Dr. Melanie A. Mayes

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Professional Preparation

1995	University of Missouri, Columbia, Geological Sciences, B.S.
1999	University of Tennessee, Knoxville, Geological Sciences, M.S.
2006	University of Tennessee, Knoxville, Geological Sciences, Ph.D.

Appointments

2002-Present Senior Staff Scientist: Oak Ridge National Laboratory, Environmental Sciences Division and Climate Change Science Institute

- Multi-scale Environmental Processes Team Leader, Earth and Aquatic Sciences Group
- Managed research projects, authored research proposals, prepared peer-review manuscripts, interfaced with sponsors, attended and organized conferences and workshops
- Molecular-scale to field-scale mechanistic controls of carbon cycling in soils, developing innovative methods for incorporating experimental data into carbon cycle models
- Experimentation and modeling of coupled hydrological and geochemical reactions of dissolved and particulate explosives, radionuclides, metals, and nutrients migrating through soils and rocks at lab to field scales
- Promoted through 3 levels (Assistant, Associate, Staff Scientist)

2016-Present Joint Faculty Associate Professor: Department of Biosystems Engineering and Soil Science, University of Tennessee Institute of Agriculture

2011-Present Joint Faculty Assistant Professor: Department of Earth and Planetary Sciences, University of Tennessee

2008-2011 Adjunct Professor: Department of Earth and Planetary Sciences, University of Tennessee

1999-2002 Post-Master's Research Associate: Oak Ridge Institute for Science and Education, Oak Ridge, TN, USA

Mentoring Activities

- Primary mentor for researchers at the staff (2), faculty (4), post-doctoral (9), post-masters (2), graduate (4), post-graduate (7), undergraduate (~30), and high school (2) levels
- Environmental Sciences Division committee for Excellence in Post-Graduate Research and Excellence in Technical Support (2015-present)
- UT-Battelle Awards Night, Head of Early Career and Postdoctoral Award Committee (2015)
- ORNL Postdoctoral Program Committee, Alternate member (2014-present)
- Advised a diverse set of staff and students on career development plans and activities
- Management oversight of personnel; weekly to bi-monthly meetings; yearly evaluations
- Generated research topics appropriate for students with diverse backgrounds and levels of expertise; Instructed students on experimental techniques, sample analysis, and safe laboratory practices; Advised students on hypothesis testing, literature review, interpretation of results, and oral and written presentation of research findings

Awards and Recognition

- *DOE Early Career Award* ($2,500,000) (May, 2016)
- *Knoxville Young Women's Christian Association Honoree in Science and Technology* (2015)
- *Fellow, American Association for the Advancement of Science* (February, 2015)
- *Stanley Auerbach Award for Excellence in Environmental Sciences.* Environmental Sciences Division, Oak Ridge National Laboratory (June, 2011)
- *Young Alumna Award for Professional Promise.* Earth and Planetary Sciences Department, University of Tennessee (October, 2011)
- *Associate Editor of Excellence*. Soil Science Society of America Journal (April, 2011)
- *Editor's Citation for Excellence in Manuscript Review.* Soil Science Society of America Journal (May, 2006)
- *Outstanding Mentor Award.* US Department of Energy Office of Science Undergraduate Research Program (December, 2004)

Synergistic Activities

- *Co-Editor,* Second State of the Carbon Cycle Report (2015-2017)
- *Member,* Carbon Cycle Scientific Steering Group (CCSSG) (2015-2018)
- *Member,* ORNL Seed Committee (2015-2017)
- *Fellow, American* Association for the Advancement of Science (2014)
- *ORNL Postdoctoral Program Committee,* Alternate member (2014-present)
- *Associate Editor,* Soil Science Society of America Journal (2007-2012)
- *Panel Reviewer:* National Academy of Science U.S.-Egypt Science and Technology Cooperation Program (2015), US DOE Biological and Environmental Research National Lab Subsurface Biogeochemical Research Program Science Focus Area (2013), US DOE Biological and Environmental Research Subsurface Biogeochemical Research Program for University proposals (2010)

