiviation. Environnement et Technique.*

Coutelot, F.M., V. Sappin-Didier, O. Atteia, (2014) *Comparison of Soil Solution Sampling Techniques to Assess Metal Fluxes from Contaminated Soil to Groundwater". Environmental Monitoring and Assessment.* doi:10.1007/s10661-014-4055-4

Conference Presentation

F Coutelot, R Williams, B Ferguson, P Davis, D Kaplan, BA Powelll (2024) *The influence of seasonal change on Fe-As colloids formation in a monomictic sub-tropical lake*, AGU Fall Meeting Abstracts 2024

R Williams, D Kaplan, **F Coutelot**, BA Powell (2024) *Factors Limiting the Migration of 137Cs from a Former Nuclear Reactor Cooling Reservoir More than 60 Years After Contamination*, AGU Fall Meeting Abstracts 2024

MP Riss, **F Coutelot**, B Powell (2024) *Variable Temperature 3H Diffusion and 237Np Adsorption with Na-Montmorillonite*, Goldschmidt Conference

F Coutelot, B Powell (2024) *Surface-mediated reduction in plutonium surface complexation modelling* Goldschmidt Conference

Coutelot, F.M., Daniel Kaplan, Annie B Kersting, Mavrik Zavarin, Brian A Powell (2023) *Effect of seasonal anoxia on Arsenic and Iron cycle in a small sub-tropical stratified lake in the context of warming air temperature.* AGU San Francisco. (Talk)

Nancy Shiao-Lynn Merino, Naomi Wasserman, **Coutelot, F.M.**, Daniel Kaplan, Brian A Powell, Yongqin Jiao, Annie B Kersting and Mavrik Zavarin (2023) *Microbial Community Dynamics and Cycling of Plutonium and Iron in a Seasonally Stratified and Radiologically Contaminated Pond.* AGU San Francisco. (Talk)

Coutelot, F.M., Reid Williams, Brian Powell (2023) *Fe-As colloids formation in a monomictic sub-tropical lake.* AGU San Francisco. (Poster)

Brian Powell, Shanna Estes, **Coutelot, F.M.** (2023) *Developing a thermochemical database of radionuclides interactions at the mineral-water interface for improved nuclear waste repository assessment.* International Nuclear Energy Agency Thermodynamics Working Group, Paris, France. (Talk)

Shanna Estes, **Coutelot, F.M.**, Brian Powell (2023) *Actinide Adsorption to Hematite at Elevated Temperatures.* 18th International Conference on the Chemistry and Migration Behaviour of Actinides and Fission Products in the Geosphere, Nantes, France. (Talk)

Simner, S., J.C. Seaman, **F. Coutelot** and J. Cochran (2018). *Evaluating the Chemical Resistance of SDU Concrete and Polymeric Coatings.* Proceedings of WM2018 Conference, March 18 – 22, 2018, Phoenix, Arizona, USA.

Seaman, J.C., D. Li, E. Dorward, J. Cochran, **F. Coutelot**, H. Chang, M. Tandukar, and D. Kaplan. (2018). *Immobilization of Radioactive materials using Porous Iron Composite Media.* Proceedings of WM2018 Conference, March 18 – 28, 2018, Phoenix, Arizona, USA.

Simner, S., J.C. Seaman, and **F. Coutelot**. 2018. *Dynamic Leaching Method for Intact Saltstone Samples.* Proceedings of WM2018 Conference, March 18 – 22, 2018, Phoenix, Arizona, USA.

Cutts Sandra, K. Mukkhtar, **Coutelot, F.M.**, J.C. Seaman, R. Brigmon, R. Peters (2018) *Phytoremediation of Cr-Contaminated Soil: Use of Chelators in Cr Phytoextraction.* 2018 AIChE Annual Meeting, Pittsburgh, PA, Oct. 28. (Talk)

Seaman J.C., **F.M. Coutelot**, S.P. Simner (2017) *Contaminant Leaching From Intact Saltstone Monoliths.* Proceedings WM2017 Conference, March 5 – 9, 2017, Phoenix, Arizona, USA.

