

Drying behavior of a rock and its effect on weathering

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Rocks near the ground surface undergo cyclic wetting and drying. Dynamic movement of pore water and significant change of chemical composition are induced by drying. Understanding of these processes is important for considering weathering of rocks. We studied the way pore water moves and solute concentration changes during drying. A porous rhyolite, porosity 26% and main pore diameter ranging from 0.1 μm to 260 μm , was used in the experiment. The core was saturated with deionized water, dried at 20 degreeC and weight loss was monitored. The water-saturation (water volume per total pore volume) decreased with elapsed time of drying. Drying rate was relatively constant for the initial period of the experiment (constant-rate stage) and then decreased (falling-rate stage). In order to evaluate the size and chemical composition of pore water under different degrees of drying, we employed centrifugation. It is known that water is progressively extracted from water-bearing rock in order of large to small pores as centrifugal speed increases. Therefore, by extracting pore water with increasing centrifugal speed in incremental steps, we can know the changes in the size of pore water and the solute concentration with progress of drying. The result of the stepwise centrifugation demonstrated that as drying advanced, first larger pores and subsequently smaller pores lost water. Also, solute concentration significantly changed with the progress of drying. Based on the results, we discuss how drying affects dissolution of primary minerals and precipitation of secondary products.

Keywords: drying, weathering, pore water, pore structure