

Badlands in humid regions - redbed desertification in Nanxiong Basin, China

Luobin Yan, Peng Hua, and Scott Simonson

School of Geography and Planning, Sun Yat-sen University, Guangzhou 510275, China

The redbed badlands in Nanxiong City, China, well represent badlands in humid regions. The erosion rate in humid regions is much higher than that in arid regions and can reach 1 cm per month during the summer.

The purpose of this study is to introduce the research of badlands in China, which have not been extensively studied so far, and to compare the badlands between arid and humid regions. Furthermore, the aim is to study the impact of mineralogical and chemical composition on the disintegration of soft rock in Nanxiong Basin badlands.

For the purpose of this study field observations, sampling, and digging profiles were done. The mineralogical and chemical compositions of the Nanxiong Basin badland lithologies were determined by XRD, XRF and thin sections. Weathering resistance, process of weathering, and disintegration features were studied by weathering experiments under natural conditions.

Weathering profiles can be easily divided into four layers: regolith, a strongly weathered layer, a poorly weathered layer, and an unweathered sediment. The depth of the weathering profile is influenced by the weathering resistance of the soft rock. Weathering resistance affects the erosion rate and evolution of landforms in badlands by influencing the rate from unweathered rock to regolith. Analyzed sediments have high content of illite and illite-smectite interstratifications. This composition of clay minerals together with poor sediment consolidation jointly leads to weathering prone sediment.

The weathering and disintegration of soft rock in Nanxiong Basin badlands has a close relationship with rainfall. Sheet erosion, a kind of solid-liquid phase flow, formed in the regolith of the badland during rainfall events and can be the most instrumental to erosion. The mineral composition and liquidity plasticity index were also analyzed, and the results show that the regolith are low liquid limit silts with liquid limit of 21%-25%, plastic limit of 13%-18% and plasticity index of 6.5%-11%. Sheet erosion will occur when rainfall splash destroys the original structure of the badland slopes with the impermeable siltstone underneath and with the high porosity regolith.

In China, the badlands in redbed areas have been called the extreme "redbed desertification". Our preliminary research concerning Nanxiong Basin badlands puts forward the concepts of "redbed deserts" and "redbed desertification". Based on the field work, the mechanism of redbed desertification depends on the lithological features, natural impacts, and human activities. The trigger for formation of the redbed badlands desertification are complex, but mainly influenced by activities such as severe reclamation, forest fires, tree planting disturbances, dry-land degradation, acquirement of topsoil, etc.