

MultiSector Dynamics Community

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Welcome to the newsletter of the MultiSector Dynamics Community

Hello MultiSector Dynamics (MSD) Community!

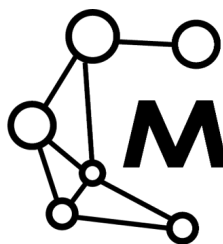
In this issue, we provide an interactive graphic of all MSD Sessions at the upcoming 2026 AGU Fall Meeting taking place in San Francisco, California from the 7th to 11th of December.

We also feature a research spotlight on Abigail Snyder, a research scientist at the Joint Global Change Research Institute (JGCRI), PNNL, specializing in the intersection of Earth science, land systems, economics, and mathematics. Be sure to also check out our three recent and one upcoming MSD community webinars, as well as recent publications and job listings – see all the details below!

www.multisectordynamics.org

MSD@AGU 2026

The MSD COP is seeking abstract submissions for **nine sessions** at the 2026 AGU Fall Meeting in San Francisco, California this December. The following graphic summarizes the titles of each session and will help you start planning your attendance at the Meeting. Click on the figure to submit an abstract to the session or [view our interactive figure on the MSD website!](#)

**MSD @****AGU ANNUAL MEETING**

7–11 December 2026 | San Francisco, CA

Click on a session bubble to submit an abstract to the session.



MSD Research Spotlight: Abigail Snyder

Abigail Snyder is a research scientist at the Joint Global Change Research Institute, [Pacific Northwest National Laboratory](#) specializing in the intersection of Earth science, land systems, economics, and mathematics. Her work primarily focuses on developing and enhancing integrated human-Earth system models to understand how multiple sectors such as water, agriculture, and energy interact and co-evolve, including characterizing uncertainty at different points in the system. She is a contributor to the development of the Global Change Analysis Model (GCAM) and data-driven emulators of Earth System Model outputs. She holds a PhD in Mathematics from the University of Pittsburgh and completed post-doctoral training at JGCRI from 2016-2018.



Abigail co-leads “Experiment 1” of the GCIMS SFA. Experiment 1 explores long- and short-term influences and their compounding effects on the energy, land, and water sectors in the United States and globally via large-ensemble experiments with the GCIMS suite of models, choosing metrics of interest from the outcomes and analyzing results through scenario-discovery tools. To achieve this, a multi-institution team from PNNL, Tufts University, MIT, and Western Washington University (WWU) utilizes large-ensemble experiments connecting models from the GCIMS suite of tools, defining key outcome metrics and analyzing results via scenario-discovery tools. supports these efforts by enabling efficient ensemble generation, environmental simulations, and advanced data interpretation.

To effectively characterize how uncertainties in the drivers of growth (economics, population, and technology development) affect human system outcomes like energy, water, and agriculture prices, multiple threads of work are pursued within Experiment 1. Traditionally, ensembles of GCAM simulations are factorially designed large ensemble experiments, following an approach pioneered for GCAM by Experiment 1 Co-Lead Prof Jonathan Lamontagne at Tufts University. These are still in active use in Experiment 1, targeting specific science questions while methodological research continues. However, because GCAM models so many sectors and their interactions, it operates with both very high-dimensional input and output spaces and therefore the number of factors that can be examined in this way quickly runs into computational and storage limits. The methodological arm of Experiment 1 research aims to overcome these computational limits using emulation of GCAM directly, building on past experience by the Experiment 1 team using emulation to characterize uncertainty for time series inputs to GCAM.

In a task led by Dr Claudia Tebaldi in collaboration with Prof Brian Hutchinson (WWU), his students, and Abigail, an existing large ensemble developed for a case study focused on the energy sector’s evolution to demonstrate that a deep neural network can emulate GCAM and deliver efficiencies (Holmes et al., 2026). In the process, optimal sampling strategies are developed for the input space, improving on the insights that the original large ensemble approach (based on an expensive 4096-member ensemble) delivered, both in terms of predictions and uncertainty quantification. The resulting work is a critical demonstration that emulation can be effectively deployed for improving exploratory modeling and uncertainty analysis with GCAM in other use cases in the future.

