U.S. DEPARTMENT OF ENERGY | Office of Science

Office of Biological and Environmental Research

Earth and Environmental Systems Sciences Division

BERAC Update

October 13, 2022

Dan Stover (Acting Division Director)

Executing Our Strategic Plan 2018-2023

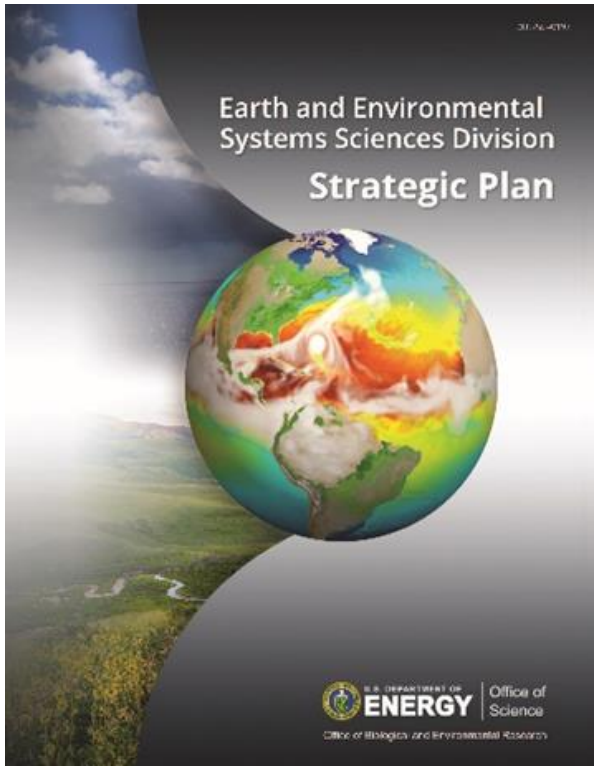
EESSD's Vision: To enhance the seasonal to multi-decadal scale predictability of the Earth system using long term field experiments, DOE user facilities, modeling and simulation, uncertainty characterization, best-in-class computing, process research, and data analytics and management in order to inform the development of advanced solutions to the Nation's energy challenges.

High-Level Scientific Grand Challenges

- Integrated water cycle
- Biogeochemistry
- High Latitudes
- Drivers/Responses in the Earth System
- Data-Model Integration

<u>Execution involving emphasis on boundaries, interfaces, extremes</u>

- Collaborative opportunities: NOAA; USGS; NGA; NSF; NASA; others
- Topics: disturbance, initialization, data analytics (e.g., machine learning), software, advanced technologies, Terrestrial-Aquatic Interfaces, Coastal, etc.



https://science.osti.gov/-/media/ber/pdf/workshop-reports/2018_CESD_Strategic_Plan.pdf

What's Happened Since the Last BERAC in April 2022

More extreme weather

- Extreme September heat
- Wildfires across the globe
- Extreme storm west Alaska
- European heat waves
- Heat wave India/Pakistan
- Floods in Pakistan
- Hurricane Ian in Florida
- Hurricane in eastern Canada
- Record heat in NW Territories

OSTP

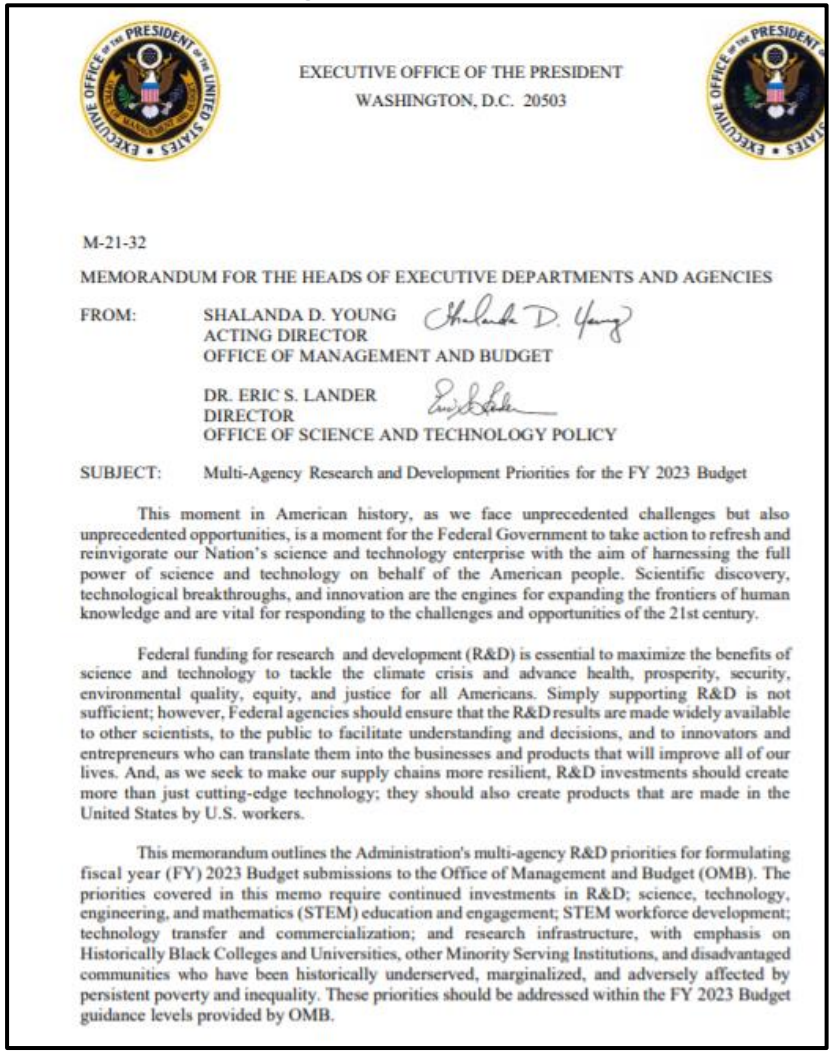
- USGCRP Strat Plan
- ICAMS wildfire workshops
- Climate Intervention task force
- GHG monitoring task force
- National nature assessment

