Geophysical Research Abstracts
Vol. 14, EGU2012-11978, 2012
EGU General Assembly 2012

Microbial diversity and activity along the forefield of a receding glacier

B. Frey
Swiss Federal Research Institute WSL, Rhizosphere Processes Group, CH-8903 Birmensdorf, Switzerland (beat.frey@wsl.ch)

The importance and extent of microbial diversity and metabolism in assessing biogeochemical ecosystems has received today more interest than at any time in the past, since rising temperatures have considerable impact on the biodiversity and ecosystem functions. Glaciers are retreating worldwide due to global climate change. Receding glaciers progressively expose fresh rock to surface conditions and offer an excellent opportunity to study the evolution of ecosystems through time. The surfaces of baren rock substrates are characterized by extremely low inputs of nutrients, large temperature fluctuations and low water availability which together exert strong selective pressures on colonizing microbes. These microbes must be supported by C, N and other nutrients, it is therefore important to determine how these two bulk nutrients become available. Primary mineral colonizers can be photosynthetic organisms that fix carbon or diazatrophs that fix nitrogen to provide the biomolecules essential to organisms at higher trophic levels. They also might synthesize an array of organic compounds which might increase mineral dissolution to acquire nutrients from fresh rock and glacier sediments. However, the functional linkages between rock weathering, buildup of C and N in the soil, and the role of microbes therein are only partly understood. Our research seeks to understand these geochemically significant microorganisms in newly exposed rock substrates and to elucidate their functional roles as primary producers and biotic weathering agents in temperate alpine glacier forefields. This presentation gives an overview of the chemical and biological gradients along the Damma glacier soil chronosequence in central Switzerland. The diversity and composition of bacterial, archaeal and fungal communities changed along the forefield from initial (< 5 years old) to developed (>130 years old) soils. Photoautotrophic cyanobacteria were highly abundant particularly on the glacier and in initial soils. Several bacterial and fungal strains were able to dissolve granite powder most efficiently due to the release of a variety of organic acids, mainly citrate, malate and oxalate. The phylogenetic identification and understanding of the physiological abilities allowed to elucidate survival strategies of pioneer colonists in these oligotrophic environments. We suggest that these microbes are involved in all the major biogeochemical cycles, contribute to mineral weathering and subsequent release of nutrients, which in turn favours the establishment of more complex and efficient microbial communities and plants.