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Editorial

Theories and methods in geomorphology: Introduction

Sessions on theories and methods of any scientific discipline often provide for stimulating discussions, and fascinating sessions at international, regional or national science congresses. In the last decade new theories and methods in geomorphology have also enriched our discipline. Some have been developed to resolve specific geomorphological problems; others have been applied within geomorphology for the first time or were originally applied in neighbouring disciplines.

This set of five papers represents some of the works that were given in session S14 "Theories and Methods in Geomorphology", held at the 6th International Conference on Geomorphology, Zaragoza, 2005, organised by the Spanish Society of Geomorphology (SEG) and the University of Zaragoza (Spain). This session received 11 oral and 10 poster presentations.

Sidorchuk presents a new theoretical approach that combines classical deterministic mechanics of soil erosion and stochastic descriptions of controlling erosion factors. This approach proposes the use of probability density functions to calculate mean erosion rate. The author emphasises that future experiments must be designed in order to validate it. This kind of theoretical method also suggests the development of a third generation of soil erosion models, and that we may be on the brink of a new perception of Geomorphology as a branch of knowledge. This is similar to the way in which quantum theory was presented to theoretical physics but verified later by empirical studies. Experience suggests that this may be a long road to follow but that it is a serious future path for the subject.

González et al., explore the capability of a geochemical test that uses the concentration of ^{222}Rn in water of natural springs as a method to identify areas in which there are faults that have a latent behaviour and societal risk. This paper shows that methods from neotectonics and geochemistry help geomorphology to obtain better explanations of risk assessment for a territory. The method is tested in Cantabria (Spain) where suitable events have occurred to test the hypothesis. The results show that faults that have high values of radon present geomorphological evidence of latent behaviour. These types of geochemical tool provide new methodologies for hazard assessment.

Borgogno Mondino et al., present results regarding the use of neural network methods applied to hyperspectral imagery in order to improve the interpretation of geomorphic elements. The images derived from high resolution hyperspectral airborne sensor MIVIS (Multispectral Infrared and Visible Imaging Spectrometer) were analyses, with mathematical tools capable of improving the geometric correction and classification of the images. The authors present results of the identification and characterization of major elements of present-day, actively unstable slopes, (including debris-covered areas, fractured/disjointed rock walls, landslide accumulation borders), as well as individual structural features and landforms (major faults and fractures, trenches, elongate depressions, counter-slope scarps), related to long-term deep-seated gravitational slope deformation.

The paper by Hürkamp et al. describes a new method using field portable X-ray fluorescence (FPXRF) to detect and quantify two- and three-dimensional element distributions in floodplain environments. Their results show high lead concentrations in top soils (0–20 cm) of river floodplains with remarkable spatial variabilities. In situ FPXRF analysis is considered to be a robust technique which can be used to investigate accurately metal contamination in floodplain soils.

The paper by Gustavsson and Kolstrup presents a new geomorphological mapping system which is tested for different scales (1:5000; 1:25,000; 1:10,000) in a formerly glaciated area in central Sweden. The authors highlight several advantages and disadvantages for each scale. The mapping system shows changing landscape hierarchies through scale transformation. The high level of descriptive information at the largest scale (1:5000) turns into a more general overview showing landform evolution features at smaller scales. The developed mapping legend, however, can be applied at different scales.

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