ICON-ModEX: Improving Knowledge and Predictions of Hyporheic Zone Respiration via Continental-Scale Iterative ICON-ModEx Science

Join the California Water Quality Monitoring Collaboration Network for the presentation "ICON-ModEX: Improving Knowledge and Predictions of Hyporheic Zone Respiration via Continental-Scale Iterative ICON-ModEx Science" on Wednesday March 29, 2023 from 11:30 AM -12:30 PM.

Topic: WHONDRS ICON-ModEx Study

In river corridors the hyporheic zone can be the dominant driver of whole channel metabolism, but it can also be a minor contributor, with literature estimates ranging from 4-96% of stream metabolism coming from the hyporheic zone. What's driving this variability is unknown and there have been no models that can explain among-stream-reach variation in the hyporheic zone contribution to stream metabolism. This significant gap in river corridor science needs to be addressed to advance our collective ability to understand and predict the future state of river corridor hydro-biogeochemical function (e.g., greenhouse gas emission rates). We have approached this challenge with a continental-scale effort aimed at producing knowledge and models that are transferable/generalizable across diverse river corridor settings. We simultaneously aim to generate science outcomes, data products, and modeling infrastructure that is mutually beneficial across a broad range of stakeholders. To do so, we are using ICON Science principles to conduct an ongoing study that is **I**ntegrated across disciplines, **C**oordinated via use of consistent protocols, **O**pen throughout the research lifecycle, and **N**etworked with multiple stakeholders to understand and respond to diverse needs. Through globally open engagement prior to initiating the study, we received feedback and modified the study design so that project outcomes would be beneficial to as many stakeholders as possible. Initial engagement was followed by crowdsourcing samples across the contiguous United States, with sampling locations guided by machine learning (ML) models. Resulting estimates of hyporheic zone respiration were used to test the ML models, update those models, and generate new ML-based guidance on where to sample next. This feedback between models and data generation is ongoing monthly, with significant changes to the spatial distribution of prioritized sampling locations. The engagement process is also approached as an iterative loop, with follow-on engagement in educational settings and direct student participation. Intentional use of ICON principles and iterative feedback between models and data is providing new opportunities for a broad range of researchers, providing unprecedented abilities to predict and understand hyporheic zone biogeochemistry, and generating FAIR products for all to benefit from.

Crowdsourced Collaboration:

We're looking for collaborators who might be interested in sampling at one or more sites. The sampling is informed by machine learning models developed by Parallel Works (www.parallelworks.com/) using open data from the WHONDRS consortium and other community resources. Sampling is focused on small amounts of river sediment and water. We supply the sampling materials for free, pay for shipping in both directions, and make the data publicly available.

Sediments will be measured for respiration rate, molecular composition of organic matter, grain size, potential and expressed microbial metabolism, and concentrations of C, N, and ions. Adjacent surface water will be measured for C, N and ion concentrations, dissolved oxygen, pH, and potential and expressed microbial metabolism.

If you are interested in collecting samples, you can explore an interactive map of sampling locations at https://tinyurl.com/ICON-ModEx-Mar23-Map. If you do not find a site on the map that you would like to sample, please let us know. There are alternative approaches for adding additional locations (e.g., your existing field sites). If you are interested in sampling, please reach out at whondrs@pnnl.gov.

