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Image segmentation and irregular shapes versus pixels in landslides hazards assessment

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Classical approaches for landslides hazard assessment are based on raster or grid format and are expressing the level of hazard for each pixel or grid node. Because landslides are not continuous distributed phenomena, the classical approach can underestimate or overestimate the hazard level. This paper uses a different approach for data format, used for the analysis and visualization of the hazard levels that is based on objects obtained from object based image analysis. OBIA have been proved a satisfactory method for landslides identification and classification (Martha 2010, 2011, Aksoy 2012). The segmentation process is run on a stack of maps composed from color ortho-photos, the first and second derivatives of DEM (slope and curvature and it is masked out by lithology, so only the objects in areas with favorable lithology for landslides are segmented. The objects obtained from the segmentation process represent the basic format for the landslides hazard assessment and the level of hazard is expressed for an entire object. The hazard assessment is calculated using a Bayesian analysis with several factors: effective precipitation, first and second derivatives of DEM

The model was tested on Breaza town, Romania, an area heavily affected by landslides, especially deep seated slides and earth flows. For this area a detailed landslide inventory have been made in the last 7 years, inventory that includes also the time of occurrence for 10 landslides from 1978 up to 2010. The objects obtained from the segmentation process are used in a weight of evidence model with an output of probability of occurrences for a landslide. The results are encouraging, with a good rate in predicting the location and time of landslides occurrences.