Community Activism

- Chairperson, WaysSouth Responsible Transportation in Appalachia (July 2012 – present), Board member (April 2010 – 2013), Volunteer in Science Communications (2008-2010)
- Volunteer, ORNL Community Shares event (2014-present)
- Member of Tennessee Citizens for Wilderness Planning (December 2012-present)
- Member Advocates for the Future of Oak Ridge Reservation (2014-present)
- Science Advisor for Lindquist Environmental Appalachian Fellowship (2010-2011)
- Oakwood-Lincoln Park Neighborhood Association Board of Directors (2003–2005), Environmental Representative (2002–2005), member of Beautification, Environment, and Safety Team (2007)

Research Grants and Contracts

"A Comprehensive Framework for Modeling Emissions from Tropical Soils and Wetlands" (**principal investigator**), U.S. Dept. of Energy, Office of Biological and Environmental Research, Climate and Environmental Science Division, 2016-2021, $2,500,000.

"Collaborative Research: Elucidating Unifying Principles Of Soil C-N Coupling Using A Continental-Scale Grassland Experimental Network" (**contributing investigator**), National Science Foundation, 2016-2020, $2,700,000.

"Predicting Climate Feedbacks from Microbial Function in Tropical Ecosystems" (**principal investigator**) ORNL Laboratory Directors Research and Development Program, 2014-2016, $764,000.

"Mercury Technology Development Plan for Remediation of the Y-12 Plant and East Fork Poplar Creek" (**task lead**), URS–CH2M Oak Ridge (UCOR), 2014-open, $1,800,000/year.

"Development of *in situ* biomembrane liners for algal bioenergy" (**task lead**), U.S. Dept. of Energy, Bioenergy Technologies Office, 2015-2016, $200,000.

"Next Generation Ecosystem Experiment – Tropics" (**contributing investigator**) U.S. Dept. of Energy Office of Biological and Environmental Research, Climate and Environmental Science Division, 2014-2016, $30,000,000.

"Incorporating Rhizosphere Interactions and Soil Physical Properties into a Soil Carbon Degradation Model through Experimenting across Ecotypes", (**co-principal investigator**) U.S. Dept. of Energy, Office of Biological and Environmental Research, Climate and Environmental Science Division, 2013-2016, $315,000/y.

"Terrestrial Ecosystem Scientific Focus Area" (**theme leader**) U.S. Dept. of Energy, Office of Biological and Environmental Research, Climate and Environmental Science Division, 2013-2019, http://tes-sfa.ornl.gov/, $8,000,000/year.

"Incorporating Molecular-Scale Mechanisms Stabilizing Soil Organic Carbon into Terrestrial Carbon Cycle Models" (**principal investigator**) ORNL Laboratory Directors Research and Development Program, 2011-2013, $635,000.

Peer-Reviewed Manuscripts (of 40)

LeDoux, S.T., Szynkiewicz, A., **Mayes, M.A.**, Faiia, A., McKinney, M., and Dean, W (2016). Chemical and isotope compositions of shallow groundwater in areas impacted by hydraulic fracturing and surface mining in the Central Appalachian Basin, Eastern United States. Applied Geochemistry 71:73-85.

Moore JAM, Jiang J, Patterson CM, **Mayes MA**, Wang G, Classen AT (2015). Interactions among roots, mycorrhizae, and free-living microbial communities differentially impact soil carbon processes. Journal of Ecology 103:1442–1453. doi: 10.1111/1365-2745.12484.

Wang, G., Jagadamma, S., **Mayes, M.A.,** Schadt, C., Steinweg, J.M., Gu, L., and Post, W.M. 2015. Microbial dormancy improves development and experimental validation of ecosystem model. The ISME Journal doi:10.1038/ismej.2014.120.

Jagadamma, S., Steinweg, M., and **Mayes, M.A.** 2014. Influence of substrate chemistry on carbon decomposition and microbial community composition. Biogeosciences 11:4665-4678.

Wang, G., **Mayes, M.A.,** Gu, L., and Schadt, C.W. 2014. Representation of dormant and active microbial dynamics for ecosystem modeling. PLOS One 9(2):e89252.

