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Control of pore geometry in soil microcosms and its effect on the growth and spread of Pseudomonas and Bacillus sp.

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The way micro-organisms access C and interact with each other in heterogeneous environments is key to our understanding of soil processes. Growth and mobility of bacteria is crucial aspect of these processes in particular how this is affected by complicated pathways of water and air-filled pores. Simplified experimental systems, often referred to with the term microcosms, have played a central role in the development of modern ecological thinking ranging from competitive exclusion to examination of spatial resources and competitive mechanisms, with important model driven insights to the field. However, in the majority of cases these do not include detailed description of the soil physical conditions and hence there is still little insight in how soil structure affects these processes. Recent advances in the use of Xray CT now allow for a different approach to this as we can obtain quantitative insight in to the pathways of interaction and how these are controlled in microcosms. In the current presentation we therefor ask the following questions:
- To what extent can we control the pore geometry in microcosm studies through manipulation of common variables such as density and aggregate size? Are replicated microcosms really replicated at the microscale?
- What is the effect of pore geometry on the growth dynamics of bacteria following introduction into soil?
- What is the effect of pore geometry on the rate and extent of spread of bacteria in soil?
We focus on Pseudomonas sp. and Bacillus sp. Both species are abundantly present in the rhizosphere and bulk-soil, frequently studied for their growth promoting ability, yet there is still very little knowledge available on how the growth and spread is affected by soil physical conditions such as pore geometry and wetness. We show how pore geometry, connectivity and interface areas are affected by the way soil is packed into microcosms and how this affects growth and spread of both species. We emphasize that microscopic heterogeneity has significant impact on bacterial dynamics and that soil physical conditions need to be considered in greater detail in microcosm studies to ensure generalisation of results.