A new era of prediction science

- AI4ESP – hybrid science
- Water cycle – mtn hydrology
- EJ40 initiatives: IFL; NVCL, RDPP, RENEW, Centers

Administration Executive Orders on Climate

EO13985: Racial equity, underserved communities
EO13990: Health, environment, climate – reversing last 4 yrs
EO14008: climate crisis – home and abroad, security
EO14017: America's supply chains
EO14027: Climate change support office established
EO14030: Climate related financial risk



EXECUTIVE OFFICE OF THE PRESIDENT
WASHINGTON, D.C. 20503

M-21-32

MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

FROM: SHALANDA D. YOUNG
ACTING DIRECTOR
OFFICE OF MANAGEMENT AND BUDGET

DR. ERIC S. LANDER
DIRECTOR
OFFICE OF SCIENCE AND TECHNOLOGY POLICY

SUBJECT: Multi-Agency Research and Development Priorities for the FY 2023 Budget

This moment in American history, as we face unprecedented challenges but also unprecedented opportunities, is a moment for the Federal Government to take action to refresh and reinvigorate our Nation's science and technology enterprise with the aim of harnessing the full power of science and technology on behalf of the American people. Scientific discovery, technological breakthroughs, and innovation are the engines for expanding the frontiers of human knowledge and are vital for responding to the challenges and opportunities of the 21st century.

Federal funding for research and development (R&D) is essential to maximize the benefits of science and technology to tackle the climate crisis and advance health, prosperity, security, environmental quality, equity, and justice for all Americans. Simply supporting R&D is not sufficient; however, Federal agencies should ensure that the R&D results are made widely available to other scientists, to the public to facilitate understanding and decisions, and to innovators and entrepreneurs who can translate them into the businesses and products that will improve all of our lives. And, as we seek to make our supply chains more resilient, R&D investments should create more than just cutting-edge technology; they should also create products that are made in the United States by U.S. workers.

This memorandum outlines the Administration's multi-agency R&D priorities for formulating fiscal year (FY) 2023 Budget submissions to the Office of Management and Budget (OMB). The priorities covered in this memo require continued investments in R&D; science, technology, engineering, and mathematics (STEM) education and engagement; STEM workforce development; technology transfer and commercialization; and research infrastructure, with emphasis on Historically Black Colleges and Universities, other Minority Serving Institutions, and disadvantaged communities who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality. These priorities should be addressed within the FY 2023 Budget guidance levels provided by OMB.

Climate, AI, computing, critical & emerging tech, innovation for equity, biopreparedness, STEM

Management Updates – PI Meetings 2022

PI Meeting	Dates	Location
ESS PI meeting	May 24-26, 2022	Virtual
ARM-ASR PI meeting	October 25-27, 2022	Rockville Hilton/ hybrid
Urban IFLs PI meeting	November 2022	TBD
Modeling PI meeting	Spring 2023	TBD
ESS PI Meeting	May 15-18, 2023	Bethesda, MD/ hybrid

Management Updates – Major Reviews in FY-2022

Lab	Program	Type	Review date	Decision	Date
PNNL	EMSL	EMSL (triennial)	Nov 3-4, 2021	Accept	April 14, 2022
PNNL	ASR	ICLASS SFA	Nov 17-19, 2021	Accept	Feb 4, 2022
ORNL-led	ESS	NGEE Arctic Phase 3 (mid-term)	March 9, 2022	Accept	Mar 21, 2022
PNNL	ESS	COMPASS (mid-term)	March 10, 2022	Accept	April 11, 2022
	Modeling	HYPERFACETS Coop Agreement	April 20, 2022	Accept	May 5, 2022
ORNL	Modeling	RUBISCO SFA (triennial)	July 13-14, 2022	Accept	Sept 9, 2022
LANL	ESS	IDEAS-Watershed (triennial)	July 28, 2022		
LLNL	ASR	THREAD SFA (New)	Aug 17-18, 2022		
LBNL	ESS	Belowground BGC SFA	Aug 24-25, 2022		
	Modeling	MIT Coop Agreement	Sept 9, 2022		
LANL	Modeling	HILAT SFA (triennial)	Oct 20-21, 2022		
LLNL-led	Modeling	E3SM (triennial)	Oct 31–Nov 2		
ORNL	ESS	WADES (post Hg/Critical Interfaces)	Nov 3-4, 2022		

Management Updates – Solicitations in FY-2022

Funds	Program lead	Issued	Proposals	Panel (2022)	Selections
FY22	Early Career (ESS)	Sept 9, 2021	11	Mar 14	3
FY22	ASR	Sep 27, 2021	92	Mar 14-25	22
FY22	ESS	Oct 18, 2021	59	May 2-6	12 (+12)
FY22	Modeling	Nov 1, 2021	89	May 9-14	11
FY22	SciDAC	Nov 22, 2021	15	Jun 6-10	7
FY22	RDPP*	Feb 23, 2022	53	(internal)	35
FY22	Urban IFL*	Mar 23, 2022	42	Jul 19-20	3
FY22	RENEW*	May 2022	16	Oct 17-19	Approx 4
FY23	ARM (AMF2)	April 4, 2022	6	Aug 30-31	1

* RDPP, Urban IFL, and RENEW have an Environmental Justice 49 (EJ40) label

FY-2022 – New BER EJ40 Climate Investments

- **Urban Integrated Field Laboratories (Urban IFLs)**

  Advance underpinning science of integrated natural-human urban systems to assure resilience to climate extremes using equitable solutions

- **National Virtual Climate Laboratory (NVCL)**

  A single portal to DOE national lab climate science capabilities, to advance access to climate science through public engagement on local to regional scale climate science. In future years this will serve as the lab partner portal for RENEW.

