Title

Model Inputs, Outputs, and Scripts associated with: "Spatial microbial respiration variations in the hyporheic zones within the Columbia River Basin"

Summary

This data package is associated with the publication "Spatial microbial respiration variations in the hyporheic zones within the Columbia River Basin" published in the Journal of Geophysical Research: Biogeosciences (Son et al. 2022) available at https://doi.org/10.1029/2021JG006654.

This data package includes the key model inputs/outputs of the river corridor model for the Columbia River Basin (CRB) and the model source codes, which were used in the manuscript. The model is a carbon-nitrogen-coupled river corridor model (RCM), and the model is used to quantify hyporheic zone (HZ) aerobic and anaerobic respiration at the NHDPLUS stream reach scales. The RCM used in this study combines empirical substrate models derived from observations and three microbially driven reactions to compute respiration of the HZ for each National Hydrography Dataset (NHD) reach within the CRB. The reactions in HZs of each NHD reach include anaerobic respiration and two-step anaerobic respiration via denitrification. Our HZ respiration estimates are limited to the lotic (or flowing) stream/river systems, and do not account for the respiration process in water column. Note that the RCM only simulates the HZ's contribution to the dissolved carbon dioxide (CO_2) concentrations in the streams, and the CO_2 emissions to the atmosphere are not modelled. The model computes at hourly timesteps because of the fast reaction rates. The key input data of the model are exchange flux, residence time, and stream solute (dissolved organic carbon (DOC), dissolved oxygen (DO), and nitrate concentrations). These inputs are constant over time and represent long-term averaged values.

This modeling framework successfully quantified HZ respiration components over multiple scales. It revealed key mechanisms driving the spatial variation of HZ aerobic and anaerobic respiration in reaches with varying hydrologic and substrate conditions. Thus, this modeling study offers a testing hypothesis in different river system (e.g., climate and biomes) for the HZ respiration processes, and can be used as a sampling design tool for large-scale HZ experimental studies.

Data Package Structure

This dataset contains five folders: (1) model_inputs, (2) model_outputs, (3) Rscripts, (4) figures, and (5) model_codes. It also contains a readme, file level metadata (FLMD), and data dictionary (dd). Please see the FLMD for a list of all the files contained in this data package and descriptions for each. The model_inputs folder contains the model inputs used to drive the model simulations. The model_outputs folder contains key model output files from the river corridor model. The Rscripts folder contains the Rscripts for pre- and post- processing model results. The figures folder contains the raw figures associated with the manuscript. The model_codes folder includes key model source codes/input files. All files are .jpg, .jpeg, .out, .e, .od, .dat, .sub, .F90, .0, .R, .sbx, .cpg, .sbn, .shx, .shp, .dbf, .prj, .tfw, .tif, .xml, .pdf, or .csv.

Citations and Acknowledgements

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Change History

Version 1	March 2023	Original data package publication