Earth & Environmental Systems Modeling

2024 EESM PI Meeting

August 6-9, 2024
Bethesda North Marriott Hotel & Conference Center
Rockville, Maryland, USA

Date and Time: Tuesday, August 6, 2024 1:00-4:00 p.m.

Session Name: E. Biogeochemistry (Processes and Feedbacks)

Room / Location: Forest Glen Room

Breakout Chairs: Forrest M. Hoffman, ORNL (hoffmanfm@ornl.gov) and Ben Bond-Lamberty, PNNL (bondlamberty@pnnl.gov)

Topic Leads: Jennifer Holm, LBNL; Dave Lawrence, NCAR; Charlie Koven, LBNL; Ryan McManamay, Baylor; Alan Di Vittorio, LBNL; Umakant Misra, SNL; Susannah Burrows, PNNL; Katherine Smith, LANL

Breakout Session Agenda

1:00–2:30 p.m. Grand Challenge Session
Facilitators – TBD
Zoom Monitors (2) – TBD
Rapporteurs (2) – TBD

1:00 p.m.: Featured oral presentation (10 min plus 2 min for clarifying questions)
- The Ecological and Economic Underpinnings of the Weak Land Sink Hypothesis – James T. Randerson, UC Irvine

1:15 p.m.: Oral Presentations (5 min plus 1 min for clarifying questions and 30 sec for transition)
- Recent advances in observations and modeling of global wetland CH_4 emission – Qing Zhu, LBNL
- Tracking carbon dioxide in the Southern Ocean – Nicole Lovenduski, U. Colorado
- Simulating marine biogeochemistry and potential climate feedbacks with a next-generation ecosystem model – J. Keith Moore, UC Irvine
- Dust and Pollution: Coupling Aerosol Nutrients to Marine and Land Biogeochemistry – Yan Feng, ANL

1:40 p.m.: Discussion (50 min)
- DOE Strengths and Capabilities (10 min)
- Grand Challenges (10 min)

    - Relevant past reports / collections of grand challenges
        - 2018 CESD strategic plan
        - 2020 BERAC Report
        - Report out from 2018 session: Hoffman_Ecosystem_Responses_and_Feedbacks_20181109
        - WCRP grand challenges
        - BERAC. 2017. Grand Challenges for Biological and Environmental Research: Progress and Future Vision; A Report from the Biological and Environmental Research Advisory Committee, DOE/SC–0190, BERAC Subcommittee on Grand Research Challenges for Biological and Environmental Research. (science.osti.gov/~/media/ber/berac/pdf/Reports/BERAC-2017-Grand-Challenges-Report.pdf). See p. 22 for summary of grand challenges.
        - Previous report draft (2018): Interannual to Multi-decadal Whitepaper
        - Previous report draft (2019): RGMA_PI_Meeting_2019_Revised1.pdf
        - MSD Vision Report (p. 31 generally, p. 36 InteRFACE project).
    - Our notes on the 2018 breakout outcomes
        - Bullet points 1 and 5 are very broad, might be useful to focus them more.
        - Bullet points 2-3 could potentially be combined.
        - Bullet point 4 could be reframed to also include impacts of land/ocean ecosystems on aerosols and climate (e.g., changes in LULCC impacting dust emissions, nitrate aerosol precursors, etc.; ocean DMS and sea spray emissions, terrestrial biogenic VOCs, impacting natural background aerosol)
- Gaps in Research / Infrastructure / Coordination (10 min)
- Opportunities to Overcome Gaps (20 min)

2:30 p.m. Break

2:45–4:00 p.m. AI/ML and Simulation Session
Facilitators – TBD
Zoom Monitors (2) – TBD
Rapporteurs (2) – TBD

2:45 p.m.: Featured oral presentation (10 min plus 2 min for clarifying questions)
- Land Carbon Sink Uncertainty Under Climate Change: Towards and Emissions-Driven Coupled Perturbed Parameter Mini-Ensemble with CESM (BGC) – David Lawrence, NCAR

3:00 p.m.: Oral Presentations (5 min plus 1 min for clarifying questions and 30 sec for transition)
- Use of machine learning to investigate soil carbon storage and dynamics – Umakant Mishra, SNL
- Large revision of global net photosynthesis with learning acclimation from multi source dataset – Doaa Aboelyazeed, Penn State U.
- Quantifying global photosynthesis and CO_2 fertilization with machine learning and eddy covariance measurements – Yanghui Kang, UC Berkeley

- The influence of global fire emissions on tropospheric chemistry in the Energy Exascale Earth System Model (E3SM) – Li Xu, UC Irvine

3:26 p.m.: Discussion (30 min)

- Potential Coordination Across BER (5 min)
- Roles Other Agencies Play / Could Play (5 min)
- 2–5 year, 5–10 year, and long-term Goals for Addressing Grand Challenges (20 min)

3:45 p.m.: Recap and Preparation of Breakout Report Out

4:00 p.m.: Adjourn

Wednesday Poster Session

- #037 A new autoregressive model of air-sea CO_2 exchange – Takamitsu Ito, Georgia Tech
- #038 Heatwaves drive net carbon losses across ecosystems – William J. Riley, LBNL
- #040 Evaluating the influence of plant-climate interactions and feedbacks on hydrologic cycling: quantifying and validating the roles of plant processes and stomatal conductance – Gabriel Kooperman, University of Georgia
- #041 Enhancing Polar Modeling Capabilities in E3SM for Evaluating Arctic Marine Ecosystem Change – Nicole Jeffrey, LANL
- #042 Using E3SM to understand bio-geo-chemical dynamics in high latitude marine ecosystems and deriving model products relevant to Arctic Stakeholders – Georgina Gibson, LANL

Thursday Poster Session

- #037 MOSART-DOC: a new large-scale riverine dissolved organic carbon model and its application over the United States – Hongyi Li, University of Houston
- #038 Photosynthesis responses to intrinsic water use efficiency depend on atmospheric feedbacks and modify the magnitude of response to elevated CO_2 – Amy Liu, University of Washington
- #039 flat10MIP: A CO_2 emissions-driven experiment to diagnose the climate response to positive, zero, and negative CO_2 emissions – Charlie Koven, LBNL
- #040 Towards Coastal Ocean Carbon Cycle Modeling in E3SM – Kat Smith, LANL
- #041 Hector V3.2.0: functionality and performance of a reduced-complexity climate model – Kalyn Dorheim, PNNL
- #042 Marine Biogeochemistry Capabilities for E3SM Version 3 Simulations – Mathew Maltrud, LANL
- #043 The E3SM BGCv2 land-atmosphere coupled simulation campaign – Sha Feng, PNNL