- **Research Development and Partnership Pilot (RDPP)**

  Preparing MSIs to engage in BER funded research, including future solicitations involving Climate Resilience Centers.

- **Reaching a New Energy Sciences Workforce (RENEW)**

  Establish traineeships for HBCU/MSI undergraduates and graduates through partnerships with ongoing Science Focus Areas (SFAs) within the Earth and Environmental Systems Sciences Division.

Urban Integrated Field Laboratories (IFLs)
Climate science with community stakeholders

Selected Urban IFLs in FY2022:

- **Chicago IFL -** the 3rd largest city in the nation, led by Argonne National Laboratory, will employ a network of observations and modeling from street to regional scales to explore multiple issues, including mitigation via green roofs and blue spaces, and community-driven future scenarios for adaptation and decarbonization.

- **Southeast TX IFL -** led by the University of Texas at Austin in Beaumont/Port Arthur Texas, focuses on specific challenges of industrialized, medium sized port cities, including significant legacies of petrochemical industry, and how climate change may affect urban flooding and air quality.

- **Baltimore IFL -** led by Johns Hopkins University, focuses on a metropolitan area facing interlinked challenges of aging infrastructure, increased heat and flood risk, and inequitable burdens of air and water pollution that are common to many other mid-sized industrial cities in the Eastern and Midwest US.

BER and DOE/SC Initiatives as We Transition from FY-22 to FY-23

FY2022 Initiatives

- **Climate and Clean Energy**
- **Artificial Intelligence and Machine Learning**
- **Reaching a New Energy Sciences Workforce (RENEW)**
- **Biopreparedness Research Virtual Environment (BRaVE)**
- **Urban Integrated Field Laboratory**
- **Advanced Computing**
- **Fundamental Science to Transform Advanced Manufacturing**
- **Quantum Information Science**
- **National Virtual Climate Laboratory (NVCL)**
- **Network of Climate Resilience Centers**
- Advanced Microelectronics
- Critical Materials
- **Exascale Computing**
- Accelerator Science & Technology

New FY2023 Initiatives

- SC Energy Earthshots
- Accelerate Innovations in Emerging Technologies (Accelerate)
- Funding to Accelerated, Inclusive Research (FAIR)

Workshops Set the Stage for EESSD Priorities in FY-23, FY-24, and Beyond

Date	Topic	Venue
Oct 25 – Dec 2, 2021	AI4ESP workshop – 17 sessions plus panels	virtual
Nov 15-16, Dec 6, 2021	Mountainous hydrology workshop	virtual
March 7, 13, 2022	Puget Sound Scoping workshops	virtual
April 1, June 2	ICAMS Wildfire workshops	virtual
April 10	Marine Cloud Brightening workshop	virtual
April 25-26	Large Eddy Simulation workshop	virtual
May 15-17	Climate Communications Workshop	virtual
May 23	Cyberinfrastructure Working Group Workshop	virtual
June 7-9	GCAM Annual Meeting	hybrid
August 2-4	Climate Modeling Summit	hybrid

EESSD Science Highlights

Examining the Ecological Assembly of Organic Matter and Microbes

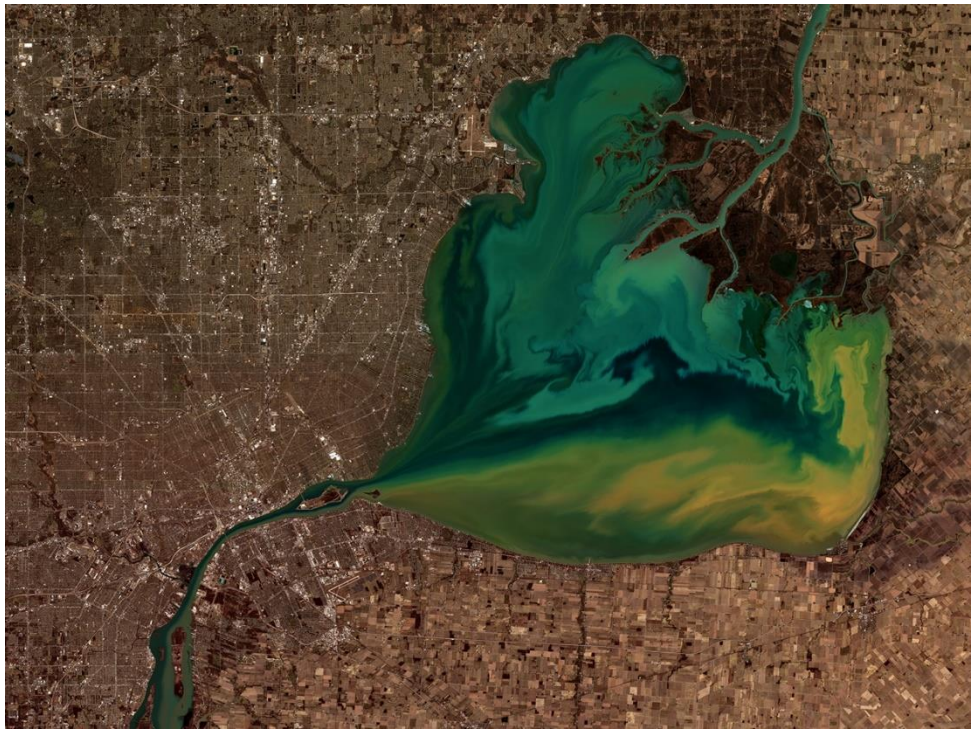
Objective: Identify community members (or assemblage members in the case of molecular formulas) that disproportionally impact community structure.

