

**New Radiocarbon Dating for Landslide Occurrences in the Emilia Apennines
(Northern Italy)**

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In the Late Quaternary, hundreds of large landslide bodies were formed and caused the burial of vegetation entrapped in the landslide body. At present, upon these dormant lithosomes, (sometimes partially or fully reactivated by slidings) stand hundreds of old and recent inhabited villages. Wood and grass remnants are found nowadays in continuous core-borings or in samples in exposed landslide sections. The aim of this study is to construct a chronology of landslide occurrences, both for scientific purposes (relationships between landslides and climatic changes) and practical needs (historical failure rate). 25 radiocarbon datings prevalingly related to reactivation events and belonging to 16 landslide bodies, are presented here. Briefly, most of the results (14) refer to the Sub-Boreal period, whereas only 5 indicate the Atlantic period. The oldest dating (Morsiano landslide, Reggio Emilia District) refers to 13,500 Cal. y. BP. whereas three samples present ¹⁴C values affected by the "carbon bomb" effects.
Key word: Landslides, radiocarbon dating, Quaternary, Northern Apennines, Italy

Poster

1st C: (1)

2nd C: (9)

OK

Effectiveness of Hedgerow Barriers in Reducing Soil Erosion on Steep Slopelands, Three Gorges Region, China.

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Simulated rainfall was used on field experiment plots to investigate the effectiveness of hedgerows in curbing water erosion on steep slopes in Three Gorges region, China, where utilization of steep slopelands is essential to the subsistence food production for the resettled population. The experiments were conducted on six 10x2 m² plots of 25 degrees. Five plots were planted with hedgerows of Vetivevia, Coriaria, Vitex, and Leucaena along contours while the sixth was left hedgerow-free. For plots with hedgerows, the within-row plant spacing was 0.4 m while between-row spacing was 3 m. The hedgerows were planted one year earlier and were pruned a day before the experiments. Litters of leaves and small branches were intentionally placed on the upper-slope side of the hedgerows. The experiments lasted for about an hour each. The data reveal that intercropping hedgerows reduce runoff of overland flow by 22-43%, and reduce soil erosion by over 90%.

Key words: hedgerows, soil erosion, steep slopes

Oral Poster Either

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Form D

Abstract Submission Form

01: Hillslope Processes and Hydrogeomorphology

Critical Travel Distance of Blocks in Rockfall

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To predict a possible area affected by rockfall on the geomorphological basis, the morphometry and field works were performed in Japan to obtain the empirical relationships between the horizontal distance (L) and the relative height (H) from cliff (free face) top to talus margin. The data were obtained for 182 sites where the talus deposits have not been removed away by fluvial and coastal processes, or where the talus is developed on flat surface such as terrace surface. The distance L depends on the height H , but a ratio of L/H varies from 0.4 to 2.4 and tends to increase both with the increasing H and with the relative age of talus (t). The age t was substituted by the easily measurable parameters reflecting the duration of slope development at each site, i.e. θ_c , θ_t and H_t/H , where θ_c and θ_t are mean angle of the cliff and that of the talus, respectively, and H_t is the relative height between talus top and talus margin. Thus, L is expressed as $L = \alpha H^\beta$, where $\alpha = f(x)$, $\beta = g(x)$ and x is θ_c or, θ_t or H_t/H , with the correlation coefficients higher than 0.9. The critical travel distance (L_{crit}) of an individual block moving in a form of rockfall on the cliff and talus higher than 1 meter in H is expressed as $L_{crit} = 1.08H^{1.16}$.

Key words: rockfall, talus, disaster prevention, morphometry, Japa

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Spatial Distribution of Soil Water Repellency on Forested Slopes**M. KOBAYASHI^{1*}, T. TSURITA², Y. ITO², and M. KATO²**¹ Kyushu Research Center, Forestry and Forest Products Research Institute² Forestry and Forest Products Research Institute

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WDPT (Water Drop Penetration Time) tests were conducted to examine the spatial distribution of soil water repellency of two different types of forest, i.e., a plantation of coniferous tree and a secondary forest of deciduous trees. Under a dry condition, more than 70 percent of the samples from coniferous forest showed actual water repellency which was characterized by WDPT for field-moist samples. Water repellency was stronger around the ridge and weaker around the stream. Under a wet condition, actual water repellency of surface soils disappeared throughout the slope. Potential water repellency characterized by WDPT for air-dried samples was stronger in the coniferous forest than in the deciduous forest. Difference in the quality of organic matter is thought to be the reason. In winter season, the degree of potential water repellency of the coniferous forest decreased at the lower part of the slope where the inclination was large and the thickness of litter layer was small.

