

Nitrogen Speciation During Weathering in Simulated Subglacial Environments

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Background

Rocks contain appreciable yet often overlooked amounts of the nutrient nitrogen (N) largely in the form of ammonium. Subglacial environments are typically nutrient limited, yet host communities of chemotrophic microorganisms. Nutrient budgets of glaciers suggest there is a missing source of N but this has not yet been identified e.g. [1]. Here we present experimental data of N speciation in simulated oxic vs. anoxic glacial weathering environments to model lithogenic N release.

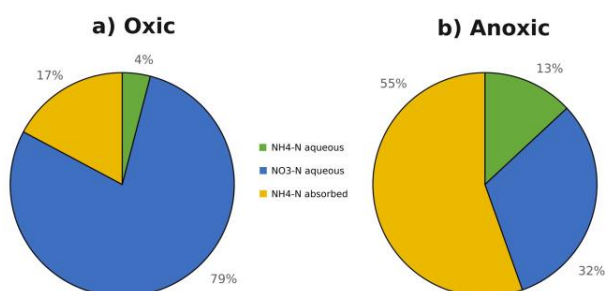


Figure 1: Nitrogen speciation during a) oxic and b) anoxic weathering

Discussion

Under oxic conditions the vast majority of N leached from rock is rapidly oxidised from ammonium to nitrate and leached into solution (Fig 1a). However under anoxic conditions, N is leached from rock mainly as ammonium, most of which sorbs to sediment surfaces (Fig 1b). Consequently the nitrogen speciation is dependent on the REDOX state of the weathering environment. Subglacial environments are known to be at least partially anoxic [2]. Therefore rock derived ammonium liberated by glacial crushing and oxidised by bacteria may represent a significant source of nutrient N (as both ammonium and nitrate) in subglacial budgets.

[1] Hodson et al. (2005), *Biogeochemistry* 72, 233-256.

[2] Bottrell & Tranter (2002), *Hydrol Process* 16, 2363-2368.