Geophysical Research Abstracts
Vol. 20, EGU2018-8486, 2018
EGU General Assembly 2018

Climate and soil properties affect diversity and abundance of soil microbial life across scales – from grains to biomes

Samuel Bickel and Dani Or

Institute of Biogeochemistry and Pollutant Dynamics (IBP), Swiss Federal Institute of Technology (ETH), Zürich, Switzerland

The spatial distribution of soil microorganisms and variability in their abundance and diversity are intertwined. Microbial abundance often reflects average conditions and a system's carrying capacity, whereas diversity is affected by dispersal opportunities and habitat fragmentation (interactions). We hypothesize that persistence and connectedness of aqueous habitats affected by rainfall frequency and soil properties are key to soil microbial diversity. We propose a heuristic modeling framework that spans scales ranging from grains to climatic zones for linking key characteristics of microbial habitats with potential abundance and diversity. We use global precipitation data and soil properties to estimate typical hydration conditions for different geographic locations. The net primary productivity (NPP) for the region provides bounds on microbial abundance and combined with soil properties and water availability enable estimates of aqueous phase connectedness and habitat numbers (related to diversity) and nutrient carrying capacity (abundance) at scales ranging from grains to soil profile and biomes. Modeling results suggest non-linear and non-monotonic relation between microbial abundance and diversity peaking at intermediate hydration conditions where suitable habitats are ubiquitous but remain fragmented ensuring spatial isolation of members of the soil microbial community.