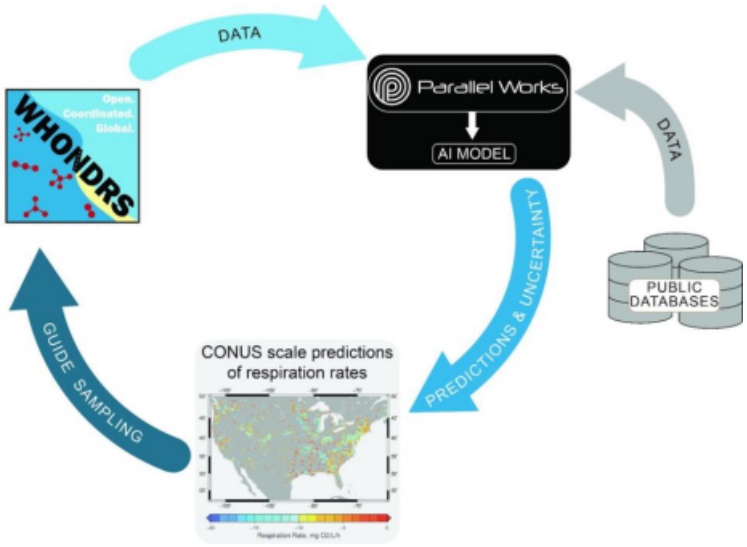

Figure 1. This project is based on an iterative ICON-ModEx approach facilitated by WHONDRS and Parallel Works. New data generation across the ConUS is guided by AI models. Iteration occurs as new data are ingested by the AI models, which provide updated guidance for further data.

Presenters:

Dr. James Stegen, Earth Scientist with the Pacific Northwest National Lab, is an internationally recognized expert in ecological theory, the interface between microbial ecology and hydro-biogeochemistry, and distributed open watershed science. He is the lead investigator for research linking microbial communities to subsurface biogeochemistry and multi-scale linkages among soil microbiomes, carbon-cycling, and permafrost. Stegen also has demonstrated leadership in building multidisciplinary research teams that integrate computational simulation, experimentation, and observation.

Lupita Renteria, Earth Scientist with the Pacific Northwest National Lab, is an early career Earth Scientist at PNNL working on several watershed science projects with James. She leads and assists with sample collection in the field, processes samples in the lab, and works on executing the ICON-ModEx sampling campaign.

Dr. Stefan Gary, Senior Application Engineer and Computational Scientist Parallel Works, is a physical oceanographer with 15 years' experience observing and modeling the North Atlantic Ocean. In his current role at Parallel Works, Stefan works with platform users to develop workflows for earth and environmental science applications, including machine learning. He has also taught undergraduates and graduate students in the US and Scotland.

When:
Wednesday March 29, 2023
11:30am-12:30pm (Pacific Time)

How to Participate:
Microsoft Teams meeting
Join on your computer, mobile app or room device
Click here to join the meeting
Meeting ID: 264 357 173 898
Passcode: 446zyK
Download Teams | Join on the web
Or call in (audio only)
+1 916-562-0861,,521008090# United States, Sacramento
Phone Conference ID: 521 008 090#
Find a local number |
Learn More | Meeting options

Related Materials:
Summary of ICON-ModEx: www.pnnl.gov/projects/WHONDRS/icon-modex
ICON-ModEx video protocol: www.youtube.com/watch?v=9fHKCeVCOWc
ICON-ModEx written protocol: https://tinyurl.com/ICON-ModEX-Protocol
Reducing sample contamination video: www.youtube.com/watch?v=b0wkO6jH_uY
Map of March priority sites: https://tinyurl.com/ICON-ModEx-Mar23-Map
ICON-ModEx data package: https://data.ess-dive.lbl.gov/view/doi:10.15485/1923689
ICON framework editorial:
https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2021EA002099
WHONDRS website: https://www.pnnl.gov/projects/WHONDRS
WHONDRS editorial: https://journals.asm.org/doi/10.1128/mSystems.00151-18

California Water Quality Monitoring Collaboration Network
Website https://mywaterquality.ca.gov/monitoring_council/collaboration_network/index.html
Videos www.youtube.com/CWQMCN
LinkedIn.com – Groups - California Water Quality Monitoring Professional Network

Receive updates by email regarding the California Water Quality Monitoring Collaboration Network and its webinar series, please self-subscribe to the California Water Quality

Monitoring Collaboration Network email list:
www.waterboards.ca.gov/resources/email_subscriptions/swrcb_subscribe.shtml#cwqmc/

Erick Burres
Clean Water Team Coordinator
California Water Quality Collaboration Network Facilitator
Safe to Swim Network Co-facilitator
erick.burres@waterboards.ca.gov
213 712 6862 mobile