Approach

- Develop a novel metric, called βNTI_{feat}, capable of quantifying ecological contributions from community members.
- Apply the metric to a dataset to demonstrate utility in generating ecological and biogeochemical observations.
- Provide the underlying methodology to scientific community.

Impact

- Using βNTI_{feat}, we observed that unclassified and uncultured microbial lineages often play an outsized role in the community, relative to their abundance, and organic matter pools were often driven by nitrogen- and phosphorus-containing molecular formulas.
- βNTI_{feat} enables researchers to evaluate members which phylogenetically or functionally drive community dynamics.



The chemistry and biology of environmental systems (one of the reasons for color differences in waters) vary tremendously through space and time, and those variations have significant influences over the functioning of ecosystems, such as the production of greenhouse gases. New methods are needed to understand what drives this chemical and biological variation. This study developed a method to reveal the forces acting on individual chemical and biological species, instead of being limited to studying bulk assemblages of species. The method promises to reveal new mechanistic connections between the chemical and biological environment within complex environmental systems.
Image courtesy of lavizzara | Shutterstock

Danczak RE, Sengupta A, Fansler SJ, Chu RK, Garayburu-Caruso VA, Renteria L, Toyoda J, Wells J, and Stegen JC. Inferring the contribution of microbial taxa and organic matter molecular formulas to ecological assembly. *Front. Microbiol.* 13, 803420 (2022) DOI: 10.3389/fmicb.2022.803420/full

Disturbance Legacies Shape Coastal Forest Soil Stability

Objective: Coastal forests are increasingly exposed to climate change and sea level rise, but the impacts to soil stability are poorly understood.

Approach

- Researchers used a natural salinity gradient in a tidal creek in eastern MD to examine how soil respiration and chemistry may change under novel salinity and inundation disturbance regimes.
- Soil monoliths were transplanted among plots varying in seawater exposure and elevation above the creek and were monitored for two years.

Findings

- Respiration did not change (high resistance) under new moisture conditions in lowland soils with a history of seawater exposure.
- Conversely, respiration decreased (low resistance) in upland soils that had little past exposure to seawater or inundation (low resistance) and remained suppressed (low resilience) when exposed to wetter, saline conditions.
- Transplantation resulted in greater changes to upland soil chemistry relative to lowland soils.

Impact

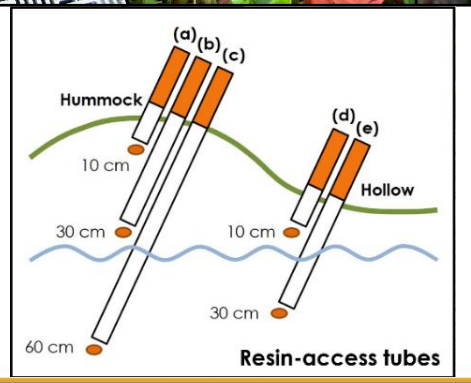
- Differences in the resilience of soil carbon cycling will likely vary across landscapes, explained by soils' ecology, biogeochemistry, and legacy prior to disturbance.
- In the context of ongoing climate change, manipulative transplant experiments provide a crucial inferential link between purely observational experiments, data synthesis efforts, and large-scale ecosystem manipulations.

Hopple, A. M., et al., "Disturbance legacies regulate coastal forest soil stability to changing salinity and inundation: A soil transplant experiment." Soil Biology and Biochemistry 169, 108675 (2022).

Warming Strongly Increases Nutrient Availability in Nutrient-Limited Bog

Objective	We investigated the nutrient dynamics underpinning peatland responses to changing environmental conditions within the framework of the large-scale SPRUCE warming × CO_2-enrichment experiment in a nutrient-limited bog at the southern end of the boreal peatland range.
New science	Whole-ecosystem warming exponentially increased nutrient availability throughout the belowground peat profile, especially in recent years as the carpet of *Sphagnum* mosses at the peat surface died in the warmest experimental treatments. Nutrient dynamics were not yet affected by elevated [CO_2].
Impact	Peatlands cover less than 3% of the world's land surface but hold at least one third of global soil carbon in deep deposits of peat. Increased nutrient availability could impact peatland carbon storage. However, the magnitude and pattern of the observed increases in peat nutrient availability with warming were not captured in the virtual space of the ELM-SPRUCE land surface model.

Iversen CM, Latimer J, Brice DJ, Childs J, Vander Stel HM, Graham J, Griffiths N, Malhotra A, Norby RJ, Olehieser K, Phillips J, Salmon VG, Sebestyen SD, Yang X, Hanson PJ. 2022. Whole-ecosystem warming increases plant-available nitrogen and phosphorus in the SPRUCE bog. *Ecosystems*, https://link.springer.com/article/10.1007/s10021-022-00744-x.



