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Gullies detection on satellite imagery in an intra urban catchment of tropical region. Methodological development in river Bumbu catchment (Kinshasa, RD Congo)

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In contrast to the effort during the last decades to investigate sheet (interrill), rill and gully soil erosion processes in agricultural environment, relatively few studies have been focused on quantifying and/or predicting gully erosion in urban sites. The extension of the use of modern spatial information technologies, such as geographical information systems (GIS), differential global positioning system (DGPS) and remote sensing, have created new possibilities for research in this field. A key issue to be addressed, as the basis for predicting the effects of global changes such as land use and climate changes, is the mapping and quantification of gully erosion rates, including rate of retreat of gully walls and rate of sediment production. This research work presents a method to detect and map gully in tropical urban environment using a visual interpretation key.

The proposed method uses high resolution satellites images and DGPS data, both of which have been processed using GIS techniques. The research was applied to a sample catchment of 23 km2 located in Kinshasa, DR Congo. Satellite image at 0.76 meter from 2006 and field data from 2009-2010 were used to map gully and validate interpretation keys used to detect gully.

51 gullies with different length and state were detected in the catchment from satellite image and 51 founded in the field in different states of activity. Too criteria dominate to determine gullies: shape and color. Some accelerated causes of gully erosion were also detected.

In comparison with the traditional visual interpretation of satellite image, the proposed method integrates local realities.

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Terrestrial laser scanning methods as instrument of landslide and erosion processes study

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Methods for estimating the intensity of hazardous exogenous geological processes are being developed. For this purpose laser scanning system used high precision instrument "Trimble GX".

Study of landslides held in the observation point Kamskoe Ust'e (Volga River, East Russian Plane, Russia), where under the action of the Kuibyshev reservoir, landslide processes actively destroys slopes, threatening buildings and destroying the old cemetery. The length of the landslide circus front is 180 meters. From remote sensing data and the results of field observations, the average retreat rate of the slope edge is 3 m per year, annually removed area ranges from 500 to 1,500 square meters, that allows to relate study area to dangerous category. Annual and intraseasonal rescan allowed us to estimate the intensity of the landslide processes more accurately over traditional methods, and get the exact volumes of slope destruction to the entire front of the landslide circus.

Erosion processes (rill and sheet erosion) studied in Kazan city (Russia) during April - June 2012 period on the experimental plot with the loamy slope without greensward, 40 sq m area, 30 degrees angle, measurements were taken after snowmelt and heavy rains. Maps of deviations between all stages of surveying and TIN-models build directly on point clouds. Obtained results may provide insight into the processes of erosion and accumulation on a slope and consider in detail the formation of erosion forms as a result of rainfall and snowmelt , also to calculate such quantitative characteristics as volume and layer of accumulation and erosion of the soil. For experimental plot erosion layer is 1.3 mm.