Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

HGG28-P01 Room:Convention Hall Time:May 23 17:15-18:30

Recent forest use and landscape dynamics in a forest located near Lohmar, northwest Germany

SAIJO, KIYOSHI[1*], KOHEI HOSHI[2], MARIE KUBOTA[3]

[1]Miyagi University of Education, [2]Undergraduate, Miyagi University of Education, [3]Graduate student, University of Bonn

Forest use for fuel and other purposes has come to life again recently in Germany. The observation of a small forest area near Lohmar, a town in the Rhein-Sieg district, in North Rhine-Westphalia, suggests that the forest landscape has been drastically changed in past several years because of forest use and ecological succession. Moor appears after timber felling of artificial conifer forest, and it changes into broadleaf forest by succession or plantation. As a result, artificial conifer forest planted mainly in last part of the 19th century or early in the 20th century for economic purposes is remarkably decreasing. Alternately, broadleaf forest spreads year by year. Moor seems to be a transitional landscape between both types of forest. National policy about forest management and fuel supply resulted in such dynamic change of forest landscape.

Keywords: Forest use, Landscape, Germany

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Geomorphic Changes in Agricultural Areas of the Kenyan Tropical Highlands

OTSUKI, Yoshinori[1*], Akihiko SASAKI[2]

[1]Graduate School of Science, Tohoku Univ., [2]Institute of Mountain Science, Shinshu Univ.

In the Kenyan Central Highlands, higher altitude areas, more than about 2,000 m a.s.l, in the Aberdare (Nyandarua) Mountains and around Mt. Kenya, are situated under the tropical highland climate, where it is relatively cool and the mean annual amounts of rainfall attain more than 1,000 mm. Prominent areas in terms of agricultural productivity were consequently formed in the tropical highlands, whereas considerably active geomorphic changes currently appear, namely, landslide including multiple slump and large-scaled gully erosion occurring on the valley-side to crest slopes on which cultivated sites stand. As we already reported, rapid and accidental mass movements in these areas, mainly landslides, occasionally accompanied with the loss of house and life, have periodicity in several hundreds of years order from the observation and radiocarbon dating of slope deposits.

Our objectives of this study are 1) to summarize the rate of geomorphic change in each landform unit and/or geomorphic process mainly in the tropical highlands, 2) to show the size of micro landforms resulted from the relationships between slope processes (geomorphic processes) and rate of geomorphic changes, and the ease with which the landforms disappear due to cultivation, and 3) to consider how the land environmental condition of cultivated sites should be evaluated by means of micro landforms.

Keywords: Cultivated Site, Land Condition, Rate of Geomorphic Change, Geomorphic Process, Tropical Highlands, Kenya

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Lacunarity Analysis of Agricultural Land Cover Image in Northeastern Tanzania

UEDA, Gen[1*]

[1]Graduate School of Environmental Studies, Tohoku University

This study examines land cover/use patterns employing lacunarity analysis as developed in fractal geometry, illuminating their scale (spatial resolution) properties and investigating its applicability to extraction of landscape elements and identification of their size. Lacunarity is an index that is used to quantify homogeneity and texture properties of an image, showing the extent to which the spatial pattern of an image deviates from translational invariance at different scales. In geography and related research fields, lacunarity of various spatial patterns has been analyzed, including drainage systems, soil erosion, tropical forest, urban vegetation and so forth. While a research focus in land cover/use classification is on the improvement in classification accuracy when taking lacunarity into account, there is also room for applying the lacunarity method to investigation on the scale property of an image and the size of its landscape components. Viewing from the latter angle, the study evaluates the capability of total and local lacunarity analyses in the study of agricultural landscape, and of resource distribution patterns in general, applying them to satellite images of agricultural land cover taken in Northeastern Tanzania. It in particular examines the process of land subdivision that is behind the present agricultural landscape in the frontier settlement zone of the mountainous areas in Arusha Region.

