Collapse susceptibility mapping in karstified gypsum terrain (Sivas basin - Turkey) by conditional probability, logistic regression, artificial neural network models

Isik Yilmaz (1), Inan Keskin (1), Marian Marschalko (2), and Martin Bednarik (3)

(1) Cumhuriyet University, Department of Geological Engineering, Sivas, Turkey (iyilmaz@cumhuriyet.edu.tr, +903462191171), (2) VSB – Technical University of Ostrava, Faculty of Mining and Geology, Institute of Geological Engineering, 17. Listopadu 15, 70833 Ostrava – Czech Republic, (3) Comenius University, Faculty of Natural Sciences, Department Engineering Geology, Mlynska dolina, 84215 Bratislava – Slovak Republic

This study compares the GIS based collapse susceptibility mapping methods such as; conditional probability (CP), logistic regression (LR) and artificial neural networks (ANN) applied in gypsum rock masses in Sivas basin (Turkey). Digital Elevation Model (DEM) was first constructed using GIS software. Collapse-related factors, directly or indirectly related to the causes of collapse occurrence, such as distance from faults, slope angle and aspect, topographical elevation, distance from drainage, topographic wetness index- TWI, stream power index- SPI, Normalized Difference Vegetation Index (NDVI) by means of vegetation cover, distance from roads and settlements were used in the collapse susceptibility analyses. In the last stage of the analyses, collapse susceptibility maps were produced from CP, LR and ANN models, and they were then compared by means of their validations. Area Under Curve (AUC) values obtained from all three methodologies showed that the map obtained from ANN model looks like more accurate than the other models, and the results also showed that the artificial neural networks is a usefull tool in preparation of collapse susceptibility map and highly compatible with GIS operating features.

Key words: Collapse; doline; susceptibility map; gypsum; GIS; conditional probability; logistic regression; artificial neural networks.