This builds on other Experiment 1 focused on characterizing uncertainty in inputs to GCAM that can come from Earth System Model outputs. In work led by Dr. Claudia Tebaldi, Abigail and Kalyn Dorheim developed STITCHES for Experiment 1, focusing on the novelty of emulating coherent, multivariable Earth System Model outputs at daily and monthly frequencies using instance-based learning. This same team, with contributions from now-University of Vermont doctoral student Noah Prime, also tackled the issue of sub-selecting Earth System Models that effectively capture the uncertainty spread of the CMIP6 model ensemble for more efficient GCAM experiments. This was done by identifying the

compressed shared latent space among all the considered CMIP6 data, projecting the CMIP6 data into the latent space, and selecting models that most efficiently span the ensemble's presence in the latent space. The subset of models was then worked with in the original coordinates to calculate the contributions to total variance of model uncertainty, scenario uncertainty, and internal variability (following Hawkins and Sutton), and then compared to the same quantities calculated for the full CMIP6 ensemble as validation.

Selected Key Publications

- [1] Holmes, A., Shen, H. M., Jensen, M., Coffland, S., Sizemore, L., Bassetti, S., Nieva, B., Tebaldi, C., **Snyder, A.**, & Hutchinson, B. (2026). Emulating the Global Change Analysis Model with deep learning: An energy sector case study. *Environmental Modelling & Software*, 106945.
- [2] Tebaldi, C., **Snyder, A.**, & Dorheim, K. (2022). STITCHES: creating new scenarios of climate model output by stitching together pieces of existing simulations. *Earth System Dynamics*.
- [3] **Snyder, A.**, Prime, N., Tebaldi, C., & Dorheim, K. (2024). Uncertainty-informed selection of CMIP6 Earth system model subsets for use in multisectoral and impact models. *Earth System Dynamics*, 15(5), 1301-1318.

Upcoming Webinar: Quantum Computing Futures through a Multisector Lens

Quantum Computing Futures through a Multisector Lens

Speakers



Olivier Ezratty
Quantum Energy Initiative



David McCollum
Oak Ridge National Laboratory

Moderated by:



Gokul Iyer
Pacific Northwest
National Laboratory



Thursday, July 9th
1:00-2:30pm EDT

This webinar will feature two presentations that will focus on quantum computing and its complex multisectoral implications for the energy, water and materials sectors. The first presentation by Olivier Ezratty will introduce quantum computing, its expected applications and added value, as well as the hardware requirements to run them. Mr Ezratty will highlight the energy cost of these systems and introduce the role of the Quantum Energy Initiative that aims to build a new interdisciplinary field that addresses these challenges. Next, the presentation by David McCollum will highlight the multisectoral challenges and opportunities that may emerge with next-generation, quantum-accelerated data centers. Dr. McCollum will discuss the potential future energy and resource impacts of these novel computing systems and the possible chokepoints that could emerge. Quantum computing presents both opportunities and challenges for the development of next-generation technologies, highlighting the importance of long-term planning and cross-cutting collaboration across researchers.

You can [register for the webinar here](#), after which you will receive a Zoom link and Calendar invite!



MultiSector
Dynamics

Issue 30
July 2026

Webinar Summary: Modeling the operations of reservoir systems with LLMs and Inverse Reinforcement Learning



Modeling the operations of reservoir systems with LLMs and Inverse Reinforcement Learning

Speakers

- 
Wyatt Arnold
Politecnico di Milano
- 
Matteo Giuliani
Politecnico di Milano
- 
Rohan Singh Wilkho
Cornell University

Moderated by:

- 
Stefano Galelli
Cornell University
- 
David Gold
Utrecht University

**Tuesday, June 23rd
12:00-1:00PM EST**

On **June 23rd**, the AI4MSD Working Group in collaboration with the MSD COP hosted a webinar featuring three speakers: Wyatt Arnold and Matteo Giuliani from Politecnico di Milano, and Rohan Singh Wilkho from Cornell University. The webinar discussion highlighted the applications of large language models (LLMs) and inverse reinforcement learning (IRL) to capture complex human-environment interactions central to the operations of large, regional reservoir systems. The discussion began with a presentation by Dr. Giuliani, who showed how IRL can be leveraged to fulfill the need for better representation of coupled human-natural dynamics and uncover the hidden objectives behind human decisions. Dr. Wilkho further demonstrated IRL's ability to recover physically-coherent rewards structures, enabling it to be used as a behavioral diagnostic tool. Finally, Dr. Arnold presented a novel framework for using LLMs to approximate historical reservoir operators' behavior, showing promise as a bridge between quantitative models and value-driven water management decisions. Overall, the three presentations emphasized that LLMs and IRL offers new opportunities for developing adaptive, transparent, and human-aware models to support water management in an increasingly uncertain future.

