Geophysical Research Abstracts
Vol. 19, EGU2017-13756, 2017
EGU General Assembly 2017

The influence of soil microorganisms by their microenvironment

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Microorganisms are of great importance for a wide range of processes in soils and sediments. Their physiologies are largely affected by environmental conditions on the scale of microbial habitats which are mainly the features of biogeochemical interfaces, surfaces for microbial colonization, and porosity. To date, a thorough understanding of the complexity of microbe-habitat interactions/interdependences is still missing due to the difficulty of visualizing and analyzing related processes in situ.
Microbial information on this scale can be gained by a range of sophisticated molecular techniques and correlated with physicochemical information. To generate the latter data, microscopic and spectroscopic analyses are available which require the preservation of the fragile structure of soils and sediments. We show that resin impregnation of these samples allows to preserve the in situ arrangement of compounds forming the physical structure including the pore space being relevant for the support with solutes and gaseous compounds. The preparation of high quality polished blocks and thin sections of these resin impregnated samples enables a detailed analysis of the spatial information on the level of microbial habitats. Along with microbiological data such as abundance of specific groups, detailed insights of the features in microbial habitats can be received which are of great importance for the study of the microbial ecology of microbes in soils and sediments in space and time.