Geophysical Research Abstracts
Vol. 19, EGU2017-14154, 2017
EGU General Assembly 2017

Point pattern analysis applied to flood and landslide damage events in Switzerland (1972-2009)

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Damage caused by meteorological and hydrological extreme events depends on many factors, not only on hazard, but also on exposure and vulnerability. In order to reach a better understanding of the relation of these complex factors, their spatial pattern and underlying processes, the spatial dependency between values of damage recorded at sites of different distances can be investigated by point pattern analysis.

For the Swiss flood and landslide damage database (1972-2009) first steps of point pattern analysis have been carried out. The most severe events have been selected (severe, very severe and catastrophic, according to GEES classification, a total number of 784 damage points) and Ripley's K-test and L-test have been performed, amongst others. For this purpose, R's library spatstat has been used.

The results confirm that the damage points present a statistically significant clustered pattern, which could be connected to prevalence of damages near watercourses and also to rainfall distribution of each event, together with other factors. On the other hand, bivariate analysis shows there is no segregated pattern depending on process type: flood/debris flow vs landslide. This close relation points to a coupling between slope and fluvial processes, connectivity between small-size and middle-size catchments and the influence of spatial distribution of precipitation, temperature (snow melt and snow line) and other predisposing factors such as soil moisture, land-cover and environmental conditions.

Therefore, further studies will investigate the relationship between the spatial pattern and one or more co-variates, such as elevation, distance from watercourse or land use. The final goal will be to perform a regression model to the data, so that the adjusted model predicts the intensity of the point process as a function of the above mentioned covariates.