

Allometric scaling of hyporheic respiration across contrasting basins in the Pacific Northwest, USA

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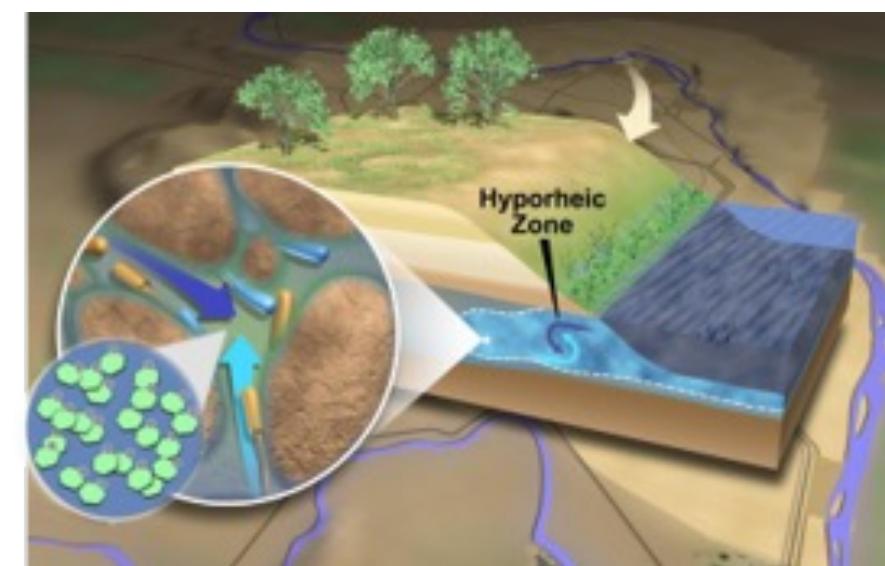
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Scan to Connect



