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Satellite time series analysis for landslide hazard assessment. A case study in the Breaza administrative, Prahova County, Romania

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The evaluation of landslide hazard requires understanding of spatial distribution of the factors that control slope instability. It is known that the behaviour of landslides is difficult to evaluate because of the various factors that trigger the mass movements. The methodology used is very diverse, based on statistical methods, probabilistic methods, deterministic methods, empirical methods or a combination of them. Some of the factors are dynamic and some of the factors are slowly changing through time. Most of the landslide hazard analysis models take into consideration the variation of precipitations through time and less the spatial and temporal evolution of land use and land cover. This evolution has an important contribution not only when the changes are produced from on class to other, but also when changes are occurred due to phenological phases. The changes of vegetation properties from one season to another and from one class to another can be assessed for a medium scale using satellite time series imagery, like Landsat which spreads from late 70' up to present time

Our coupled model uses deterministic approaches to model the spatial and temporal distribution of precipitations that reaches the terrain surface, for a period from 1984 up to 2010. The interception of rainfall is calculated based LAI index extracted from a few hundreds of Lansat TM and ETM+ satellite images. The use of LAI index makes possible to assess both the changes in land use and land cover and also the changes in rainfall interception induced by the phenological phases of vegetation

The landslide hazard assessment is based on Bayes probability theory, with inference from the past landslides. The model is run for different time intervals with different time steps, mostly monthly time steps and calibrated with landslides triggered in different time periods. The study area spreads over approximate 50 km2 and represents the administrative area of Breaza town, located along the Prahova River in the Curvature Subcarpathians, Romania. This area is highly affected by mass movements, spread on the entire hillslopes. Over 70% of the area is medium or highly susceptible to landslides