

Estimating and Mapping Ecological Processes Influencing Microbial Community Assembly

Objective

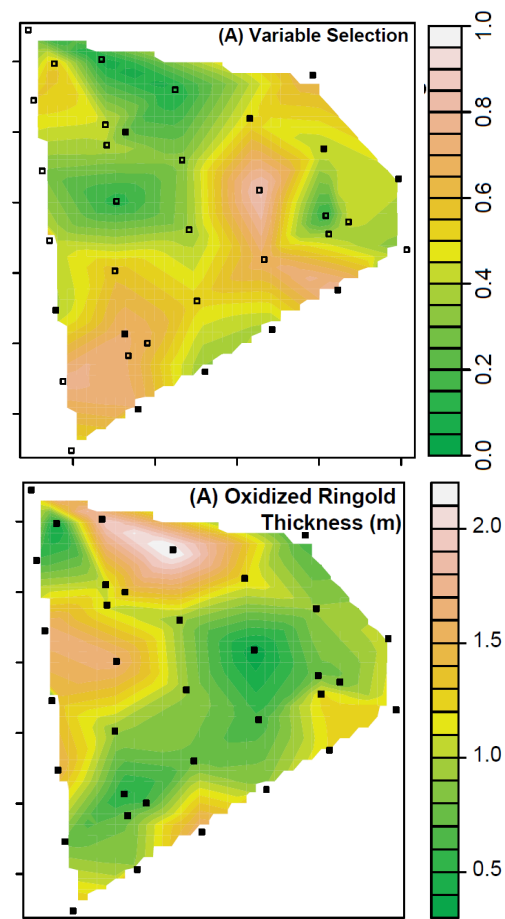
- Develop a modeling approach that quantifies ecological processes, identifies environmental variables that drive processes, and characterizes spatial variation in processes.

Approach and Results

- A new ecological simulation model was used to evaluate a new null modeling framework that aims to quantify ecological processes.
- Simulation results provide evidence that the developed null modeling framework generates robust inferences of ecological processes from observational data.
- The null modeling framework was applied to observations of microbial community composition and environmental conditions across two geologic formations in the Hanford 300 Area.
- Significant spatial variation was discovered in ecological processes (top figure) and spatial patterns varied markedly across geologic formations. The vertical extent of oxidized sediments was found to govern the influence of selection (figures are inversely related).

Significance and Impact

- Provides ecological modeling framework that can be applied across ecosystems (microbial and non-microbial).
- First characterization of spatial variation in ecological processes.
- Enables a bridge between ecology and biogeochemical models.



(Top) Spatial variation in the influence of ecological selection in the Ringold formation. (Bottom) Spatial variation in vertical thickness of oxidized Ringold. ~50m in both dimensions in both panels.

Stegen, J., X. Lin, J. Fredrickson, and A. Konopka (2015) Estimating and mapping community assembly processes in the subsurface. *Frontiers in Microbiology*, 6, 370; doi:10.3389/fmicb.2015.00370.