

## Effect of temperature and humidity changes on salt weathering: Verification by rock surface moisture content and color measurements

Masaki Oi<sup>1</sup>, \*Masato Sato<sup>2</sup>, Tsuyoshi Hattanji<sup>3</sup>

1. Graduate School of Life and environmental Sciences, University of Tsukuba, 2. National Research Institute for Earth Science and Disaster Resilience, 3. Faculty of Life and Environmental Sciences, University of Tsukuba

This study investigates weathering processes using porous rocks with three types of salts in field environments where water supply is limited to vapor in air. The experiments were performed using three types of rocks (Oya tuff, Ubara sandstone and Kominato mudstone). Each rock sample was cut into a cylinder having a diameter of 5 cm and a height of 5 cm. The shaped rock was immersed in a saturated salt solution of NaCl, Na<sub>2</sub>SO<sub>4</sub>, or MgSO<sub>4</sub> for 48 hours, then oven-dried at 110°C. After these treatments, the rock cylinders were placed in a box on a field for 51 days in winter or summer season. The two types of boxes were used in the experiment; one has a transparent roof penetrating solar radiation and another has a roof shielding solar radiation. The roofs prevent rainwater into the two boxes, then water supply is limited to water vapor in air.

The experimental results are summarized as follows: (1) Rocks containing salt weathered during the daytime with low humidity. (2) Rock weathering in summer were greater than those in winter. (3) Weathering rates of rocks with sodium chloride were largest when exposed to solar radiation, while they were smallest without solar radiation.

Moisture content and color of rock surface indicated that the salt deliquesced and turned into a solution during high-humidity term at night, and recrystallized during the daytime with low humidity. As a result, detachment progressed during the daytime. Temperature and humidity observation suggested that the deliquescence in summer was longer and more frequent than that in winter. In actual field environments such as stone heritage, cave wall and tafone, the seasonal contrast in weathering rates would be occurred by the difference in temperature and humidity conditions for deliquescence.

Keywords: deliquescence, crystallization, hydration, infrared optical moisture meter, visible microspectrometer, field weathering experiment