

# MultiSector Dynamics Community

## Welcome to the newsletter of the MultiSector Dynamics Community

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Hello MultiSector Dynamics (MSD) Community!

In this issue, we provide a guide to all the exciting MSD sessions at this year's AGU Meeting taking place from 11<sup>th</sup>-15<sup>th</sup> December. Below you will find graphic that will lead you to information on the specific talks and posters being presented throughout the week.

We also provide highlights from the inaugural 2023 MSD Workshop that took place from 3<sup>rd</sup>-5<sup>th</sup> October and include a research spotlight on Tirthankar Chakraborty, an Earth Scientist in the ESM group at PNNL.

[www.multisectordynamics.org](http://www.multisectordynamics.org)

## MultiSector Dynamics Meet-Up at AGU 2023

**Date:** Wednesday, December 13, 5-6pm PT

**Mode:** In-person and online

**In-person location:** Poster Hall A-C South Pod 1

**Zoom link:** <https://michigantech.zoom.us/meeting/register/tZYtcOCrjojGNCqNMd7IHAOFDGU6SW6W3cb>

All career stages are invited to join us for an informal meet-up at AGU 2023. This meet-up is hosted by the Early Career Working Group with the goal of fostering connections in the MSD community and related disciplines. For those attending AGU online, **the physical meeting point will be Poster Hall A-C South Pod 1**. Following the hour of networking, we will invite folks to gather for a meal nearby. For those attending AGU online, a parallel event will be held online. Please register for this Zoom event [here](#). If you would like to connect with the Early Career Working Group for future events, please join [our mailing list](#). For more information about this event contact Ana Dyreson ([adyreson@mtu.edu](mailto:adyreson@mtu.edu)) or Julia Szinai ([jszinai@lbl.gov](mailto:jszinai@lbl.gov)).

## MSD Sessions at AGU 2023

We have developed a graphical summary to help you navigate this year's AGU schedule. On the following page, you will find a graphical summary guide indicating all the sessions (co-) organized by our Community of Practice. Clicking on each session's Oral or Poster box will take you to the session's page on the official AGU schedule. This year at AGU, we have a total of **seven oral sessions** and **eight poster sessions**.

# 2023 AGU FALL MEETING

All times are in US Pacific Time. Click on session bubbles to go to the AGU website.



[www.multisectordynamics.org](http://www.multisectordynamics.org)

## 2023 Inaugural MSD Workshop at UC Davis

The MSD Community of Practice (CoP) hosted the inaugural MSD workshop on October 3-5 at UC Davis.

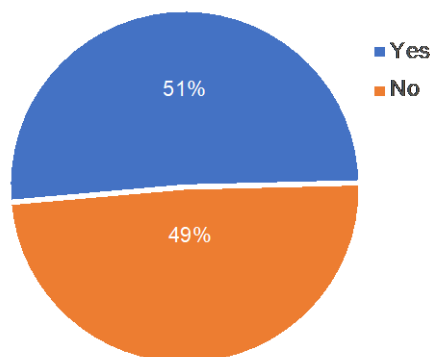
The aim of the workshop was to bring together MSD researchers to advance understanding of the co-evolution of human and natural systems and build the next generation of tools that bridge sectors, scales, and systems to realize a more resilient and equitable future. The theme of the workshop was **"Advancing Complex Adaptive Human-Earth Systems Science in a World of Interconnected Risks"**. A major focus of the workshop was placed on fostering collaborations opportunities for students and early career researchers (ECRs).

The workshop hosted a total of 96 attendees, which included 29 students and 43 early career researchers. The workshop attendees represented 6 DOE National Laboratories, 25 US universities, 5 international universities, 1 federal agency, 1 California state agency and 1 non-profit organization. The workshop also benefited from the attendance of 10 Principal Investigators of projects supported by the DOE MSD program.