Keywords: Local lacunarity, Spatial scale, Agricultural landscape, Tanzania

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Gully Erosion and Its Relating Rainfall Events in Agricultural Area, Middle Parts of the Inner Mongolia, China

OTSUKI, Yoshinori[1*], Sudesiqin[2]

[1]Graduate School of Science, Tohoku Univ, [2]Center for Mongolian Studies, Inner Mongolia Univ., China

In this presentation, we reveal the land environmental condition, in particular, the current condition of gully erosion and its cause, as one of physical environmental resources for agriculture. The Wuchuan County is situated in the north of the Huhhot City, the capital of the Inner Mongolia: The mean annual air temperature and the mean annual precipitation are 2.5 degree Celsius and 354.1 mm, respectively, on the basis of the data from the China Meteorological Administration. Our observations were conducted mainly at two gullies (about 1650-1700 m a.s.l), where the regional low-relief landform is distributed, corresponding to the denudation surface overlain by thin sheetwash deposits.

In this area, the maximum gully-extending rate ranged from 0.25 to more than 1 m/yr between 2003 and 2010. We presume that these gullies started to form in the several hundreds of years ago at least, in consideration of the average yearly extending rate for about 50 years, that is, more than 1 m/yr. From the observation and radiocarbon dating of sheetwash deposits, it is concluded that the area has been subjected to gully erosion resulted from the predominant sheetwash since the mid-Holocene.

It is inferred that the gully erosion in this area is also caused by overland runoff and shallow ground water flow arisen from rainfall, because the noteworthy erosion appears especially in the gully heads and the retreat amounts of gully walls at a short distance away from the head become extremely low from our observation.

The appearance of the gully erosion temporally coincides with rainfall events in the warm season, accompanied by a rapid increase of soil moisture. Based on the observations of precipitation and soil moisture, we deduce that the gully walls collapsed in the rainfall events, in 2008, 1) 19:32 12/June-02:23 13/June in local time (total 14.6 mm), or 2) 11:18 29/June-00:11 30/June (18.2 mm); in 2009, 17:44 27/July-20:26 27/July (12.8 mm), respectively. In 2010, the rainfall event resulting in the gully extension is considered to be 1) 19:59 02/Aug.-3:12 03/Aug. (18.4 mm, 2.49 mm/hr) or 2) 05:12 07/Aug.-11:12 07/Aug.(39.6 mm, 6.61 mm/hr).

In each year, the almost first rainfall event in the warm season attaining approximately 10 mm in total or more, led to the collapse and retreat of gully walls at one time. Thawing seasonal permafrost possibly has relationship with the lowering ground intensity, and further studies including this are necessary.

Keywords: Land Condition, Gully Erosion, Sheetwash, Rainfall Event, Inner Mongolia

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Livelihood Change and Resource Use in Agro-silvo-fishery Settlements around Lake Victoria, Western Kenya

UEDA, Gen[1*], Matheaus Kioko Kauti[2]

[1]Graduate School of Environmental Studies, Tohoku University, [2]South Eastern University College, University of Nairobi

This study aims at illuminating the extent of environmental change driven by livelihood diversification and resource use, and identifying factors that influence livelihood security of households in agro-silvo-fishery settlements around Lake Victoria, Western Kenya, in the context of a new resource co-management regime introduced in the 2000s that may impact on resource access and livelihood strategies of the people. The following is a discussion based on a preliminary field research in Sindo and its environs, the former Suba District, Nyanza Province. A sample of 59 households was obtained from different zones to examine how resource use is different according to the distance from the lake shore. Contrary to some expectations set by the existing literature, farming households located in the interior zones were increasingly separated from fishing, possibly due to overfishing and the general shift from inshore to offshore fisheries, and to the increasing fishing cost: only those with sufficient capital can go offshore to fish. The livelihood options for the people may become less than before, with the consequence of their increasing vulnerability to various economic shocks. In contrast to the case of fishing, resources in the forest reserve adjacent to their settlements were widely used for firewood and fodder regardless of the zones from the lake shore. This was with no communal nor co- management except occasional community policing, facing environmental degradation. Natural resource use and livelihood diversification/security in the research area are also to be examined taking into account the co-management system since, once operational on a greater scale, it may restrict the resource access of the interior people when the aquatic resources are restored and firewood are used again for local processing of fish.

Keywords: Resource use, Livelihood diversification, Lake Victoria, Kenya