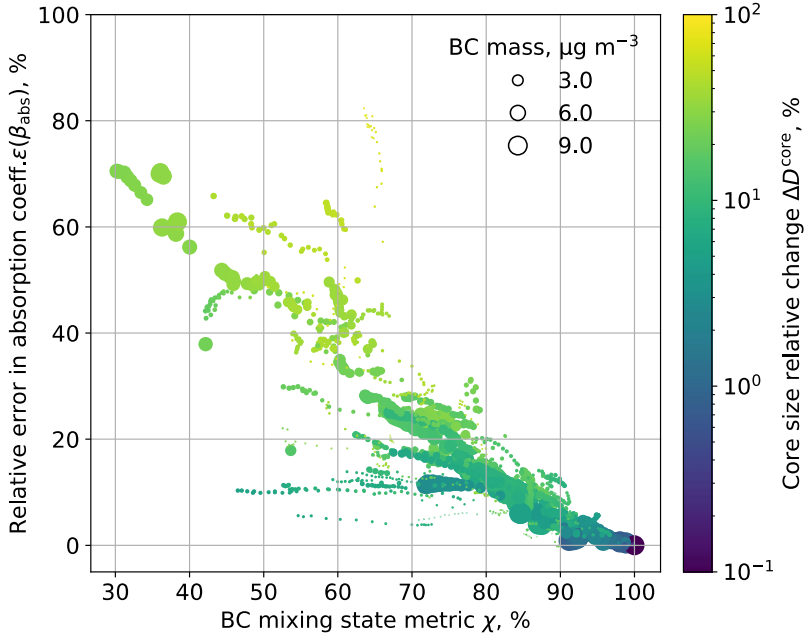
Particle-Resolved Model Simulations Quantify Errors in Optical Properties

Scientific Challenge

- Accurate calculations of the aerosol direct effect on climate require assumptions about the optical properties of populations of aerosols.
- Aerosol populations can be composed of mixtures of different particle types, as well as particles that themselves are mixtures.
- How models simplify and represent the way that aerosol populations are mixed can introduce large uncertainties into radiative forcing estimates

Approach and Results

- ASR-funded scientists systematically quantified the impact of aerosol mixing state on aerosol optical properties calculations using results from an ensemble of 1800 particle-resolved simulations representing different ways particle populations could be mixed.
- Assuming the aerosol population to be uniformly internally mixed caused overestimations of aerosol absorptivity and underestimations of aerosol scattering.



Relative error in absorption coefficients when assuming the aerosol is internally mixed. Each marker represents an aerosol population. The color denotes the change of black carbon (BC) diameter due to composition averaging, and the marker size represents black carbon bulk mass in the population.

Significance and Impact

- Particle-resolved simulations offer a benchmarking tool to determine the error in optical properties when using simplified aerosol representations that are common in large-scale models.
- Errors in single scattering albedo due to the internal mixture assumptions are of a magnitude that warrants caution in calculating the direct radiative aerosol forcing.

Yao, Y., Curtis, J. H., Ching, J., Zheng, Z., and Riemer, N.: Quantifying the effects of mixing state on aerosol optical properties, *Atmos. Chem. Phys.*, 22, 9265–9282, https://doi.org/10.5194/acp-22-9265-2022, 2022.

Molecular Composition of Aerosols Differs Day to Night

Objective

- Identify molecular makeup of secondary organic aerosols (SOAs) over the Southern Great Plains in Oklahoma, a major agricultural region.

Approach

- Collected aerosol samples at the Southern Great Plains (SGP) atmospheric observatory using a bulk aerosol collector.
- Analyzed the samples using nanospray desorption electrospray ionization with high-resolution mass spectrometry.

Findings and Impact

- While SOAs have been investigated for a wide variety of environments, their formation over agricultural land is relatively unexplored.
- Organosulfates within aerosols were greater during daytime than nighttime; nighttime aerosols were more liquid-like.
- Some aerosols could be traced back to urban area sources.
- Characterization of aerosols from agricultural regions can be incorporated into atmospheric process and climate models.

Scientists characterized SOAs over an agricultural field in the SGP, unveiling new details about aerosol composition in the daytime compared to at night.

EMSL ARM

Participants:
Environmental Molecular Sciences Laboratory
Atmospheric Radiation Measurement user facility
Sandia National Laboratories
Brookhaven National Laboratory
Pacific Northwest National Laboratory

G. Vandergrift, et al., "Molecular Characterization of Organosulfate-Dominated Aerosols over Agricultural Fields from the Southern Great Plains by High-Resolution Mass Spectrometry." ACS Earth and Space Chemistry. 6(7), 1733-1741 (2022). [DOI: 10.1021/acsearthspacechem.2c00043]

New Detection Methods Find More Drizzle in Marine Stratocumulus Clouds

Scientific Challenge

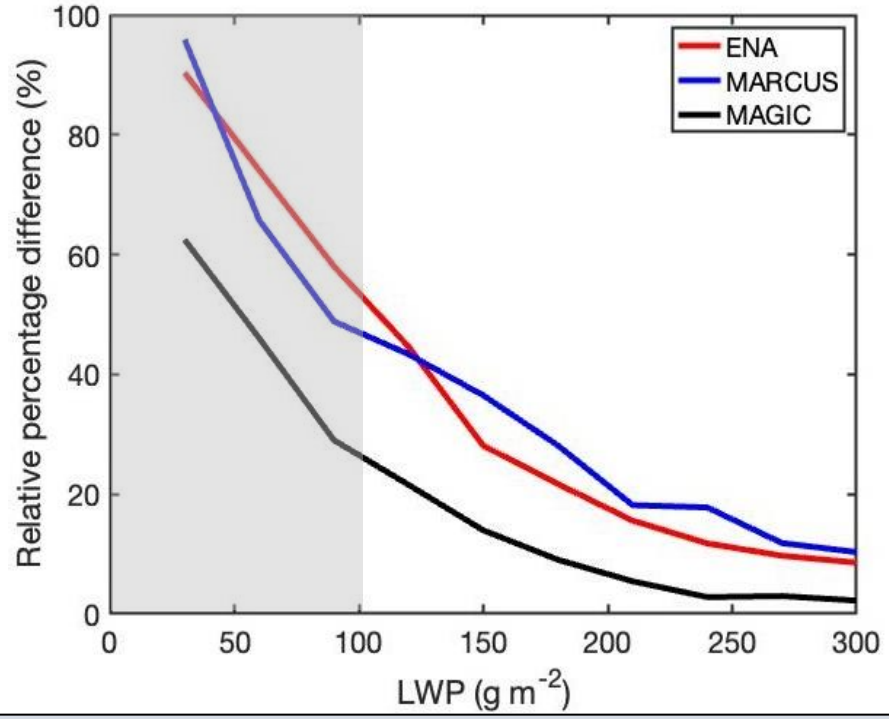
- Drizzle plays a vital role in the lifecycle of the marine stratocumulus clouds that are important to climate.
- Current understanding of drizzle formation and existence in marine stratocumulus clouds is incomplete.

