

A formative process of raised rims along joints on shore platforms made of andesite at Oh Island coast, Okinawa, Japan

*Hisashi Aoki¹, Adrian H. Gallardo², Akira Maekado³

1. Tokyo Gakugei University, 2. San Luis National University, 3. University of the Ryukyus

Raised rims are well developed along polygonal joints on andesite layers forming intertidal shore platforms at Oh Island coast, Okinawa, Japan. The landform is called "tatami ishi" and has been declared a national natural treasure. The rims have widths of 5-10 cm and have relative heights of 1-5 cm from the bottom of adjacent depressions (called pools). To explore the process of rim formation, measurements of the hardness and moisture contents of the andesite surface were conducted at the rims and pools. A schmidt hammer and a moisture meter were used for the former and latter measurements, respectively. The schmidt hammer testing showed that the rims and pools have no significant difference in hardness. This result does not support the existing explanation that the elevated rims are formed due to case hardening, i.e., cementation by concentration of calcium, silica and/or iron. Temporal changes in the measured moisture content during ebb tide showed that the value at the pools decreased drastically in low tide due to strong drying caused by direct insolation, while rims maintained higher moisture contents by capillarity in narrow joints. These results suggest that (1) the higher moisture content prevents drying and thus salt weathering on the surface of andesite along the joints, which results in little deterioration of the surface strength, and (2) the surface lowering occurs as a result of strength reduction due to salt weathering prevailing on the place apart from the joints, i.e., on the pools. This leads to the conclusion that the rims and pools are landforms controlled by the difference in fluctuation of moisture contents.

Keywords: Raised rims, Shore platform, Moisture contents, Hardness, Weathering, Andesite