Li, J., Wang, G., Allison, S.D., **Mayes, M.A.,** and Luo, Y. 2014. Soil carbon sensitivity to temperature, carbon use efficiency, and model complexity in two microbial-ecosystem models. Biogeochemistry doi:10.1007/s10533-013-9948-8.

Petridis, L., Ambaye, H., Jagadamma, S., Kilbey II, S.M., Lokitz, B., Lauter, V., and **Mayes, M.A.** 2014. Spatial arrangement of organic compounds on model mineral surface: Implications for soil organic matter stabilization. Environmental Science and Technology 48: 79-84, http://dx.doi.org/10.1021/es403430k.

Jagadamma, S., Steinweg, J.M., **Mayes, M.A,** Wang, G., and Post, W.M. 2013. Mineral control on decomposition of added and native organic carbon in soils from diverse eco-regions. Biology and Fertility of Soils 49, doi: 10.1007/s00374-013-0879-2.

Jagadamma, S., **Mayes, M.A.,** Zinn, Y.L., Gísladóttirc, G., and Russell, A.E. 2013. Sorption of organic carbon compounds to the fine fraction of surface and subsurface soils. Geoderma 213:79-86.

Hui, D., **Mayes, M.A.,** Wang, G., and Post, W.M. 2013. Kinetic parameters of phosphatase: A quantitative synthesis. Soil Biology and Biochemistry 65:105-113.

Sharma, P., **Mayes, M.A.,** Tang, G. 2013. Role of soil organic carbon and colloids in fate of TNT, RDX and HMX in training range soils. Chemosphere 92(8): 993-1000. doi: 10.1016/j.chemosphere.2013.03.028

Steinweg, J.M., Jagadamma, S., Frerichs, J., and **Mayes, M.A.** 2013. Activation energy of extracellular enzymes in a global suite of soils. PLoS ONE 8(3): e59943. doi:10.1371/journal.pone.0059943.

Martin, M., **Mayes, M.A.,** Heal, K., Brice, D.J., and Wullschleger, S. 2013. Investigation of laser-induced breakdown spectroscopy and multivariate analysis for differentiating inorganic and organic C in a variety of soils. Spectrochimica Acta Part B 87: 100–107.

Mayes, M.A., Jagadamma, S., Ambaye, H., Petridis, L., and Lauter, V. 2013. Neutron reflectometry reveals the internal structure of natural organic matter deposited onto an aluminium oxide. Geoderma 192:182-188. doi: 10.1016/j.geoderma.2012.07.025.

Wang, G., Post, W.M., **Mayes, M.A.** 2013. Parameterizing an enzyme-mediated soil organic carbon decomposition model. Ecological Applications, 23(1): 255-272. doi: 10.1890/12-0681.1.

Jagadamma, S., **Mayes, M.A.,** and Phillips, J.R. 2012. Selective sorption of dissolved organic carbon compounds by temperate soils. PLoS ONE 7(11): e50434. doi:10.1371/journal.pone.0050434.

Wang, G., Post, W.M., **Mayes, M.A.,** Frerichs, J., and Jagadamma, S. 2012. Parameter estimation for models of ligninolytic and cellulolytic enzyme kinetics. Soil Biology & Biochemistry 48:28-38, doi 10.1016/j.soilbio.2012.01.011.

Mayes, M.A., Heal, K., Brandt, C., Phillips, J.R., and Jardine, P.M. 2012. Relation between soil order and Langmuir parameters for sorption of dissolved organic carbon. Soil Science Society of America Journal 76:1027-1037, doi:10.2136/sssaj2011.0340.

Garten, Jr., C.T., Brice, D.J., Castro, H.F., Graham, R.L., **Mayes, M.A.**, *et al.* 2011. Response of "Alamo" switchgrass tissue chemistry and biomass to nitrogen fertilization in west Tennessee, USA. Agriculture, Ecosystems, & Environment 140: 389-297, http://orproxy.lib.utk.edu:2052/10.1016/j.agee.2010.12.016.

Tang, G., **Mayes, M.A.,** Parker, J.C., and Jardine, P.M. 2010. CXTFIT/Excel – A modular adaptable approach for parameter estimation and uncertainty/sensitivity analysis. Computers and Geosciences 36:1200-1209, doi: 2052/10.1016/j.cageo.2010.01.013.