Coutelot, F.M., J.C. Seaman, S. Simner (2017) *Quantitative study of Portland cement hydration by X-Ray diffraction/Rietveld analysis and geochemical modeling.* AGU FALL MEETING, New-Orleans, LA, Nov. 11-15. (Poster)

Dorward, E., R.J Thomas, J.P. Cochran, H.S. Chang, M. Tankukar **F.M. Coutelot** and J.C. Seaman (2017) *Removal of Radioactive Materials from Groundwater Using Porous Iron Composite Media.* AGU FALL MEETING, New-Orleans, LA, Nov. 11-15. (Talk)

Baker, M., **F.M. Coutelot** and J.C. Seaman (2017) *The Use of Phosphate Amendments for Chemical Immobilization of Uranium in Contaminated Soil.* AGU FALL MEETING, New-Orleans, LA, Nov. 11-15. (Talk)

Coutelot, F.M., J.C. Seaman, S Sumner (2017) *Coupled geochemical-transport modeling of Tc and Re leaching from saltstone cementations waste forms.* ICOBTE: Conference on the Biogeochemistry of Trace Elements, Zürich, Switzerland, July. 16-20. (Talk)

Seaman, J.C., S.P. Simner, H.S, Chang, **F.M. Coutelot** (2016) *Technetium Leaching Cementitious Materials.* 2016 American Institute of Chemical Engineers Meetings. San Francisco, CA, Nov. 13-18. (Talk)

Baker, M.R., **F.M. Coutelot**, J.C. Seaman (2016) *Chemical Immobilization of Uranium in Contaminated Soil by Phosphate Amendments.* 2016 Annual ASA/SSSA/CSA Meetings. Phoenix, AZ, Nov. 6-9. (Talk)

Dorward, E.R., J.C. Seaman, J. Cochran, H.S. Chang, M. Tandukar, **F.M. Coutelot** (2016) *Removal of Radioactive Materials from Groundwater Using Iron Composite Media.* Annual ASA/SSSA/CSA Meetings. Phoenix, AZ, Nov. 6-9. (Poster)

Coutelot, F.M., J.C. Seaman, D. Kaplan, S.P. Simner (2016) *Geochemical Transport Modeling of Tc and Re Leaching from Cementitious Waste Forms.* Annual ASA/SSSA/CSA Meetings. Phoenix, AZ, Nov. 6-9. (Talk)

Thomas, R.J., J.C. Seaman, **F.M. Coutelot**, A. Chauhan, M. Denham, M. Millings, M. Amidon, C. Eddy-Dilek (2016) *Technetium Accumulation within Reduced Sediment Horizons.* Annual ASA/SSSA/CSA Meetings. Phoenix, AZ, Nov. 6-9. (Poster)

Seaman, J.C. H.S. Chang, **F.M. Coutelot**, R.J. Thomas,S.P. Simner (2016) *Technetium (Tc) Partitioning in Cementitious Waste Materials.* Annual ASA/SSSA/CSA Meetings. Phoenix, AZ, Nov. 6-9. (Talk)

Seaman, J.C., S.P. Simner, H.S. Chang, **F.M. Coutelot** (2016) *Assessing Technetium Immobilization in Cementitious Materials.* 2016 Goldschmidt Conference. June 26 through July 1, Yokohama, Japan. (Talk)

Coutelot, F.M., O. Atteia, V. Sappin-Didier, S. Galaup (2015) *A Combined Solid/Liquid Approach for Understanding the Mechanisms of Trace Element Immobilization in Apatite Amended Soils.* ICOBTE: Conference on the Biogeochemistry of Tace Elements, Fukuoka, Japan. (Talk)

Coutelot, F.M., O. Atteia, (2015) *Trace Element Release From Coal Fly Ash: Quantitative Geochemical Modeling Using Leaching Tests.* SSSA International Annual Meeting, Minneapolis MN. (Talk)

Baker M., **F.M. Coutelot**, J.C. Seaman, H.S. Chang, (2015) *Uranium-Phytate Interaction in Soils.* SSSA International Annual Meeting, Minneapolis MN (Poster)

Coutelot, F.M., V. Sappin-Didier, O. Atteia, (2013) *Comparison of Multiple-Scale Leaching Tests : Potential Release of Trace Elements from Polluted Soils.* 12th International Conference on the Biogeochemistry of Trace Elements, Athens, USA. (Talk)

Coutelot, F.M., V. Sappin-Didier, O. Atteia, (2012) *Comparison of Soil Solution Techniques to Assess Metal Fluxes to Groundwater*, 4th International Congress EUROSOIL, Bari, Italy. (Poster)

Coutelot, F.M., V. Sappin-Didier, O. Atteia, (2012) *Soil Solution Techniques to Assess Metal Fluxes to Groundwater*, Summer school on Contaminated Soils : from Characterization to Remediation, Paris, France. (Talk)

Reports

LLNL SFA OBER FY23 Program Management and Performance Report: BioGeoChemistry at Interfaces Submitted to BER, 2023

Coutelot, F.M., Shanna Estes, Brian Powell *Partioning of Cesium-137 and Other Radionuclides from SRS Sediment Recovered fron Field Lysimeter Experiment at the Savannah River site* Submitted to SRR April. 20, 2020

Seaman, J.C. and **Coutelot, F.M.**. *Thermal Properties of Salstone Simulants* Submitted to SRR Sept. 29, 2018.

