

Erosion process of mudstone and its possible relation with chemical osmosis in Southwest Taiwan

Kohei Higuchi^{1*}, Masahiro CHIGIRA¹

¹Kyoto University

Plio-Pleistocene mudstone is widely distributed in southwest Taiwan and has been prone to rapid erosion, forming badlands with steep, sharp ridges and gullies. We monitored the erosion rates and also investigated the weathering by using samples obtained from slope surfaces by drilling. The rock-forming minerals were analyzed by using X-ray diffraction method. They were quartz, feldspar, illite, chlorite, and calcite; no swelling minerals were identified. The erosion rates, monitored for three years by using erosion pins, ranged from 1.5 cm to over 20 cm annually; erosion occurred essentially only in wet season from May to September. Analyses and tests of drilled cores revealed that water contents, strength, and density changed as deep as 10 to 20 cm from the slope surfaces. These depths are consistent to the depths of annual erosion. The water contents near slope surfaces generally decrease in dry season and increase in wet season. Rock is hardened when it is dried and softened when it gets wet. Electrical conductivity in the interstitial water seems to be high near the slope surfaces, suggesting that ions migrated upward and concentrated near the slope surfaces particularly during a dry season. In the following wet season, surface layer may get wet and softened and also its interstitial water may become diluted. This dilution may accompany chemical osmosis, which could cause rapid dispersion of grains and lead to rapid erosion. Because electrical conductivity near slope surfaces is higher in gullies than those on ridges, upward migrated ions may move down to the gullies. Therefore, the dilution of interstitial water and erosion could be more effective in gullies.

Keywords: mudstone, badland, rapid erosion, weathering process, chemical osmosis