Approach and Results

- A machine-learning-based approach is developed using unique cloud radar observations to identify the early stage of drizzle drops.
- The drizzle detection algorithm is evaluated by aircraft in-situ measurements and then applied to three ARM observational campaigns (ENA, MARCUS, MAGIC).
- Drizzle is found to be far more frequent than previously recognized by the traditional methods.
- Drizzle formation and distribution is regime dependent, controlled by microphysical and dynamical processes in the local region.

Significance and Impact

- The ubiquitousness of drizzle found in marine stratocumulus clouds requires an improved understanding of drizzle formation.
- The new method provides essential information in the light precipitation region, which challenges the detection limits of satellite-borne observations used in precipitation climatologies for GCM evaluation.



The figure shows the relative percentage difference in drizzle occurrence between the traditional and new detection methods as a function of liquid water path (LWP) for ARM campaigns at ENA, MARCUS, and MAGIC

Zhu, Z., Kollias, P., Luke, E., and Yang, F. 2022: "New insights on the prevalence of drizzle in marine stratocumulus clouds based on a machine learning algorithm applied to radar Doppler spectra." *Atmospheric Chemistry and Physics,* 22, 7405–7416, https://doi.org/10.5194/acp-22-7405-2022.

Sea-Ice Dynamics on Unstructured Voronoi Meshes in MPAS-Seaice

Scientific Challenge

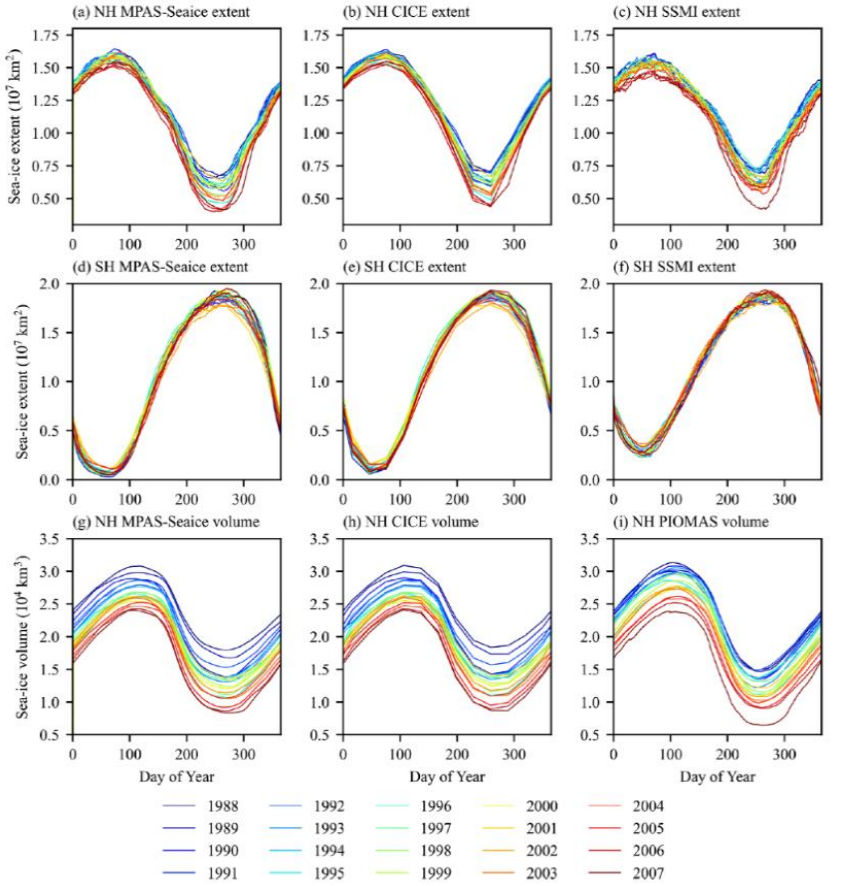
- Develop a sea ice dynamical core for the unstructured Voronoi meshes used in the Modeling for Prediction Across Scales (MPAS) framework
- Develop and validate a sea ice component for E3SM

Approach and Results

- Adapt variational operators used by CICE for the Voronoi meshes used by MPAS
- Use two basis function options: Wachspress and piecewise linear
- Additional finite volume formulation for comparison
- Compare simulation results in idealized test cases, and against existing sea ice models on a quadrilateral mesh (CICE), and against observations
- New spatial operators for strain and stress divergence show good error convergence properties for increasing model resolution
- Model results compare favorably against CICE results and observations

Impact

- MPAS-Seaice developed and used as sea ice component for E3SM
- E3SM sea ice component can now use variable resolution meshes with model resources concentrated in regions of interest
- Possibility of removing equatorial cells from model domain to increase computational efficiency



Comparison of sea ice extent and volume for results from MPAS-Seaice and CICE and observations showing good agreement.

Turner, A. K., Lipscomb, W. H., Hunke, E. C., Jacobsen, D. W., Jeffery, N., Engwirda, D., Ringler, T. D., and Wolfe, J. D.: MPAS-Seaice (v1.0.0): sea-ice dynamics on unstructured Voronoi meshes, *Geosci. Model Dev.*, 15, 3721–3751, https://doi.org/10.5194/gmd-15-3721-2022.

