MultiSector Dynamics Community

Welcome to the newsletter of the **MultiSector Dynamics Community**

INSIDE THIS ISSUE

Hello MultiSector Dynamics (MSD) Community!

In this issue we're introducing the three newly established MSD Working Groups: *MultiSector Impacts of Energy Transitions*, *Urban Systems*, and *Professional Development and Education for Early Career Scientists*. We are also featuring the work of Yanyan Cheng (PNNL) on the inclusion of perennial bioenergy crops in land surface models.

Finally, we present the sessions organized by members of our community in this year's AGU Fall Meeting.

www.multisectordynamics.org

Community engagement through our website

We would like to remind you that the website for our community of practice is now fully functional at www.multisectordynamics.org.

We will be transitioning all our future communications and distributed materials to this website. In an effort to simplify operations as our community grows, **the current mailing list is being phased out so we invite everyone to register with the website to continue to receive future communications from us.** By joining, you can also register your interest with our current and future working groups.

Register here

Three newly established MSD Working Groups

Following the latest request for Working Group proposals, three new WGs have been established:

Professional Development and Education for Early Career Scientists

Description

As the MSD community is formed and begins to grow, this Working Group will seek to expand participation among a diverse group of early career scientists, provide professional development opportunities to graduate students and post-docs, and serve as a contact point for interdisciplinary education activities taking place in the MSD community. The overarching goal of this group is to support early career success in the field, which we believe will in turn support the scientific vision of MSD. Specific activities include planning workshops for early career faculty and completing an inventory of MSD-related coursework at U.S. universities.

Co-chairs

Ana Dyreson, Michigan Technological University

Tom Wild, University of Maryland

MultiSector Impacts of Energy Transitions

Description

Technological advancement and energy & environmental policy have driven rapid changes in the energy sector, and these developments have pervasive influence on other economic sectors and natural systems. As these developments accelerate, there is an increasing need to understand the resulting feedbacks between human and natural systems. This Working Group will advance the understanding of these multisectoral relationships by building a diverse team to identify what feedbacks, sectors, and societal constructs are missing from existing analytical approaches and define new research pathways towards a more holistic understanding of the multisector impacts of energy transitions.

Co-chair

Stuart Cohen, National Renewable Energy Laboratory

Marshall Wise, Pacific Northwest National Lab

MultiSector Dynamics

Urban Systems

Description

Cities are a key focal point for addressing questions related to system dependencies, tipping points, and uncertainties. Cities are also a fruitful context to explore model coupling across sectors and scales. However, efforts to combine multi-sector urban tools and insights to examine key uncertainties, interactions, and tradeoffs are still nascent. The urban working group will facilitate the development of these tools and ideas. We will explore questions like: What are the risks faced by the world's urban areas as they seek to increase resilience and balance multiple objectives such as human health, economic development, and sustainable use of resources? How does urban change influence larger-scale infrastructure, economic, and Earth system processes, and how is urban evolution constrained by these larger systems? Which processes and couplings must be represented to understand multi-sector dynamics within cities?

Co-chairs

Andrew Jones, Lawrence Berkeley National Lab (LBNL)

Christa Brelsford, Oak Ridge National Lab (ORNL)


Researcher Highlight: **Yanyan Cheng**

Yanyan Cheng is a hydrologist and land surface modeler working on complex energy-water-land dynamics. She is currently a Postdoc at the Pacific Northwest National Laboratory (PNNL) in the Atmospheric Sciences and Global Change division. She earned a PhD in hydrology and water resources engineering from the University of Wyoming in 2018.

Yanyan Cheng

Yanyan's research focuses on the development and application of hydrological and land surface models to explore the complex interactions among land use and land cover changes (LULCC), vegetation dynamics, and hydrology in agro-ecosystems. During her PhD, she developed a physically-based, distributed, hyper-resolution hydrologic model named "PFPMod" to investigate how preferential flow influences hydrological behaviors in tropical catchments (e.g., Panama). This work was the first attempt to explicitly incorporate preferential flow into hydrological models at catchment scales and has been featured in American Geophysical Union (AGU) Magazine Eos as an AGU Research Spotlight. She further applied PFPMod to examine the effects of land use dependent preferential flow on water provisioning in the Panama Canal Watershed.

