Crushing of real and model subglacial sediments as a source of microbial nutrients and energy.

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The successful clean access to Subglacial Lake Whillans (SLW) and Subglacial Lake Mercer (SLM) by hot water drilling provided the scientific community with a unique opportunity to study these environments via direct sampling. Results unequivocally proved the existence of microbial life under Antarctica. However, there is still some uncertainty as to the sources of energy and nutrients which support these microbiomes, due to the isolated nature of these ecosystems. It has been previously shown that unweathered rocks found in subglacial environments can produce significant concentrations of hydrogen, which can support subglacial methanogenic communities. Here we present the results obtained from crushing and subsequent incubation of SLW sediments. Results showed significant concentrations of hydrogen were produced. Further short chain hydrocarbons (such as methane and ethylene) were also detected. Both methanogenic and methanotrophic archaea have been found in subglacial environments, including SLW, and both these gases could be significant to these ecosystems. Additionally, crushing was shown to increase the concentrations of certain solutes, such as acetate and NH_4^+, providing these environments with labile sources of carbon and nitrogen. Specific minerals were used to examine particular rock:water reactions to further understand the reactions taking place in these environments. Results from these controlled laboratory experiments demonstrate the potential of glacial erosion to supply nutrient and energy sources to subglacial microbial communities.