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STSM title: Contribution of Extracellular Polymeric Substances to Biological Soil Crust Structure

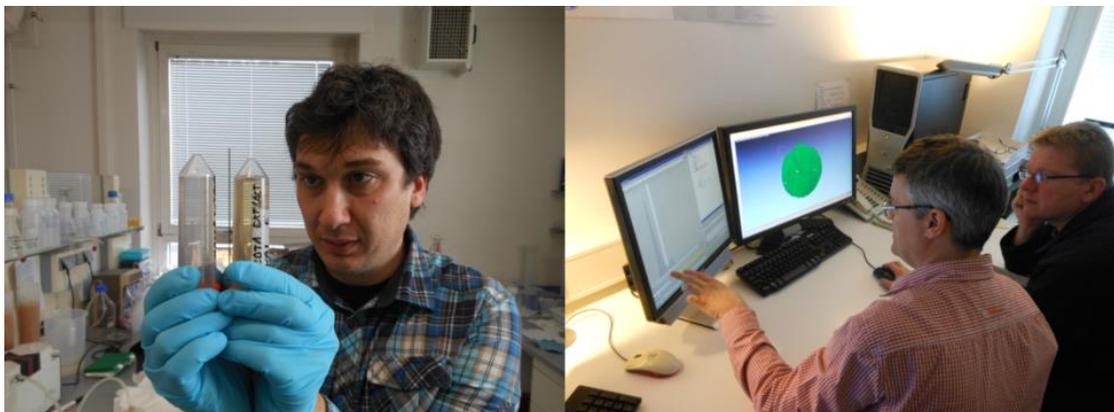
STSM Host scientist: Prof. Dr. Roberto De Philippis and Dr. Federico Rossi, Department of Agrifood Production and Environmental Sciences (DISPAA), Florence University, Florence, Italy

Five Keywords: Biological soil crusts (BSCs), desertification, extracellular polymeric substances (EPSs), soil structure, hydrology

Topic summary: This STSM aims at understanding the role of EPSs in hydrological processes that include biological soil crusts, such as surface runoff. I visited the host institution in order to learn a novel technique for the non-invasive extraction of EPSs from BSCs. This should enable me to do the extraction in Germany and perform high resolution tomography scans of the crust before and after the extraction in order to analyze a possible effect of the loss of EPS on soil structure and porosity.

Methods summary: We were able to further improve the existing extraction method by standardizing many parameters of the procedure, such as the geometry and size of the holes in the Petri dish, a constant suction and a controlled pH value. The experiments were successfully conducted a few months later at the University of Kiel, Germany.

Results and implications for restoration: The analysis of the structure of BSCs from four different ecosystems before and after the EPS extraction revealed that the treatment had no effect on any of the measured parameters. Neither the total porosity, nor the pore size distribution or the geometry of the pores showed significant effects of the treatment. It is therefore hypothesized that the change in hydrological behavior that was detected in a previous study was caused by a change in the physico-chemical properties of the surface, rather than the inner structure of the BSCs. Future work will therefore focus on the development of water repellency with increasing EPS content (i. e. during crust succession).



[Left] Dr. Rossi inspecting the EPS extracts of different solvents after the non-invasive extraction of EPS [Right] First screening of the CT-results with Prof. Peth of Kassel University.