

Weathering and Denudation Process of a Cut Slope in the Kobe Group, Japan

KIYOHARU HIROTA¹ & MASANORI MURAI²

¹Graduate School of Science and Engineering, Ehime Univ., 3 Bunkyo-cho, Matsuyama, Ehime 790-8577, Japan (sbhirota@muc.biglobe.ne.jp)

² Graduate School of Kuroshio Science, Kochi Univ., 200 Monobe-otsu, Nankoku, Kochi 783-8502, Japan

INTRODUCTION

The basic purpose of this paper is to elucidate control factors and mechanism of weathering and denudation of the Kobe Group (the Tertiary) at a cut slope site in Hisaihara, Kobe City, Japan.

There are many rills and gullies on the surface of the slope at the site after denudation.

Cutting hills in this area of the Kobe Group results in mass wasting, which usually affects the paddy fields and makes them inappropriate for cultivation. So, it is important to understand the mechanism of weathering and denudation against mass wasting.

STUDY SITE

The study area is located in the northern part of Kobe City, Hyogo Prefecture. In Yokawa-cho of Miki City in the area, there is produced a great amount of high quality rice called 'Yamadanishiki' which is one of the most popular rice types for producing *Sake* (i.e., Japanese rice wine).

The denudation-caused problem in the paddy fields has posed a great threat to living of the farmers in this area.

GEOLOGICAL SETTING

The Kobe Group is distributed in the northern part of Kobe City and Miki City (Sanda basin), which makes monoclinic slope of about 5° westward. The angle of stratification is more or less equal to the angle of internal friction for the material involved in the slip layer, which in most cases is decomposed tuff. The stratigraphic components are conglomerate (Cg), sandstone (Ss), coarse tuff (C-tf), fine tuff (F-tf), and conglomerate (Cg) in lower level to upper level in the cut slope.

METHODOLOGY

The authors look into main causal factors of weathering namely temperature, pH, and electrical conductivity (EC) considering the hydrogeomorphologic changes. The temperature measurement points were located at a depth of 10cm in a square grid of 1m. The pH and EC were also measured at each cross point of grid on the surface.

RESULTS

- 1) The distribution of temperature of the soil indicates that the characteristic contrast is affected by the geological structure.
- 2) The pH values of the soils on the slope surface mostly indicate alkaline condition at about 9.0 at each measurement point.
- 3) The soil when saturated with water has a tendency

to have higher EC value with the passage of time. However, this change is not observed in case of pH value.

CONCLUSIONS

- 1) The control factors of denudation were found from field observation to be joints of rocks, boundary of sediments, sedimentary structure, and weathering depth ([1], [2]).
- 2) The geological structure controls the denudation of sediments, i.e., conglomerate and sandstone to have priority over soft sediments, i.e., tuff ([1], [2]). The hydrogeomorphology for this site shows mainly 2 patterns for faces of sediments: one is sheet erosion with rills and gullies in C-tf and F-tf, and the other is gully flow along lines of weakness such as joints for Cg and Ss.
- 3) The grain size and physical characteristics of soils are related with the weathering capacity.
- 4) The uniaxial compressive strength indicates 5.9 to 10.7 MPa for Cg, 5.8 to 39.1MPa for Ss, 2.4 to 12.5MPa for C-tf, and 0.4 to 1.3MPa for F-tf.
- 5) The distributions of temperature, pH, and EC of soils are considered to play an important role in the mechanism of mass wasting. Mainly, the feature of EC is related with the ease to increase water content of soil. The area of high natural moisture content makes the soil have greater weight. Upon investigating further, it is expected to understand that the distribution of EC has a close association with the slope unstable.

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