

Quantifying the rock nitrogen input through weathering

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Even though the nitrogen (N) cycle is generally well understood, the geological N input has been occasionally neglected in the traditional biogeochemical models. During weathering of the N-rich underlying bedrock, a part of the total N which is bound in minerals is mobilized and leached out to the surrounding soil and therefore affecting the ecosystem.

The goal of this study was to quantify the inorganic N (ammonium and nitrate) which was mobilized during weathering of rock samples. The amount of leached inorganic N was determined by conducting laboratory weathering experiments modified from Montross et al. [1]. Pulverised rock samples were incubated in rainwater, ultrapure water and deionized water with citric acid (initial pH=4). The total N content in the samples were measured with isotope-ratio mass spectrometer, K content was measured with a handheld X-ray fluorescence analyzer and inorganic N with a discrete analyzer. Potassium and NH₄⁺ are closely associated due to similar ionic radii and the similar charge [2]. The correlation between total N content and K content in the samples was clear. The concentrations and release rates of the leached inorganic N varied among samples and among incubation fluids. All of the samples contained less than 320 ppm of total N, therefore the samples could not be expected to leach out ecologically significant amounts of inorganic N. However, all of the samples that contained measurable amounts of total N leached detectable amounts of inorganic N.

[1] Montross, G. G., McGlynn, B. L., Montross, S. N., & Gardner, K. K. (2013). Nitrogen production from geochemical weathering of rocks in southwest Montana, USA. *Journal of Geophysical Research: Biogeosciences*, 118(3), 1068-1078. [2] Honma, H., & Itihara, Y. (1981). Distribution of ammonium in minerals of metamorphic and granitic rocks. *Geochimica et Cosmochimica Acta*, 45(6), 983-988.