The webinar recording is now available on the [MSD YouTube channel here](#). Subscribe to our channel [here](#) to view previous webinars and receive notifications when new recordings are available!

Reference

Arnold, W., Giuliani, M., & Wilkho, R. S. (2026, June 25). MSD CoP Webinar: Modeling the Operations of Reservoir Systems with LLMs and Inverse Reinforcement Learning. MSD-LIVE Data Repository. <https://doi.org/10.57931/3375561>

Webinar Summary: Advances in MSD-LIVE to Support the MSD Community of Practice

Advances in MSD-LIVE to Support the MSD Community of Practice

Webinar: May 12th
1:00 pm - 2:00 pm ET
Registration Link in Description

Presenters



Casey D. Burleyson
PNNL



Zoe Guillen
PNNL

Team

Casey Burleyson
Zoe Guillen
Carina Lansing
Rebekah Mars
Jon Weers

Recently, several high-profile datasets have attracted many new users to the MultiSector Dynamics Living, Intuitive, Value-adding Environment (MSD-LIVE). To accommodate the growing MSD-LIVE user base, it was recently relaunched MSD-LIVE v3 (version 3) in late 2025 with significant improvements to its cloud-based data management system and advanced computing platform. Casey Burleyson and Zoe Guillen from the Pacific Northwest National Laboratory (PNNL) hosted a webinar on **May 12th** to refamiliarize the MSD COP and new users with the components of the platform such as the data repository, new model training notebooks, and interactive data dashboards. Additionally, both hosts also highlighted examples on how these components are being used to advance MSD science. During this session, Dr. Burleyson and Dr. Guillen walked through the new features of MSD-LIVE v3, with an emphasis on the ability to interactively explore data in MSD-LIVE without downloading it. They demonstrated how MSD-LIVE users can now click a button in the data repository and launch a blank Jupyter notebook with access to the underlying data on AWS. Furthermore, they demonstrated the new GitHub integration feature that enables users to share analysis or visualization code with the community of MSD-LIVE users. The webinar wrapped up with a discussion on future developments for the MSD-LIVE platform in 2026.

The webinar recording is now available on the [MSD YouTube channel here](#). Subscribe to our channel [here](#) to view previous webinars and receive notifications when new recordings are available!

Reference

Burleyson, C., & Guillen, Z. (2026, May 12). MSD CoP Webinar: "Advances in MSD-LIVE to Support the MSD Community of Practice". MSD-LIVE Data Repository. <https://doi.org/10.57931/3367734>

Webinar Summary: Data Driven Monitoring of Inland Waters Using Remote Sensing

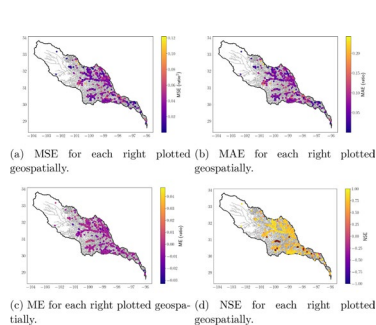


On April 2nd, the MSD AI4MSD Working Group hosted a webinar focused on data-driven methods for the monitoring of inland waters using remote sensing. This webinar featured two speakers: Ryan Riggs from Liberty Mutual, and Tyler King from the United States Geological Survey (USGS). The discussion kicked off with a presentation by Dr. Riggs, who presented his work on using SWOT satellite data to characterize the operational signatures of reservoirs. He demonstrated how this method could be used to better understand the variability of reservoir and river boundaries. The second presentation was led by Dr. Kind, who walked through recently-published USGS products that advance the remote sensing of inland water quality. He provided a demonstration on how these data products could be used to support water quality decision-making in the United States. The webinar closed out with a discussion and Q&A session led by the hosts of the webinar: Stefano Galleli (Cornell University), David Gold (Utrecht University), and Jared Smith (USGS).