Key words: Soil water repellency, Spatial distribution, Forest types

Sheetwash Erosion Evaluation in Distinct Hillslope Positions in Chamela, Mexico**J. LOPEZ-BLANCO^{1*}, F. GARCIA-OLIVA², R. RODRIGUEZ¹ and A. ZARCO²**¹Instituto de Geografía, UNAM, Circuito Ext., Cd. Universitaria, Mexico, 04510, D.F.²Instituto de Ecología, UNAM, AP 27-3 (Xangari), CP 58089, Morelia, Mich., Mexico

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In this research, we present a soil erosion evaluation by overland flow processes in a small catchment in a tropical deciduous forest ecosystem, western coast of Mexico. We taken account three hillslope positions: 1. Summit, 2. Backslope and 3. Footslope, under two treatments: 1. Plots on soils covered by forest litter (PS) and 2. Plots on exposed soils (ES). Monitoring was achieved during eleven dates for two years (April 1997-March 1999) using a 1-m² plot scale. Twelve monitoring sites were established. In the ES treatment, the particle's movement length was measured using three 10-cm strips using fluorescent painting. Total soil-sediment particles were collected and weighted each date. Mineral and organic fractions (dead leaves and twigs) were considered in a separated form. The soil-sediment collected were analyzed considering, pH, texture, bulk density, nutrients, etc. Results suggest the role that plays forest litter cover is more important that tree covering. The soil movement events gave up mainly in the last cyclones of rainy season, representing more than 50% of collected soil. This suggests that the processes of soil movement depend on particular events and not on the annual precipitation amount.

Key words: sheetwash erosion, hillslope positions, catchment, Chamela, Mexico.

Slope Development in Tertiary Mudstone of Higashi-Kubiki Hills, Japan

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Higashi-Kubiki Hills consist of Tertiary mudstone and have increasing summit levels from the minimum of around 100m in the north-western area to the maximum around 700 m in the south-eastern area. Slope forms were measured by using 50m interval DEM. Landslides data were collected from maps and aerial photographs. The slopes in the area with low summit elevation have a low relief and appear to be concave with average inclinations of around 13 degrees of the upper slope portion and 10 degrees of the lower slope portion. Valleys have a gentle stream on a wide flat floor, in places, filled with alluvial deposits. A limited number of landslides occur on the upper steep slope portion. In the area with high summit elevation, the slopes have a high relief and a straight profile with an average inclination of around 20 degrees. Streams cut into bedrock and form a V-shape valley. Almost all of slopes are affected by landslides. In a course of slope form development in the areas, the landslides carry weathered material down the slope to accumulate at its toe. The streams at toe of slopes remove the material. The slope forms are controlled by combination of activities of the landslides and the streams.

Key words: slope form, slope development, landslide, mudstone, DEM.

Topographic Effect on Rock Failure at Sea Cliff

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Topographic effect of notch or overhang on stability of rock mass was examined. At the sea cliff composed of Miocene hyaloclastites in the Shakotan Peninsula, Hokkaido, Japan, two types of rock failure are recognized. The one is the failure caused by a crack propagated upward from the roof of notch, and the other is the failure of rock beam with a crack propagated downward from the top of cliff. Depths of notches are two meters of the former, and over ten meters of the latter respectively. Crack propagation analysis by the displacement discontinuity method based on the fracture mechanics indicated the possibility that a short initial flaw in rock started to propagate under the stress condition of cliff and rock properties. Propagated crack from the roof of notch is longer than the one from the surface of vertical cliff without notch. The analysis also demonstrated crack propagation downward in the case with the rock beam failure. The finite element method showed the domain of tensile stress over the strength of rock at the top of the cliff. Such results of numerical analysis were concordant with the observation. Therefore, notch or overhang drives the cliff instable. Difference of the failure type may be owed to cliff height and erosion rate of notch.

Key words: rock failures, sea cliff, notch, fracture mechanics, numerical analysis

Soil Creep Measurement on a Forest Slope in Japan
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We measured the amount of soil creep on a forest slope in Japan, using an improved Young's pit method, three times in seven years. The topsoil is sandy and porous because it consists of weathered granite and is covered with forest trees. Measurement was conducted at 15 sites in a 30 m length along the slope from the upper to the middle part of the slope (inclination is 35-42 degree) and at 10-60 cm depths of B horizon in soil layer. Average amount of soil creep in this section was about 3 mm/year, but there were both the parts of relatively large displacement and of small displacement along the slope. In the high rainfall period, the remarkable seepage flow is presumed to have caused the topsoil displacement in downslope direction with elasto-plastic shearing in the soil units. In the low rainfall period, destruction and marked displacement of soil were detected in the limited parts. In the later five-years period, a new sliding unit appeared, presumably as a consequence of falling down of a tree.