Contrasting How Urbanization and Irrigation Affect Mid-Atlantic Summer Precipitation

Objective

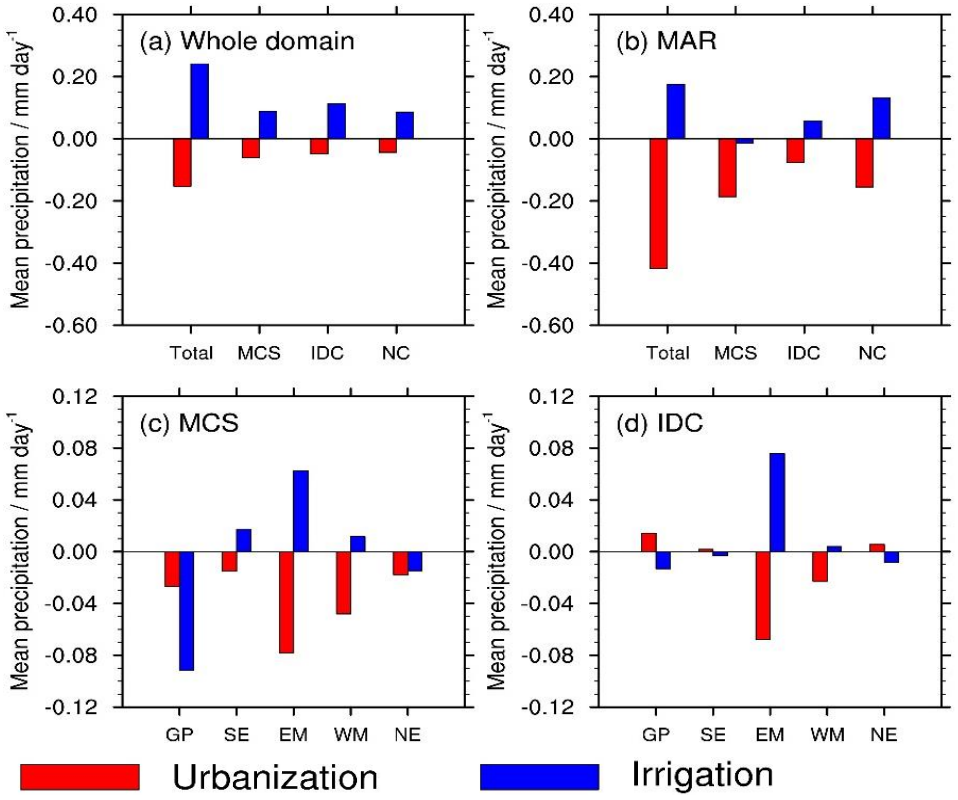
- Investigate the effects of large-scale urbanization and irrigation on three types of summer precipitation (MCS: mesoscale convective system; IDC: isolated deep convection; NC: non-convective) in the mid-Atlantic region.

Approach

- Compare convection-permitting Weather Research and Forecasting model simulations with and without urbanization or irrigation in summers from 2008 to 2012.
- Separate precipitation into three types using the updated Flexible Object Tracker algorithm.
- Classify MCS and IDC events in the mid-Atlantic region into five groups based on their initiation location.
- Analyze how large-scale urbanization and irrigation affect different groups of MCS and IDC precipitation.

Impact

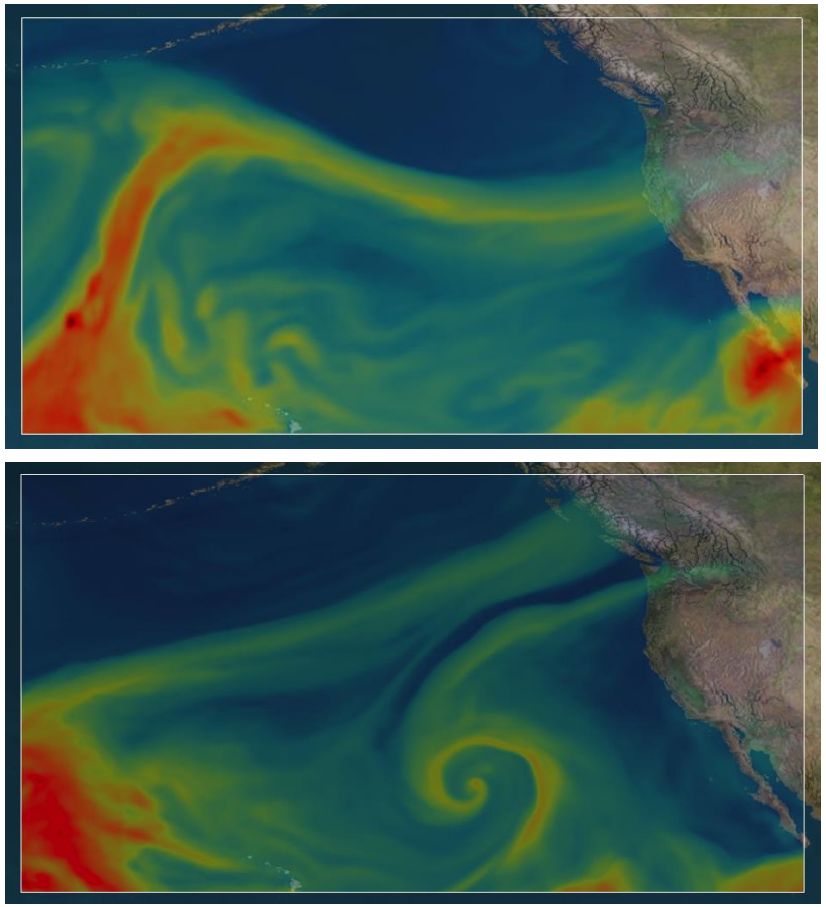
- Identifies the mechanisms underlying the contrasting effects of large-scale irrigation on mid-Atlantic precipitation from locally and remotely initiated MCSs.
- Highlights the diverse effects of human activities on total rainfall and its distribution across different rain types.