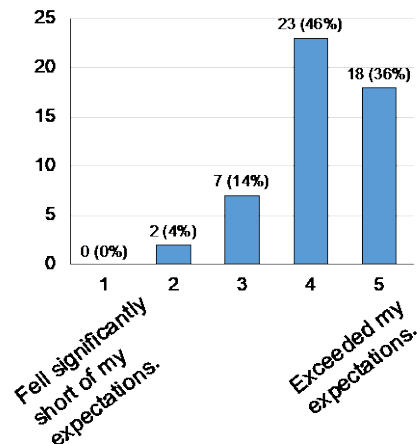
On the morning of day 1 of the workshop, several plenary presentations provided updates on the MSD CoP and Working Groups, described the goals of the workshop, provided guidelines to conduct an inclusive workshop, and introduces the 5 breakout sessions developed to address major cross-cutting challenges and themes in MSD research. The afternoon followed with two poster sessions designed to foster discussions between students/ECRs and more senior MSD researchers. The final 2 days were focused on the 5 breakout sessions:

- Inspiring operational relevance in MSD research related to climate change and energy transition.
- Better capturing human actors and their responses to emergent risks in MSD systems.
- Understanding how human and natural system drivers and uncertainties at different scales combine to shape global-to-local dynamics.
- Challenges and approaches to represent and analyze equity in MSD research.
- Using AI to advance the modeling of complex adaptive Human-Earth systems.

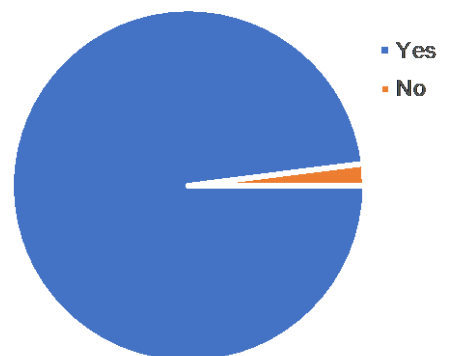
Was this your first time interacting with the MSD community?  
49 responses



How would you rate your overall experience as a workshop attendee?  
50 responses

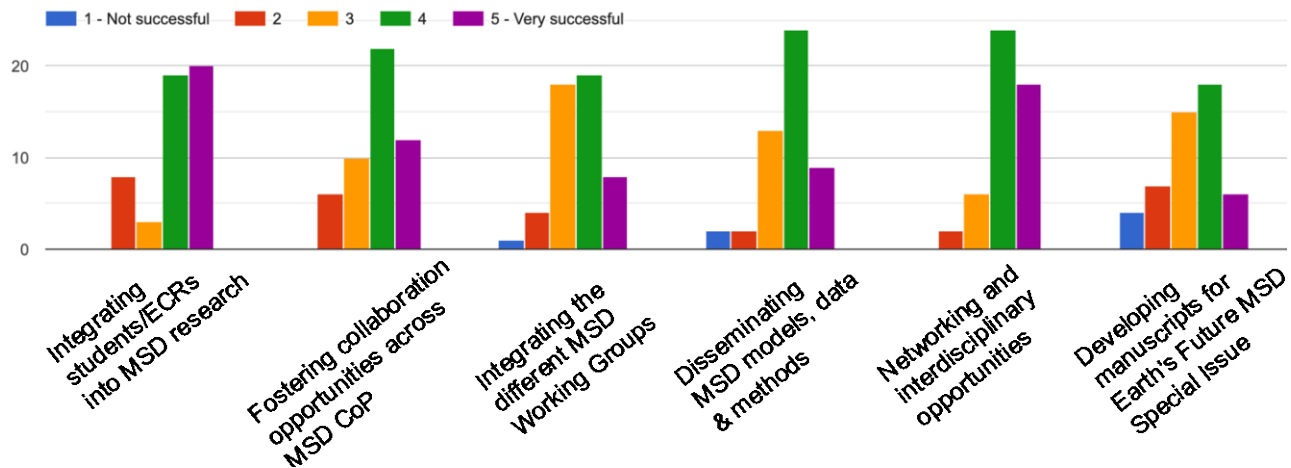


Would you like to attend a future MSD workshop?  
50 responses



Based on the post-workshop feedback from 50 attendees, the MSD workshop was successful in providing many attendees with their first interaction the MSD CoP and a workshop experience that exceeded expectations. There was also clear consensus that the MSD workshop objectives had been met and that attendees would like to attend a future MSD workshop.

