Quantitative Geomorphic Analysis to Evaluate Geomorphological Hazards

M. DEL MONTE, P. FREDI, E. LUPIA PALMIERI* and M. MONGILLO
Dipartimento di Scienze della Terra, Università “La Sapienza”, Roma, Italy
* lupia@uniroma1.it

Geomorphological hazard is a very important problem both from the scientific and the practical point of view; therefore its objective assessment is desirable. The aim of this study is to improve a methodology, based on the quantitative geomorphic analysis, which can help in the precise evaluation of geomorphological hazards. The Fiume Ombrone drainage basin (Central Italy), affected by geomorphological instability to different extents, was examined. By means of detailed geomorphological field survey and air photo interpretation, a map showing the main hazardous processes was obtained. Successively this map was overlaid with other thematic maps showing the areal variability of the main predicted factors of instability (lithology, tectonics, topography, surface drainage, climate, land use) expressed by suitable parameters. Map overlay allowed to determine the weight of each category of factors. In order to evaluate the effects produced by the concomitant influence of the selected factors of instability, more thematic maps were overlaid and the attributes of the different categories were combined. In this way several areas with different hazardous process susceptibility were obtained and some equations were derived, that allowed the compilation of hazard’s maps related to each process.

Key words: quantitative geomorphology; geomorphological hazard; drainage basins.
Radiometric Age Determination of Active Faults: Do They Indicate the Time of Fault Movements?

HASEBE, Noriko
Department of Geological Sciences, University College London
hasebe@kenroku.kanazawa-u.ac.jp

Quantitative assessment of heat generation and transfer along faults either during, or associated with, fault movement is of primary importance in understanding the dynamics and geohistory of faulting. This study analyses samples from rocks near the Nojima fault which cause the Hyogoken Nanbu Earthquake in 1995, Mozumi fault, one of the Atotsugawa Fault system in central Japan, Nobeoka fault in southwest Japan, and the Rogers Creek fault, one of the San Francisco Bay Area strike slip system, using the fission track method to investigate the relationship between fault characteristics and the heat generation. The results indicate that faults and surrounding rocks were heated probably by fluid circulation along the faults and this heating may reset radiometric dating system with low closure temperatures. Obtained ages, however, do not necessarily indicate the time of fault movements.

**key words:** fault, radiometric age, fission track, heat
Fractal Analysis of Nhundiaquara Watershed in South Brazil

M. KOBIYAMA1, J. BUENO JUNIOR2, and J.P.G. MINELLA3
1 Department of Soils and Agricultural Engineering, Federal University of Parana
2 Geography Course, Federal University of Parana
3 Agronomy Course, Federal University of Parana
*kobiyama@agrarias.ufpr.br

The Nhundiaquara Watershed (area of 600 km² and elevation from zero to 1540 m) is situated in the littoral region of Parana State, Brazil. The watershed is occupied by Quaternary sedimentary rocks and Precambrian granite and migmatite and covered mainly with Atlantic Forest. Using a digital map of the watershed (1:50,000 scale), the fractal dimension (Df) values of contour lines and stream networks in the watershed were estimated with the box-counting method. The Df values of the whole stream network and the mainstream of the watershed are 1.5631 and 1.0368, respectively. As the elevation increases, the Df value of the contour decreases. Some of contours in higher parts of the watershed do not have a fractal nature, their Df values being less than one. The Df value of the stream network within each 100-m elevation interval also decreases with increased elevation. These values are highly correlated with those of the corresponding counter lines, which implies the existence of a relation between contour form and stream network form.

Key words: fractal dimension, box-counting method, Nhundiaquara watershed
Automated Generation of Fall Lines and Drainage Networks for Geomorphometric Measurements and Analyses Using Digitized Contour Data

H. MIZUKOSHI\(^1\) and M. ANIYA\(^2\)

\(^1\)Geography and Crustal Dynamics Research Center, Geographical Survey Institute
\(^2\)Institute of Geoscience, University of Tsukuba

mizukosi@gsi.go.jp

The aim of this study is to generate fall lines and drainage networks from digitized contours with which to measure geomorphometric parameters. The following five algorithms were developed. (1) Generation of a fall line from all data points of all contours, which is the basic algorithm for the subsequent manipulation of the contour data. (2) Derivation of slope gradient and aspect between two consecutive contours, utilizing a fall line. (3) Construction of a drainage network by merging fall lines. (4) Assignment of a stream order by the Horton-Strahler method to each stream segment defined by a fall line segment. A stream order of 0 is given to a fall line segment whose upper edge point is a starting point of a fall line, and the number of fall lines merging at the lower edge point of a fall line segment is counted. (5) Delineation of a drainage basin by grouping fall lines which share the same terminal point of a fall line. The mapped and measured results from these algorithms were compared with those by gridded DEM and manual work.

Key words: digitized contour data, fall line, drainage network

José ROA\footnote{José Roa is at the University of Los Andes, Venezuela. E.mail: jose_roa@yahoo.com}

From December 15 to 17 of 1999, the central Coast of Venezuela experimented an extraordinary amount of rainfall at the beginning of the dry season, which developed into destructive floods, intensive erosion, landslides, debris-flows and a violent and chaotic deposition of sediments; which affected a densely populated area only 35 km from Caracas, the capital of the country. There has been a total amount of affected people ranging from 400 to 600 thousands. Other 20 to 50 thousands people might have died and material losses are hard to estimate. Moreover the extreme rainfall as triggering factor, the highly weathered soils and substratum in the "Cordillera de la Costa" (coastal range), the steep slopes and the anarchic urban expansion in certain areas, were other factors contributing. This poster is a photographic review of this tragedy and an explanation about the geomorphic processes involved as well as its causes and consequences.

Key Words: Geomorphology, debris, flow, landslide.
Influence Due to Geomorphology on Context Genetic Algorithms: GA Clustering

A. YOSHIZAWA* and K. ARAI

*Department of Information Sciences, Saga University

A clustering method with Genetic Algorithms (GA) based on the k-means clustering featuring context information for classification of remote sensing satellite data is proposed. Although the k-means clustering is widely used as an unsupervised classification method, there are two major problems, clustered results depend on the initial values used, isolated clusters sometime occurred in homogeneous clusters (due to result falls in local minima).

The proposed method employs GA algorithm in order to avoid the initial value dependency while contextual information is featured to find a global optimum of cluster. The paper describes a background theory on the proposed method with some evidence that show an advantage of the proposed method as well as an influence due to geomorphologic effect on clustered results.

Using Digital Elevation Model: DEM provided by Geographical Survey of Japan and satellite imagery, simulation data with a variety of DEM magnifications are generated. A robustness of the proposed clustering method against the DEM magnifications has been classified.

Key words: K-Mean Clustering, Genetic Algorithms, Context, Spatial, and DEM