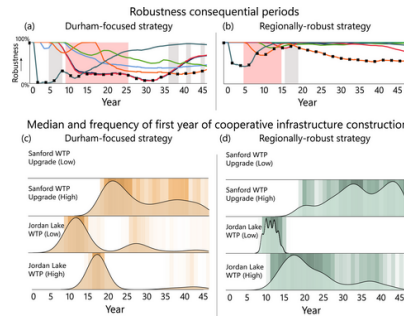
MSD Relevant Publications

We have been posting and will be regularly updating select MSD relevant publications on the website, under the [Publications](#) page. If you have any publications you would like us to highlight, please email contact@multisectordynamics.org.

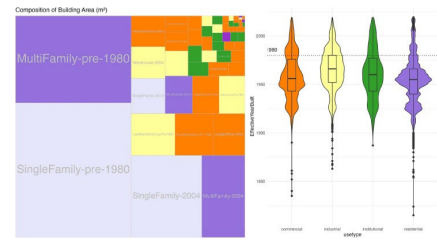
Below you can find some of the publications posted most recently:



[Emulation of monthly water allocations using LSTM models: a case study of the Colorado River Basin in Texas](#)



[Exploiting multi-objective reinforcement learning and explainable artificial intelligence to navigate robust regional water supply investment pathways](#)



[Improving energy efficiency while reducing anthropogenic heat from buildings: how retrofits influence the building stock and urban microclimate in Los Angeles](#)

MSD Job Listings

Our website features a [careers page](#) that lists available MSD-focused positions at all levels. If you'd like to post a position to be featured in this page, please email us at: contact@multisectordynamics.org. Here are some of our latest posts:

Post Doctorate Research Associate in Human-Earth Systems

Pacific Northwest National Laboratory (PNNL) is soliciting applications for postdoctoral scientist positions advancing research, modeling and uncertainty characterization in the human-Earth system, as part of the Global Change Intersectoral Modeling System (GCIMS) Science Focus Area led by PNNL and sponsored by DOE BER. The successful applicant will lead analysis using the [Global Change Analysis Model \(GCAM\)](#) and related GCIMS modeling capabilities (e.g., Hector, Xanthos). Specifically, this scientist will focus on model, data, and scenario development to generate and analyze large ensembles of GCAM simulations that quantify the effect of changes in human and Earth system drivers on energy, water, land systems, and other important resource and technology systems, such as critical minerals and materials. The scientist is expected to be able to apply advancing artificial intelligence and machine learning tools to facilitate analysis where applicable. The scientist is also expected to lead multiple peer-reviewed publications on this work. There will be many opportunities to work with the multi-disciplinary GCIMS team as well as collaborators in other national labs and universities

Postdoctoral Scholar in adaptation of civil infrastructure systems at Pennsylvania State University

The Pennsylvania State University's Department of Civil and Environmental Engineering seeks a **Postdoctoral Scholar** to participate in a multi-disciplinary, multi-investigator NSF-funded research project. The overarching aim of this project is in the development of new knowledge and a new framework to facilitate the optimal design and life-long adaptation of civil infrastructure systems that rigorously accounts for diverse uncertainties in the life-cycle demands, system's state, and decision criteria. This project thus aims to offer an engineering response to infrastructure adaptation, mitigating the impact of evolving hazards on the built environment and society, and fundamentally transforming the basis for which infrastructure is designed, maintained, and adapted, to ensure a prosperous and sustainable future.

1 PhD and 4 Postdoctoral Research Positions in Global Hydrology

We are creating an interdisciplinary cohort of PhD students and Postdoctoral Research Fellows to work across several institutions and topic areas to progress towards a global understanding for links between water infrastructure and aquatic ecosystems. The positions are offered by **Cornell University** (School of Civil and Environmental Engineering), the **University of California, Santa Barbara** (Environmental Studies Program/Bren School of the Environment), and the **University of Maryland** (Center for Global Sustainability) as part of an upcoming project that will develop a global, time-series dataset documenting the past and present evolution of riverine systems under human influence.

The project will reconstruct historical hydraulic infrastructure operations—including dams, wells, and diversions—at the global scale and quantify their influence on river discharge; assess the impacts of hydraulic infrastructure on sediment transport, water temperature, and biodiversity through time-varying indicators; characterize the uncertainty associated with all key variables in the dataset; and validate the dataset and explore policy implications in collaboration with regional partners worldwide.

This newsletter has been edited by Lillian Lau and the Community of Practice Facilitation Team. This and all previous newsletters can be accessed at the [Newsletters](#) page of our website. If you have any suggestions, concerns or other feedback about this newsletter or the MSD website, please email

contact@multisectordynamics.org.