How successful was the workshop in meeting the outlined objectives?



For more information on the workshop, please visit the [2023 Inaugural MSD Workshop website](#).

The Multi-Sector Dynamics Workshop organizers thank the DOE Office of Science, Earth and Environmental System Modeling, MultiSector Dynamics program area for financial support of its activities through the [Integrated Multisector Multiscale Modeling \(IM3\)](#) project.

## 2024 Request for Proposals for New MSD Working Groups

We are pleased to announce the 2024 Request for Proposals (RFP) for new MultiSector Dynamics (MSD) Working Groups. Working Groups are a central component of the MSD Community of Practice (CoP), where researchers from different disciplines, projects and institutions coordinate and innovate MSD research around various science questions, themes, and methodological approaches as well as advance and support the development and training of a diverse, equitable, inclusive MSD community and ensure sustained interactions among MSD researchers and various user communities.

For more information on the current MSD Working Groups, please visit the [MSD CoP website](#).

Proposals must be submitted through the [2024 MSD Working Group proposal submission form](#) by Monday, February 5, 2024, 11:59 pm Pacific Time Zone. We anticipate the initiation of two new Working Groups, for a term of two years each, in response to this RFP.

To ensure coordination between proposals, and to avoid multiple proposals for similar Working Groups, we ask that you identify your new Working Group idea on the [2024 MSD Working Group proposals database](#) ahead of the submission of your letter of intent. If you see that a similar Working Group proposal is already in development, please coordinate with that group.

Please direct all questions regarding new MSD Working Group proposals to Erwan Monier ([emonier@ucdavis.edu](mailto:emonier@ucdavis.edu)).




## Call for Earth's Future Special Collection Peer Reviews

Please consider submitting your research to the [Earth's Future Special Collection](#)

"Multi-Sector Dynamics: Advancing Complex Adaptive Human-Earth Systems Science in a World of Interconnected Risks"? Submissions will be considered through December 2024. We also welcome anyone who is interested and especially encourage early career researchers (e.g., advanced graduate students and postdocs)

to serve as reviewers. Please contact either Pat Reed ([patrick.reed@cornell.edu](mailto:patrick.reed@cornell.edu)) or Nicole Jackson ([njacks@sandia.gov](mailto:njacks@sandia.gov)) if you are interested in serving as a reviewer.



**Multi-Sector Dynamics: Advancing Complex Adaptive Human-Earth Systems Science In a World of Interconnected Risks**

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## MSD Research Spotlight: TC (Tirthankar Chakraborty)

*TC's research at PNNL centers on improving urban representation in land models and examining extreme events over coastal cities in the COMPASS-GLM and ICoM projects. Overall, TC aims to improve discourse around uncertainties when detecting urban climate signals using models and observations. His broader goal is to provide a framework for developing urban representations for other ESMS and to generate global datasets that will be useful to the urban climate community at large.*



TC is an Earth Scientist in the Earth System Modeling group at the Pacific Northwest National Laboratory (PNNL) with interest in atmosphere-biosphere interactions at various scales. Before joining PNNL, TC finished his PhD from Yale University on developing a surface-energy budget perspective on aerosol-climate interactions. He has also led and contributed to multiple studies on urban climate impacts across scales, which have been follow-ups to his master's dissertation research on the urban heat island (UHI) effect. TC is interested in the role of big data, machine learning, and urban informatics to better understand cities and their complexities. He often uses the Google Earth Engine (GEE) cloud computing platform for satellite remote sensing and geospatial analysis and was one of 26 inaugural GEE Developer Experts in the world (<https://developers.google.com/profile/u/tc25>).

