Modeling spatio-temporal patterns using temporal Bayesian dynamic networks with uncertainty propagation. Case study: landslide hazard in Breaza town, Romania

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Landslide hazard assessment has received special attention from specialists in various research fields. Our study proposes a model to identify spatio-temporal patterns in landslide hazard. A special tool had been build, using causal models represented by Bayesian dynamic networks (BDN) that incorporates both empirical data and expert knowledge. The tool is developed using PCRaster software for dynamic modelling developed by Utrecht University and PCRaster Company and UMN Mapserver. Because the BDN strongly influenced by the uncertainty presented in the input data, various uncertainty models have been developed using fuzzy analysis and Monte Carlo simulation. The model takes into account the metadata (ISO19115 standards) associated with the input data, so each uncertainty model is adapted according to the metadata. The output of the model is a series of images with the spatial and temporal distribution of the landslides hazard. For each cell a probability value for landslide occurrence is calculated with an associated uncertainty value. The model was tested in the area of Breaza town (the Subcarpathians of Prahova Valley) and satisfactory results were obtained