Seaman, J.C. and **Coutelot, F.M.**. *Contaminant Leaching from Saltstone.* Submitted to SRR Sept. 29, 2017.

Seaman, J.C. and **Coutelot, F.M.**. *Thermal Properties of Saltstone Simulants: Initial Method Development.* Submitted to SRR September, 2017

Seaman, J.C. and **Coutelot, F.M.**. *Impact of Cementitious Material Leachate on Iodine Partitioning.* Submitted to SRR September, 2017

Seaman, J.C. and **F.M. Coutelot**. 2017. *Interim Report: Precipitates Derived from PIC Treatment of Low Quality Alkaline Groundwater.* Submitted to North American Höganäs, April 7, 2017

Seaman, J.C., **F.M. Coutelot**, J. Cochran, R.J. Thomas and M.R. Baker. *Contaminant Leaching from Saltstone.* Submitted to SRR September 16, 2016

GRANTS AND FUNDINGS

Fanny M. Coutelot (PI), Brian A. Powell(Co-PI), Joshua Bregy (Co-PI) *CHEMCLINE: Lake Stratification Effects on Iron and Carbon Dynamics* National Science Foundation (FY26 $790,000) (pending)

Fanny M. Coutelot (PI), Brian A. Powell(Co-PI), Haruko Wainwright (Co-PI) *Impact of Climate Change-Induced Seawater Intrusion on Iron Redox Cycling and Organic Matter Dynamics in Southeastern U.S. Coastal Wetlands* National Science Foundation (FY26 $390,000) (pending)

Fanny M. Coutelot (PI), Brian A. Powell(Co-PI), Nathan A. Conroy (Co-PI). *The Role of Temperature on Radionuclide 2D Transport in Engineered Clay Barriers* Nuclear Energy University Program (FY25 $800,000) (pending)

Fanny M. Coutelot (PI) and Brian A. Powell(Co-PI). *Collaborative Research: Quantifying iron, organic matter, and trace metal fluxes across seasonally fluctuating redox gradients in hyporheic zones* National Science Foundation (FY25 $490,025) (Unawarded)

Fanny M. Coutelot (PI) Shanna Estes (Co-PI) and Brian A. Powell(Co-PI). *MRI-Targeted In-sity Geochemistry Enhanced Radiochemistry Research (TIGERR) vehicule* Clemson University (FY24 $219,000) (2024)

Brian A. Powell (PI), Nicole Martinez(Co-PI), **Fanny M. Coutelot (Co-PI)** . *Combined Field and Laboratory Studies of Plutonium Aging and Environmental Transport* (project 20-19504) DOE (NNSA) (FY22 $889,796) (2022)

Brian A. Powell (PI), **Fanny M. Coutelot (Co-PI)**. *Characterization of Radionuclide Migration at the Savannah River Site Pond B* (project 20-19504) Lawrence Livermore National Labs (FY19 $300,000) (2019-2023)

Brian A. Powell (PI), Shanna L. Estes (Co-PI, **Fanny M. Coutelot (Co-PI)**, Mavrik Zavarin (Co-PI. *Developing a Thermochemical Database of Radionuclide Reactions at the Mineral/Water Interface for Improved Nuclear Waste Repository Performance Assessment* (project 20-19504) U.S. DOE Nuclear Energy University Program (NEUP), $794,192 (2020-2023)

Shanna Estes (PI), Brian Powell (Co-PI, **F.M. Coutelot (Co-PI**, Ryan Tappero. *Biogeochemical Transformations of Actinide-Bearing Wastes in Soils and Sediments (proposal 30-6400)* National Synchrotron Light Source II (NSLS-II), beam time allocation (4-BM XFM) (2020-2021)

Seaman, J.C. **F.M. Coutelot** and M. Baker. *Selective Sorbents for the In Situ Immobilization of* $129I$ *and* $99Tc$ *at the Four-Mile Branch Seepline* SRNS-ACP (FY19 $100K$)

F.M. Coutelot. *ISTEB Early Career Research Award 2016 (*$1300*).*

Seaman, J.C. and **F.M. Coutelot**. *Research in support of the Saltstone Disposal Facility. SRR Statement of Work G-SOW-Z-00024 Rev. 0 (FY17* $368K*) (Renewed in FY18 for $167K).*