Stewart, B.D., **Mayes, M.A.,** and Fendorf, S.E. 2010. Impact of uranyl-calcium-carbonato complexes on uranium(VI) adsorption to synthetic and natural sediments. Environmental Science and Technology 44:928-934.

Mayes, M.A., Tang, G., Jardine, P.M., McKay, L.D., Yin, X.L., Pace, M.N., Parker, J.C., Zhang, F., Mehlhorn, T.L., and Dansby-Sparks, R.N. 2009. Influence of sedimentary bedding on reactive transport parameters under unsaturated conditions. Soil Science Society of America Journal 73:1938-1946, doi:10.2136/sssaj2008.0317

Tang, G., **Mayes, M.A.,** Parker, J.C., Yin, X.L., Watson, D.B., and Jardine, P.M. 2009. Improving parameter estimation for column experiments by multi-model evaluation and comparison. Journal of Hydrology 376, 567–578. doi:10.1016/j.jhydrol.2009.07.063.

Jardine, P.M., **Mayes, M.A.,** Mulholland, P.J., Hanson, P.J., Tarver, J.R., Luxmoore, R.J., McCarthy, J.F., and Wilson, G.V. 2006. Vadose zone flow and transport of dissolved organic carbon at multiple scales in humid regimes. Vadose Zone Journal 5:140-152, doi: 10.2136/vzj2005.0036.

Ginder-Vogel, M., Borch, T., **Mayes, M.A.,** Jardine, P.M., and Fendorf, S.E. 2005. Chromate reduction and retention processes within Hanford sediments. Environmental Science and Technology 39:7833-7839.

Mayes, M.A., Jardine, P.M., Mehlhorn, T.L., Bjornstad, B.N., Ladd, J.L., and Zachara, J.M. 2003. Transport of multiple tracers in variably saturated humid region structured soils and semi-arid region laminated sediments. Journal of Hydrology 275: 141-161, doi: 10.1016/S0022-1694(03)00039-8.

Mayes, M.A., Jardine, P.M., Larsen, I.L., Brooks, S.C., and Fendorf, S.E. 2000. Multispecies transport of metal-EDTA and chromate complexes through undisturbed columns of

weathered fractured saprolite. Journal of Contaminant Hydrology 45: 243-265, doi: 10.1016/S0169-7722(00)00108-X.

Jardine, P.M., Fendorf, S.E., **Mayes, M. A.**, Larsen, I.L., Brooks, S.C., and Bailey, W.B. 1999. Fate and transport of hexavalent chromium in undisturbed heterogeneous soil. Environmental Science and Technology 33: 2939-2944.

Data Products and Technical Manuscripts

Dickson, J., **Mayes, M.,** Earles, J., Mehlhorn, T., Lowe, K., Peterson, M., Pierce, E. 2016. Soil Investigation of Lower East Fork Poplar Creek. ORNL/TM-2015/374. Oak Ridge National Laboratory, Oak Ridge, TN.

Peterson, M.J., Brooks, S.C., Mathews, T.J., Mayes, M.A., Johs, A., Watson, D.B., Poteat, M.D., Smith, J., Mehlhorn, T., Lester, B., Morris, J., Lowe, K., Dickson, J.O., Eller, V., DeRolph, C.R. 2016. Mercury remediation technology development for lower east fork poplar creek—FY 2015 progress report. ORNL/TM-2016/48. Oak Ridge National Laboratory, Oak Ridge, TN.

Peterson, M. J., Brooks, S.C., Mathews, T.M., Mayes, M.A., Johs, A., Watson, D.B., Poteat, M.D., and Pierce, E. 2014. Mercury Remediation Technology Development for Lower East Fork Poplar Creek. ORNL/SPR-2014/645, Oak Ridge National Laboratory, Oak Ridge, TN.

Jagadamma, S., **Mayes, M.A.,** Steinweg, J.M., Wang, G., Post, W.M. 2014. Organic Carbon Sorption and Decomposition in Selected Global Soils. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tennessee, U.S.A. http://dx.doi.org/10.3334/CDIAC/ornlsfa.002