Key words: soil creep, measurement, forest slope, seepage flow

5th International Conference on Geomorphology**Form D**

August 2001, Chuo University (Tokyo, Japan)

Abstract Submission Form

Numbers of applied Session and/or Symposium

1st Choice: (1) 2nd Choice: (7) 3rd Choice:**Comparison of Several Events of Earthquake-Induced Landslide**

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The greater the intensity of earthquake tremor, the larger the number of the earthquake-induced landslides or the bigger the total volume of landslides. Hydrologic conditions of slopes may affect the features of the earthquake-induced landslides in addition to the conditions of earthquake itself, slope topography, geology and vegetation. The 1998 Earthquake on the border of Gifu and Nagano Prefectures in Japan induced a large number of landslides which were promoted also by the condition of a large amount of preceding rainfall. The 1998 Iwate Earthquake induced many severe landslides which were also promoted by a similar rainfall conditions as those at the Gifu-Nagano Earthquake. Comparison of seven earthquakes, including two examples mentioned above, which induced various level of landslides clarified the following point in comparison of a standard value of landslide volume which is deduced by a regression curve proposed by Keefer (1994). The point is that the heavily rainy condition before the earthquake promote landslides, although the intensity of the earthquake tremor is the primary factor which is controlled by the magnitude of earthquake, depth of hypocenter, topographic condition of ground surface.

Key words: earthquake, landslide, magnitude of earthquake, preceding rainfall

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**Observation of Suspended Sediment during Rain Events in the Valley-head Area
of the Simosa Upland, Chiba Prefecture**

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To estimate hydrogeomorphologic change in the valley head area, observations of sediment transport are required during rain events. In this study, such sediments are inorganic materials, which are transported by overland flow and subsurface flow from the watershed to the river. Transported sediments are resedimented due to velocity of river water, those grain diameter, shape, specific gravity and so on. Therefore, we can evaluate hydrogeomorphologic change from observations of fine suspended sediment, which is not influenced by the effect of resedimentation. As a result of observations in the valley-head area in the Simosa Upland, Chiba prefecture, Japan, most of fine suspended sediment are originated by the erosion of scarp from the edge of the small terrace in the valley bottom, which are various soil pipes with different diameter.

Key words: suspended sediment, soil pipe, Simosa upland, small terrace

**A Decadal Hydrologic Change and Debris Flow Occurrence at the
Kamikamihori Gully, Mount Yakedake, Japan**

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Debris flow recently becomes to be less likely to occur at the Kamikamihori Gully, Mount Yakedake, where it had been occurring frequently in 1970's. This is supposed to be due to hydrologic change at the source area. To confirm the supposition and clarify its cause, rainfall and runoff observations at the source area were carried out in 1970's and 1990's. The repeated observations show the significant decrease in surface runoff. Furthermore, a result of a runoff analysis using a physically-based surface-runoff model for the runoff events both in 1970's and 1990's shows increase in surface roughness, initial loss of rainfall and final infiltration capacity and decrease in contributinal area of runoff, which are consistent with the significant revegetation in the study slope. The history of debris flow occurrences in the Kamikamihori Gully shows the increase in the minimum hourly rainfall for debris flow occurrences. It seems to be caused by the runoff decrease due to the revegetation in the source area.

Key words: debris flow, Mount Yakedake, revegetation, hydrologic change

Analysing Problematic Areas in a Mountainous Watershed Using GIS

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A localised highland-lowland geomorphological and hydrological system exists in Phewa Tal watershed, Nepal. Agriculture on the higher slopes in many places is failing due to soil erosion and a lack of groundwater, while on the lower slopes it is in trouble from flooding and sedimentation. Previous research attempting to develop models for regional slope stability have encountered data availability problems, especially at the interval and ratio levels necessary for quantitative analyses. This study takes another tack by exploring the spatial associations between problematic areas, human activity, and the physical conditions. A digital terrain model within a geographical information system is employed to test for associations using measures of slope aspect, gradient, and curvature along with various land-uses. Results indicate that more intensive land use related to cultivation and deforestation on the predominantly steep south-facing dipslopes of the northern half of the watershed have the strongest associations with problematic areas.

Key words: hazards, GIS, DTMs, terrain analysis, Nepal