During his time at Yale, TC developed a new algorithm to estimate surface UHI (SUHI), which led to the most comprehensive publicly available SUHI intensity dataset, covering almost 10,000 urban areas, and including annual, seasonal, monthly, and diurnal patterns<sup>1</sup>. He has also worked extensively on combining satellite estimates of the urban environment with socioeconomic data to examine within-city environmental disparities<sup>2–4</sup>. However, he has also been concerned about common misuses of SUHI and satellite-derived land surface temperature (LST) when discussing policy and public health. LST is, at best, a crude proxy for overall patterns of urban heat distributions, but this temperature is not what urban residents generally feel. He has been recently focusing on better quantifying the decoupling between urban heat stress and LST. He has examined this decoupling using various methods to provide multiple lines of evidence and ensure the robustness of the patterns. He used crowdsourced data over Europe to show that LST is a poor proxy for daytime heat stress across scales<sup>5</sup>. More

recently, he used numerical model simulations to show that disparities in moist heat stress in US cities, although pervasive, are much lower in magnitude than what you might infer from LST6.

At PNNL, he is contributing to the COMPASS-GLM (<https://compass.pnnl.gov/GLM/COMPASSGLM>) and ICoM (<https://icom.pnnl.gov/>) projects. His role in these projects is to improve urban representation in land models and examine extreme events over coastal cities. For example, he has been examining the sensitivity of coastal impacts on outdoor heat stress to various model configurations and complexities. Overall, he wants to improve discussions around uncertainties when detecting urban climate signals using models and observations. TC received the 2023 U.S. Department of Energy (DOE) early career award to improve the representation of urban areas in DOE's Earth system model (ESM). Beyond providing a framework for developing urban representations for other ESMs, this project will generate global datasets that will be useful to the broader urban climate community.

#### Highlighted Articles:


- 1 T. Chakraborty and X. Lee, "A simplified urban-extent algorithm to characterize surface urban heat islands on a global scale and examine vegetation control on their spatiotemporal variability," *International Journal of Applied Earth Observation and Geoinformation*, vol. 74, pp. 269–280, Feb. 2019, doi: 10.1016/j.jag.2018.09.015.
- 2 T. Chakraborty, A. Hsu, D. Many, and G. Sheriff, "Disproportionately higher exposure to urban heat in lower-income neighborhoods: a multi-city perspective," *Environ. Res. Lett.*, vol. 14, no. 10, p. 105003, Sep. 2019, doi: 10.1088/1748-9326/ab3b99.
- 3 T. Chakraborty, A. Hsu, D. Many, and G. Sheriff, "A spatially explicit surface urban heat island database for the United States: Characterization, uncertainties, and possible applications," *ISPRS Journal of Photogrammetry and Remote Sensing*, vol. 168, pp. 74–88, Oct. 2020, doi: 10.1016/j.isprsjprs.2020.07.021.
- 4 T. Chakraborty, T. Biswas, L. S. Campbell, B. Franklin, S. S. Parker, and M. Tukman, "Feasibility of Afforestation as an Equitable Nature-Based Solution in Urban Areas," *Sustainable Cities and Society*, p. 103826, 2022, doi: 10.1016/j.scs.2022.103826.
- 5 T. Chakraborty, Z. S. Venter, Y. Qian, and X. Lee, "Lower urban humidity moderates outdoor heat stress," *AGU Advances*, vol. 3, no. 5, p. e2022AV000729, 2022, doi: 10.1029/2022AV000729.
- 6 T. Chakraborty, A. J. Newman, Y. Qian, A. Hsu, and G. Sheriff, "Residential segregation and outdoor urban moist heat stress disparities in the United States," *One Earth*, vol. 6, no. 6, pp. 738–750, 2023, doi: 10.1016/j.oneear.2023.05.016.