Seaman, J.C. and **F. Coutelot**. *Sorption Properties of Bimetallic Porous Iron Materials. SRNS RFP No. 0000318991 and Statement of Work (SOW) G-SOW-A-01867 (FY17 SREL Budget $30 K).*

Graduate students committee member & Undergraduate mentoring

Reid Williams, *Phosphate Amendments for Chemical Immobilization of Uranium in Contaminated Soil*, Ph.D Candidate: Environmental Chemistry, EEES, Clemson University **Mentor and Committee Member**

Ethan Fix, *Digitalization of litterature data and surface complexation model paremeter estimation for trivalent Americium, Curium and Europium sorption*, Ph.D Candidate: Environmental Chemistry, EEES, Clemson University **Mentor and Committee Member**

Matthew Baker, *Phosphate Amendments for Chemical Immobilization of Uranium in Contaminated Soil*, MS Soil Chemistry, Crop and Soil Sciences, University of Georgia: **Mentor and Committee Member**

Robert Thomas, *Use of Zero-Valent Iron for Technetium and Rhenium Contaminated Waters*, MS Soil Chemistry, Crop and Soil Sciences, University of Georgia: **Mentor and Committee member**

Emily Dorward, *Iron Porous Media* MS Soil Chemistry, Crop and Soil Sciences, University of Georgia: **Mentor**

Trey Lewis (2017),*"Impact of Biomirneralization of Organophosphate on Uranium Availability in Riparian Sediments"*, REU student: **Mentor**

Jill Banach (2016), REU Student (2016), *"Radionuclide Leaching from Reducing Cementitious Materials"*: **Mentor**

Awmna Rana (2016), *"Tritium Partitioning in the Biosphere"*, REU Student: **Mentor**

Professional Service

Reviewer, *Outstanding Student Presentation Awards (OSPA)* (AGU; 2023)

Reviewer, *CECAS undergraduate grant* (2021; Athens)

Chair, *Remediation of Metal Contaminated Environments* Session, ICHMET 2018 International Conference on Heavy Metals in the Environment (July, 21-25 2018; Athens, GA)

Chair, *Remediation of Metal Contaminated Environments* Session, ICHMET 2018 International Conference on Heavy Metals in the Environment (July, 21-25 2018; Athens, GA)

Moderator, *Management and Remediation of Contaminated Fresh Water and Marine Sediments* Session, ICOBTE 2013: 12th International Conference on the Biogeochemistry of Trace Elements (June, 16-20 2018; Athens, GA)

Professional Development

Large-Scale Geospatial Data Analysis and Visualization in R, *AGU workshop, 2023*

Radiological Worker Training II, *Department Of Energy in Aiken, 2016*

The Geochemist's Workbench® Training, *Applied Geochemical Reaction Modeling workshop in Denver, 2016*

ICP-OES Training *Thermo Scientific iCAP Series ICP-OES Training in Paris, 2012*

Skills

Modeling, Statistical, Data science and Code Literacy:

- Geochemical modeling: PHREEQC, PEST, PHT3D, HYDRUS 1D, The Geochemist's Workbench®
- Physical modeling: Global Lake Modeling (GLM)
- Proficients with PCA, MFA, FAMD, Hierarchical clustering
- Sensitivity analysis, Large data sets Analysis, Data Visualization
- R, Python, PEST, Java

Trace elements analysis:

- ICP-AES, ICP-OES, ICP-MS, FAAS, Infrared Spectrometer, Capillary Electrophoresis, Ion Chromatography, UV-Vis Spectrometer, XRF

Experimental:

- Column leaching, Batch experiment, Upward percolation column, Sorption kinetics, Sequential and selective extraction, DGT kinetics, Soils physics measurements (hydraulic conductivity, soil moisture content), Experimental designing

Fields:

- Development, planning and execution of sampling campaigns and long-term monitoring in wetland systems, In situ analysis of Trace Metals by Portable XRF, Soil sampling, Water Sampling (river, estuary, sea and aquifer), Suspended Matter, Coring, In situ measurements of physiochemical parameters (autonomous multi-parameter probes)

Microscopy:

- XRD, SEM-EDS and WDS, Micro-XRF, XRF, Calorimetry

XRD Analysis:

- Diffract-Eva (XRD phase analysis), Fullprof Suite (XRD Cristallographic tool for Rietvield analysis)

University Teaching Experience

Teaching vacation January 2012 - May 2012

Engineering School of Environment, Georesources and of Sustainable Development (ENSEGID), Pessac, France Practical work: Transport in the unsaturated zone. Zero-tension lysimeter, geochemical study.