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Background and Motivation

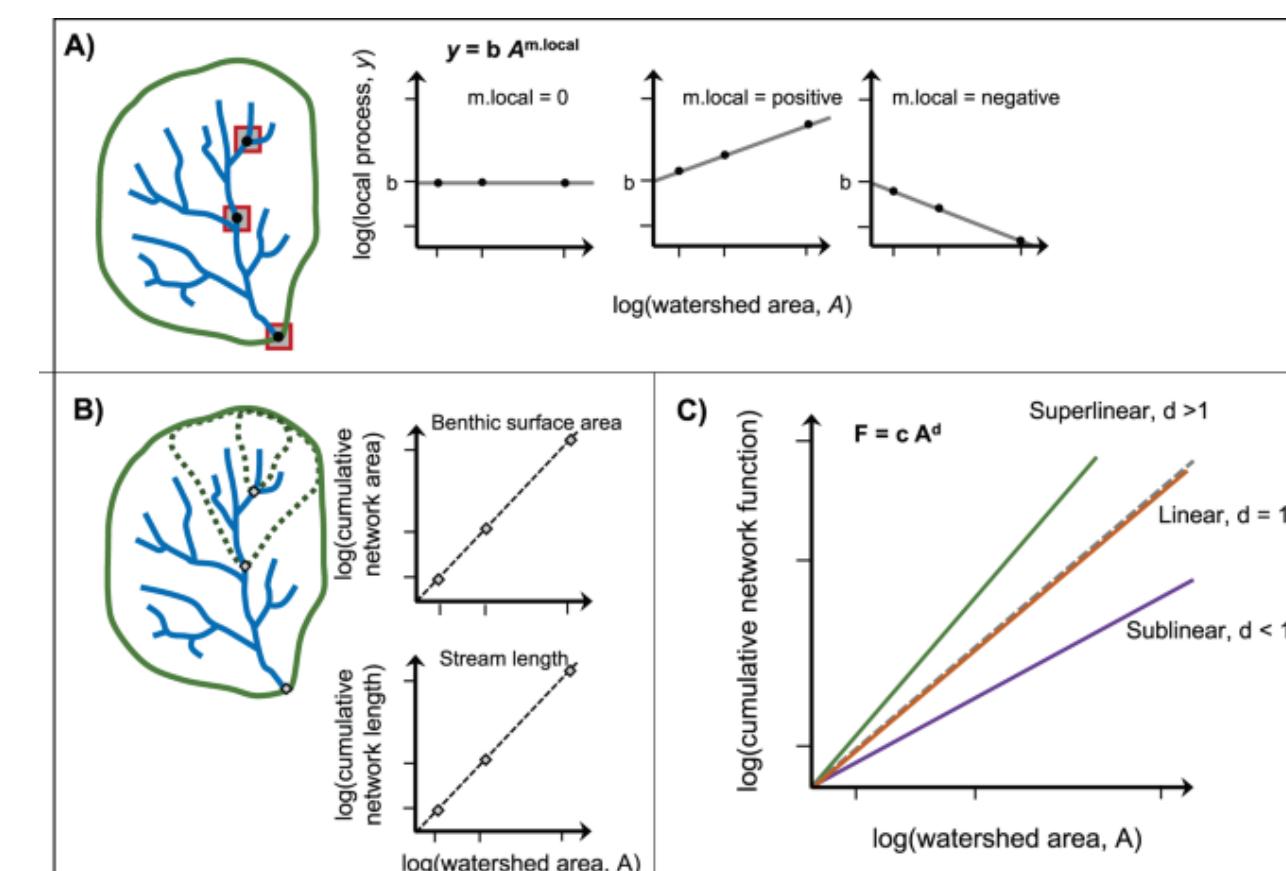


Hyporheic zones (the interface between surface and groundwater) in river corridors regulate aquatic metabolism. They are temporally dynamic and spatially heterogeneous interfaces, **making it difficult to predict hyporheic respiration across scales**.

Allometric scaling (processes that scale with watershed area) provides a framework for scaling watershed processes. Wollheim et al. (2022) showed consistent linear to super-linear allometric scaling of ecosystem respiration with watershed area.

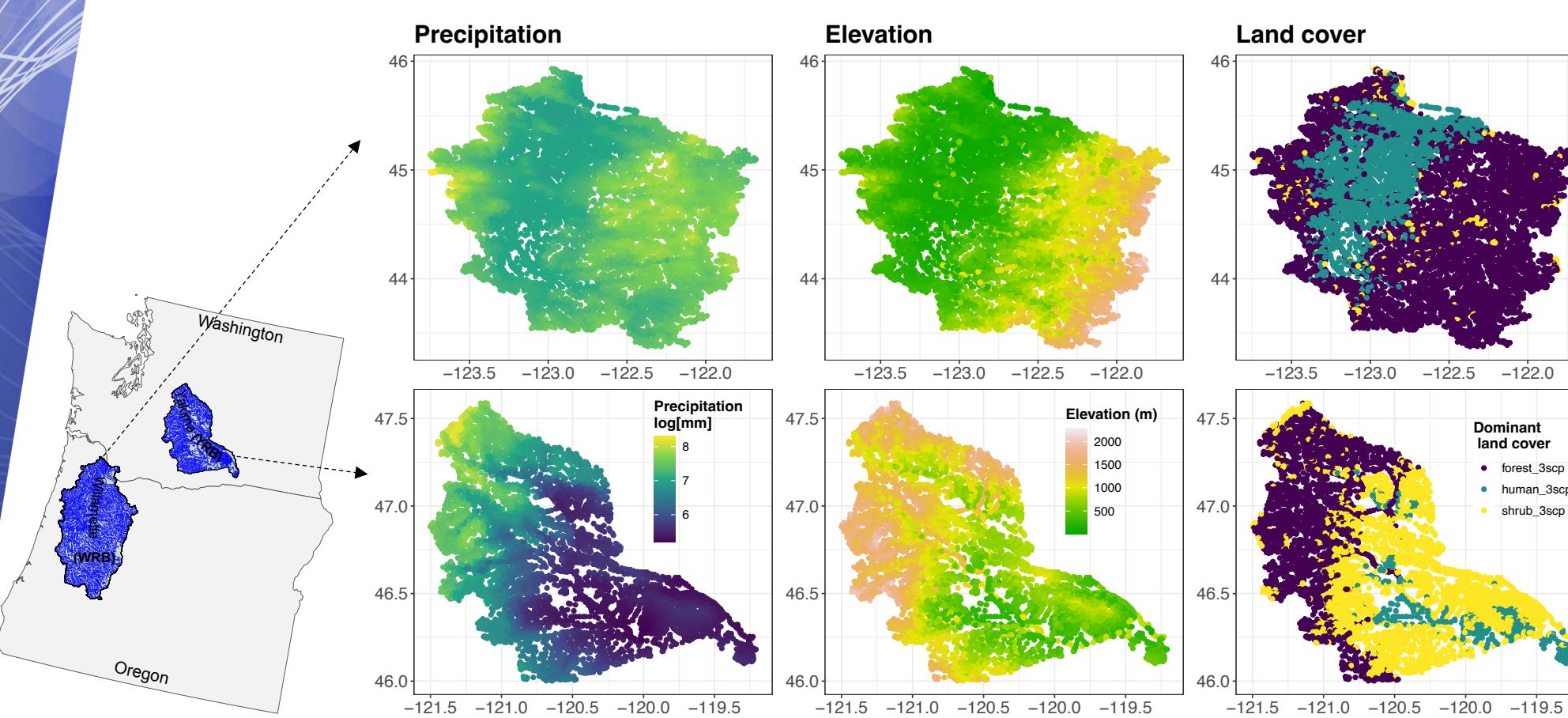
Questions

- Does hyporheic respiration scale allometrically?
- Do watershed characteristics influence allometric scaling relationships?