## Working Group Announcements

### Modeling Approaches

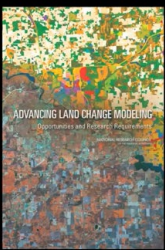
Five overlapping approaches and hybrids and evaluated for their analytical capabilities and science and policy applications


- Machine learning & Statistical
- Cellular
- Economic
  - Sector-based
  - Spatially disaggregated
- Agent-based



Pattern-based

Process-based



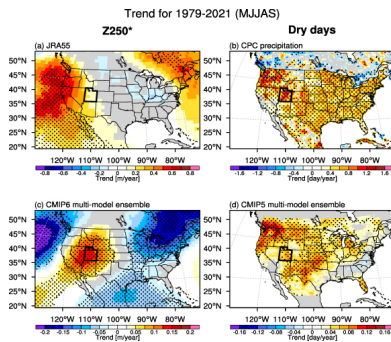


**Human Systems Working Group:** Earlier in September, the Human Systems Working Group hosted a virtual webinar by Dan Brown (Professor, University of Washington) titled "Opportunities in Spatial Agent-Based Models for Complex Land System Science." Dan discussed examples, challenges, and opportunities in utilizing agent-based models for MSD science. The webinar was attended by nearly 50 members of the MSD community, including several international participants. A recording of the webinar is available on the MSD YouTube Channel [here](#).

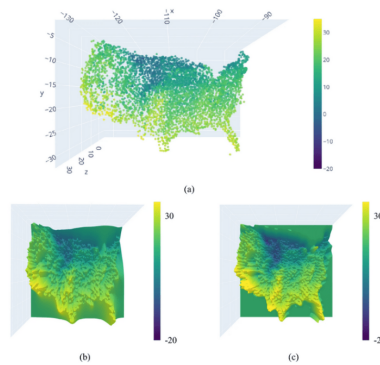
## MSD Relevant Publications

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](mailto:contact@multisectordynamics.org).

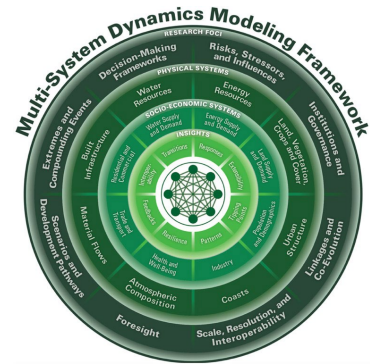
Below you can find some of the publications posted most recently:



[Interannual Variability and Trends of summertime PM2.5-based air quality in the Intermountain West](#)



[Exact Gaussian processes for massive datasets via non-stationary sparsity-discovering kernels](#)



[Assessing Compounding Risks Across Multiple Systems and Sectors: A Socio-Environmental Systems Risk-Triage Approach](#)

## 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](mailto:contact@multisectordynamics.org). Here are some of our latest postings:

### [Assistant Professor \(Engineering for Sustainable Energy Transitions\) in Biological and Environmental Engineering at Cornell University](#)

The Department of Biological and Environmental Engineering (BEE) in the College of Agriculture and Life Sciences (CALS) at Cornell University is seeking a highly collaborative scholar to contribute to the development of innovative solutions for sustainable energy transition. Our new colleague will join a Cohort Faculty Hire in Creating a Climate-Resilient Future.

### [Post Doctorate RA in JGCRI – Energy, Emissions, Environmental Modeling](#)

The Earth and Biological Sciences Directorate (EBSD) leads novel and necessary research in three core areas: Atmospheric and Climate Sciences, Biological Sciences, and Environmental Molecular Sciences. The contributions of EBSD staff are many as we continue to elevate the impact of PNNL's science mission: to understand, predict, and control the complex adaptive systems underlying the science behind Earth, energy, and security.

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](mailto:contact@multisectordynamics.org).