Mapping current slope failures on the western slope of the Heringeš massive in Košice.



Michal Gallay

Institute of Geography, Faculty of Natural Sciences, michal.gallay@upjs.sk Pavol Jozef Šafárik University in Košice, Slovakia







Background

The Heringeš massive is a tectonically uplifted block of the Younger Sarmatian gravels, clays and sands deposited in a delta environment (Kaličiak et al., 1991, Janočko, 1997). The thurst has been elevated since the Upper Pliocene along the fault lines followed by the rivers of Hornád and Torysa in the northsouth direction. Hornád has markedly undercut the western edge of the asymmetrical thrust which is now of about 150 metres vertical relief difference between the channel and the Heringes ridge line. These geological and geographical circumstances caused slope instability and failures in the Quarternary up to present (Nemčok, 1982).

The problem



Despite the unfavourable geological conditions, people tend to inhabit the area since the Middle ages. The use of the land intensified gradually during the last fifty years. The inhabitants of the Košice City turned large area into gardening sites where they built small weekend houses. Even though the entire left bank of the Hornád river is officially assigned an active landslide area (Šimeková et al. 2005), the small houses were in many cases reconstructed into large housing estates and new such houses were also built. This happend in the last two decades. Land sliding and earthflows occur regularly especially in the seasons of high precipitation (end of spring, winter). In the last five years, considerable damage was caused on several sites in this part of the Košice City in May 2006, June 2010, January 2011. Although the new failures were mapped and published by Liščák et al. (2010) for wider region of the Košice City, no such results exist for the area of the city (Heringes massive) up to date.

Methods

Real time differential GPS (EGNOS corrections, average vertical precision +-2 metres) was used to record the scarp lines of the recent und older failures. The results are compared with a detailed digital terrain model derived from photogrammetric points (average accuracy below 1 metre, data currency 2007). Another DTM was derived from digitized contour lines of 1:10 000 topographic map. The DTMs were used for geomorphometric analysis.

Results and conclusions

This research presents results of the first stage of mapping of the most recent failures which occurred after abnormal rainfall in the spring of 2010. Digital geomorphometric analysis shows that the earthflows and shallow landslides of the 2010 occurred on the most inclined slopes. Although, there have been no sudden movements recorded since the last sliding in 2010, such processes can occur on similar sites which have remained unaffected so far. Further, marked cracks of soil layer were found above scarp lines of 2010 on the slopes behind the houses on the Dubová street, in particular. Immediate rapid sliding if soil moisture increases can be expected in on such places.

Future work

The research results can be used in a more detailed mapping focused on dating and classification of the slope failures on the western slopes of the Heringes massive. They provide a tool for continuous monitoring and analyses of the data in GIS in future.

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Data

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- Geodis Slovakia s.r.o orthoimagery 2010

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