The effects of urbanization and irrigation on different rain types and different groups in the Mid-Atlantic region. Urbanization suppresses all three rain types. Irrigation enhances IDC and NC but slightly suppresses MCS precipitation. While irrigation enhances locally initiated MCSs (EM), it induces a mid-level cyclonic circulation anomaly that inhibits MCSs initiated in the Great Plains and Midwest from propagating to the Mid-Atlantic region.

J. Li, Y. Qian, L. R. Leung, Z. Feng, C. Sarangi, Y. Liu, and Z. Yang. "Impacts of large-scale urbanization and irrigation on summer precipitation in the Mid-Atlantic region of the United States." *Geophysical Research Letters*, **49(8),** e2022GL097845, (2022). [DOI: 10.1029/2022GL097845].

Topological Methods for AI/ML Pattern Detection in Climate Data



Sample images of two simulated weather patterns having topologically distinguishable structures in climate model output. Top: Atmospheric River making landfall over California. Bottom: Extra-Tropical Cyclone approaching the US west coast.

Scientific Achievement

- We describe an automated method for the identification of the extreme events in large sets of climate simulation data. This method adapts an algorithm for topological data analysis to extract numerical features of topological descriptors called connected components. The features are then fed to a supervised machine learning classifier. The classifier performs a binary classification task to identify the extreme weather patterns we are interested in.

Significance and Impact

- Our pattern detection method is reliable and exhibits high accuracy. This method performs better for low-spatial-resolution simulation datasets than high-spatial-resolution datasets because high-resolution datasets contain noisier AR patterns. It is possible to apply them to higher-dimensional or multivariate fields. The applied topology and machine learning framework could be an effective way to characterize and identify a wide range of other weather patterns than analyzed here, including tropical cyclones or blocking events.

Research Details

- Combining concepts from **topology with machine learning** presents an alternative and efficient storm detection algorithm useful in very large climate model datasets. The main advantage of incorporating a topological algorithm in a detection scheme is that it allows for a threshold-free analysis The method is also much faster than traditional machine learning methods such as convolutional neural networks.

G. Muszynski, V. Kurlin , D. Morozov, M. Wehner, K/ Kashinath , Prabhat (2022) Topological Methods for Pattern Detection in Climate Data, Big Earth Data Analytics in Earth, *Atmospheric and Ocean Sciences*, Chapter 13, pp 227-243.T. Huang, T. Vance, C. Lynnes, eds. ISBN: 978-1-119-46757-1

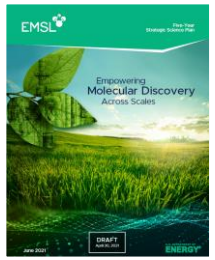
ARM Updates

- **ARM 30-year anniversary**
  - First ARM data collected at SGP in May 1992
- **ARM Mobile Sites & Campaigns**
  - TRACER successfully completed operations Sep 30, 2022, and BER site visit on June 8-9, 2022
  - SAIL campaign ongoing – BER site visit Sep 20-21
  - EPCAPE – Scripps Pier, La Jolla, CA – in prep for Feb 2023 start
  - ARM Mobile Facility proposal review panel held Aug 30-31
- **ARM Fixed Site Activities**
  - Mentor visits to ENA & NSA to catch up on COVID-deferred maintenance
  - First Arctic Shark UAS science flights at SGP successful
  - Aerosol Growth in Eastern North Atlantic campaign at ENA
  - Multiple small campaigns at SGP; snow albedo campaign at NSA
- **ARM High Performance Computing:**
  - Initial CACTI deep convection simulations w/ LASSO available
  - New Jupyter notebook capability for analysis of ARM datasets
- **ARM/ASR User Facility & PI Meeting**
  - Oct 24-27; Rockville, MD and hybrid

Environmental Molecular Sciences Laboratory

Accelerating scientific discovery and pioneering new capabilities to understand biological and environmental processes across temporal and spatial scales

EMSL Strategic Planning



- MONet – Molecular Observations Network
  - 1,000 Soils Pilot launched as "soft" MONet roll-out
- Microbial Molecular Phenotyping Capability (M2PC) Project ($80-$120M)
  - Analysis of Alternatives (AoA) signed by SC-1; EMSL expansion as the selected alternative
  - CD-1 Review in FY23, Construction start in FY25, Start-up in FY28

User Proposals for FY2023

Large-Scale Research | 105 LOIs, 21 new to EMSL

Functional And Systems Biology	**37**
Environmental Transformations and Interactions	**56**
Computation, Analytics, and Modeling	**12**

EMSL-JGI FICUS | 47 LOIs, 10 new to EMSL

EMSL-ARM FICUS | 7 LOIs, 2 new to EMSL

Exploratory Call | 33 LOIs, 20 new to EMSL

Outreach and User Activities

- EMSL Summer School "Soils Exposed" | July 18-22
  - ~130 attendees per day, 19% from HBCUs/MSIs
- EMSL LEARN Webinar Series | Monthly
- EMSL LEARN Tutorial Series | emsl.pnnl.gov/learn
- EMSL Integration | AI & Machine Learning | Oct. 4-6
- EMSL-ARM land-atmosphere workshop | Oct. 17
- Breakout session at ASR PI Meeting | Oct. 26
  - Vertical distribution of aerosol properties

THANK YOU!