Wollheim et al. (2022) *Nat. Comm.*

Study Basins



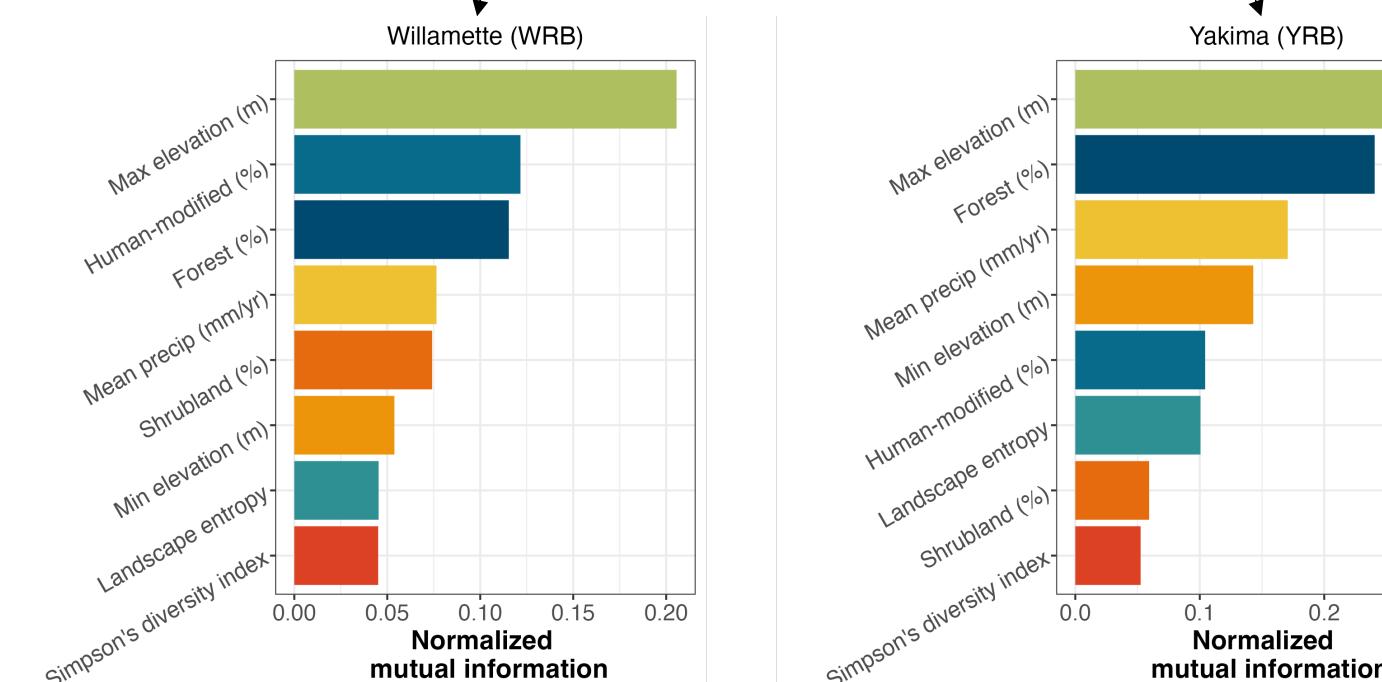
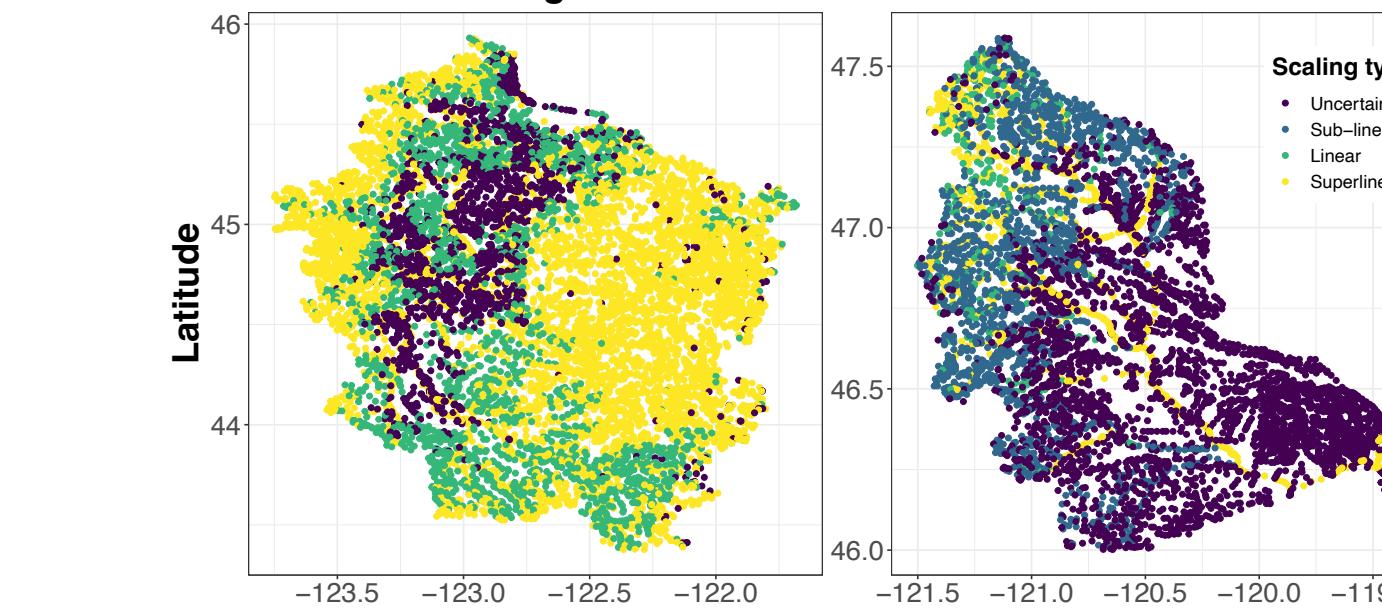
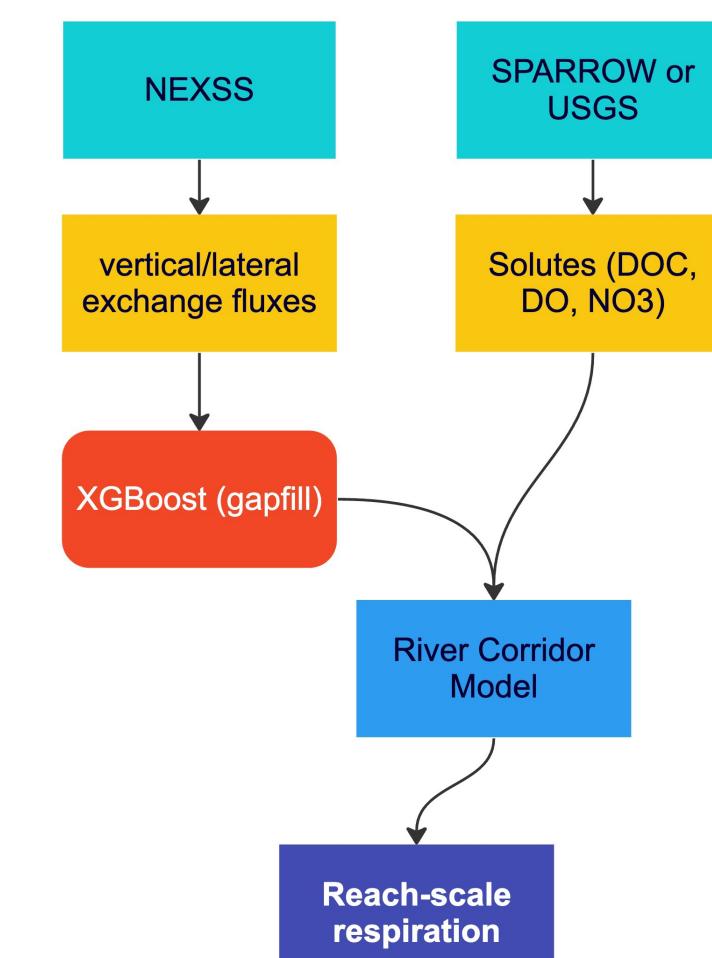
Willamette (WRB)

- Wetter
- Lower elevation
- Primarily human and forested landcover

Yakima (YRB)

- Drier
- Higher elevation
- Primarily shrub and forested landcover

Modeling



Consistent relationships

- Maximum elevation most closely related to spatial scaling patterns in both basins
- % Forest and annual precipitation were top-4 in mutual information

Basin-specific relationships

- Super-linear scaling primarily main-stem in YRB, primarily headwaters in WRB
- Human-modified land-cover 2nd in mutual information for WRB, 5th for YRB

Take-homes

- Allometric scaling of hyporheic respiration:
 - weakest** at low exchange fluxes
 - super-linear** at high exchange fluxes
- Max. elevation** strongest explanation of spatial scaling patterns across both basins
- Land-cover and precipitation also relate to spatial scaling patterns, differ by watershed