Her current research at PNNL aims at improving the capability of land surface models to represent key missing vegetation types (e.g., perennial bioenergy crops) and hydrological processes (e.g., preferential flow) to investigate water, energy, and carbon cycle dynamics associated with LULCC across various scales. Recently, she has implemented two new perennial bioenergy crops (Miscanthus and switchgrass) into one of the most widely used land surface models, the Community Terrestrial System Model (CTSM; formerly known as the Community Land Model [CLM]) with comprehensive validation against site-level measurements, which constitutes the first attempt to explicitly simulate perennial bioenergy crops in CTSM (https://github.com/ESCOMP/CTSM/releases/tag/ctsm1.0.dev097). The local-scale results indicate that these two high-yield perennial crops assimilate more CO_2 while demand less nutrients and water than traditional annual crops, which are promising alternatives for biofuel feedstocks. With this enhancement, CTSM becomes one of the first land surface models that can evaluate how energy technology advances (such as potential future biofuel expansion) could influence the complex energy-water-land-climate dynamics at local, regional, and global scales.
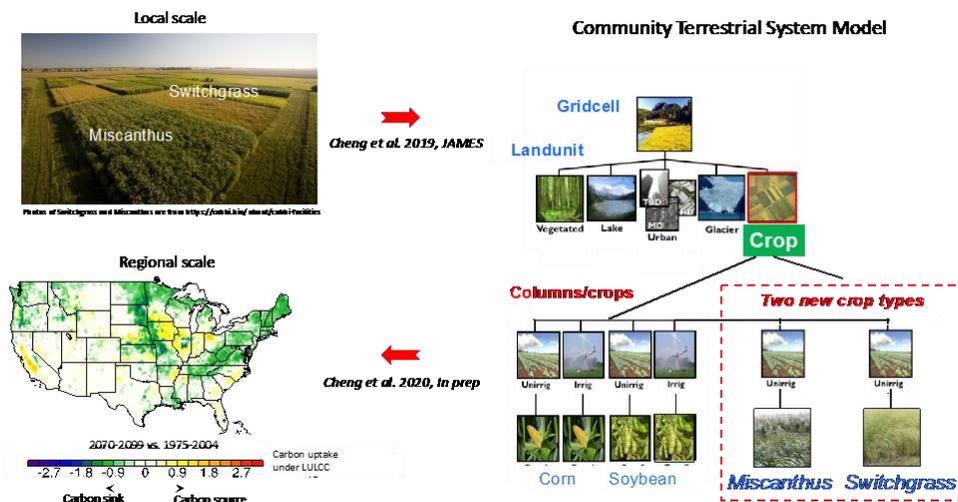
She also comprehensively validated CTSM over the Contiguous United States (CONUS) during the historical period against various datasets to examine the capability of CTSM in simulating water and carbon cycle dynamics at regional scales, with a particular focus on identifying model shortcomings related to model structure, parameterization, and agricultural management practices, which could inform future model development. Working with colleagues at PNNL and NCAR, her most recent work focuses on developing an integrated multi-sector and multi-scale modeling framework (Global Change Assessment Model [GCAM]-Demeter-CTSM) to investigate how future biofuel expansion could influence water availability and quality over the CONUS.

Yanyan is co-convening an AGU session on Advances in Understanding Impacts of Land Use and Land Cover Change in a Changing Climate Using Earth System Records and Models this year. The session's conveners sincerely welcome the MSD community's submissions and collaborations.

Highlighted articles:
- Cheng, Y. et al. (2019). Parameterizing perennial bioenergy crops in Version 5 of the Community Land Model based on site-level observations in the Central Midwestern United States, Journal of Advances in Modeling Earth Systems
- Cheng, Y. et al. (2018), Land use dependent preferential flow paths affect hydrological response of steep tropical lowland catchments with saprolitic soils, Water Resources Research.
- Cheng, Y. et al. (2017), Earthworms and tree roots: A model study of the effect of preferential flow paths on runoff generation and groundwater recharge in steep, saprolitic, tropical lowland catchments, Water Resources Research.
- Cheng, Y. et al. (2019), Characterization of sudden and sustained base flow jump hydrologic behavior in the humid seasonal tropics of the Panama Canal Watershed, Hydrological Processes.

MSD community sessions at AGU's Fall Meeting 2020

The following sessions are being convened by members of our community at this year's AGU conference:

Session	Conveners	Abstract and more information
U007 - Modeling MultiSector Dynamics to Inform Adaptive Pathways	Nathalie Voisin (PNNL), Klaus Keller (Penn State), Yoshihide Wada (IIASA)	https://agu.confex.com/agu/fm20/prelim.cgi/Session/102348
GC058 - MultiSector Dynamics: Science & Modeling for Societal Transformations	Pat Reed (Cornell); Jennifer Morris (MIT); Enayat Moallemi (Deakin U); Jan Kwakkel (TU-Delft)	https://agu.confex.com/agu/fm20/prelim.cgi/Session/101618
IN030 - MultiSector Dynamics: Adopting FAIR Data Standards	Casey Burleyson (PNNL), Adam Schlosser (MIT), Allen Lee (ASU), and Chris Vernon (PNNL)	https://agu.confex.com/agu/fm20/prelim.cgi/Session/103821
GC057 - MultiSector Dynamics: Modeling Advances for Representing Adaptive Human Systems Response to Change	Jim Yoon (PNNL), Patricia Romero-Lankao (NREL), Christian Klassert (UFZ), Evelina Trutnevyte (University of Geneva)	https://agu.confex.com/agu/fm20/prelim.cgi/Session/102850
GC059 - MultiSector Dynamics: Uncertainty Characterization for Coupled Natural-Human Systems	Vivek Srikrishnan (Penn State), Jonathan Lamontagne (Tufts), Andrea Castelletti (Politecnico di Milano), Stefano Galleli (Singapore SUTD)	https://agu.confex.com/agu/fm20/prelim.cgi/Session/103835
GC054 - Multi-Sector Dynamics: Urban System Interactions and Resilience	Andrew Jones (LBNL), Christa Brelsford (ORNL), James Rising (London School of Economics), Anu Ramaswami (Princeton)	https://agu.confex.com/agu/fm20/prelim.cgi/Session/105523
GC055 - MultiSector Dynamics: Energy-Water-Land Interactions at Multiple Scales	Tom Wild (PNNL/UMD), Zarrar Khan (PNNL), Adriano Vinca (IIASA), Makoto Taniguchi (RIHN)	https://agu.confex.com/agu/fm20/prelim.cgi/Session/105185
GC056 - MultiSector Dynamics: linking physical and human system dynamics	Abigail Snyder (JGCRI), Kalyn Dorheim (St. Olaf College), Alexander C. Ruane (NASA Goddard), Yan Li (Beijing Normal University)	https://agu.confex.com/agu/fm20/prelim.cgi/Session/104792
GC040 - Extreme Events, Climate Change and Urban Systems	Deeksha Rastogi (ORNL), Melissa R Allen-Dumas (ORNL), Kuldeep R Kurte (ORNL)	https://agu.confex.com/agu/fm20/prelim.cgi/Session/103877
GC008 - Advances in Understanding Impacts of Land Use and Land Cover Change in a Changing Climate Using Earth System Records and Models	Dan Li (BU), Edouard Davin (ETH), Yanyan Cheng (PNNL)	https://agu.confex.com/agu/fm20/prelim.cgi/Session/101664

MSD job listings

Our website is now featuring a **careers page** that will list available MSD-focused positions at all ranks. If you'd like to post a position to be featured in this page, please email us at: contact@multisectordynamics.org.

Currently, we have the following position posted:

Postdoctoral Scholar: Risk- and Decision-Analysis to Inform Flood-Risk Management

The Earth and Environmental Systems Institute (EESI) at The Pennsylvania State University invites applications for a Postdoctoral Scholar position focusing on the analysis of flood risks and strategies to manage these risks. The successful candidate will join a transdisciplinary research team supported by funding from sponsors such as The Department of Energy (DOE) and The National Oceanic and Atmospheric Administration (NOAA). The ideal candidate will have a strong background in a relevant discipline such as applied mathematics, statistics, atmospheric science, geosciences, civil and environmental engineering, or operations research. A Ph.D. in a relevant field is required by the start date.
Read more ….

MSD publications

We have been posting and will be regularly updating select MSD publications on the website, under the Publications page. If you have any publications you would like us to highlight, please email contact@multisectordynamics.org.
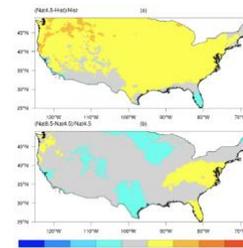
Below you can find some of the publications posted most recently:
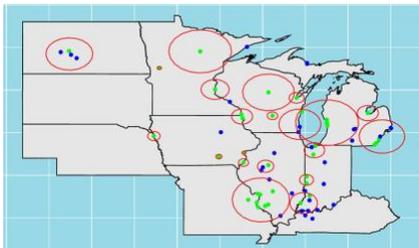
Fine-Scale Analysis of the Energy–Land–Water Nexus: Nitrate Leaching Implications of Biomass Cofiring in the Midwestern United States
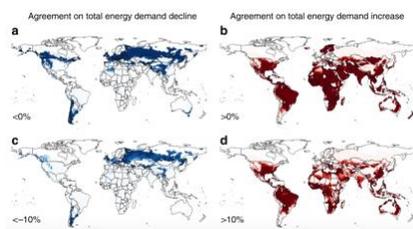
Amplification of future energy demand growth due to climate change

River Regulation Alleviates the Impacts of Climate Change on U.S. Thermoelectricity Production

This newsletter has been edited by Antonia Hadjimichael 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.