Natural Hazards
and Earth System
Sciences

Discussions

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Interactive comment on "Sample size matters: investigating the effect of sample size on a logistic regression debris flow susceptibility model" *by* T. Heckmann et al.

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In my opinion, this discussion paper is really interesting as it combines debris-flow susceptibility assessment with statistical issues. The bibliographic review on debris-flow phenomenon, spatial modeling and statistical modeling approaches for debris-flow or other natural hazards is very complete and well summarized in the introduction section. The fundamental scientific concepts on which their approach is based are fairly well stated and the study area well described. This paper does not aim at identifying the geofactors controlling debris-flow spatial occurrence, but explores the sampling process aiming at building and validating the statistical model in order to limit the effects

of spatial autocorrelation. The issues of sample size, response variable prevalence and diversity of geofactors taken into account are well-addressed. The logistic regression models developed focus on the probability for a pixel to be considered as an initiation site (within the potential release areas). The reviewer recommends the manuscript to be published after taking into account the following minor revisions. The multicollinearity between the geofactors has been measured thanks to the VIF indicator, and has been showed to be a little bit high for some of them. However, the authors judiciously chose a backward stepwise procedure to select explanatory factors, so multicollinearity is a minor issue.

Questions about the diversity of model species: The definition of model species is not so easy to understand at the first reading. I am still not sure to have properly understood. Could the authors confirm that only models considered as relevant (according to the AIC) are taken into account for the model species diversity calculation ? What about the richness calculation ? The interpretation of the diversity indicators is not very clear. The author should explain a little bit more why the lowest diversity value corresponds to a minimal dependence of model selection on the sample and its size.

Questions about the reliability / predictive power of the models: How can the authors explain the differences in AUC observed between the model calculated in the LT area and applied to the ZBT and the model calculated in the ZBT and applied to the LT area ? Is it due to the sampling process or to the spatial variability of geofactors between the two areas ? Can the spatial autocorrelation be considered as identical? Is it due to the difference in debris-flow event density between the two areas? Did the authors try to measure the effects of other predictive modeling approaches (not the median) on the susceptibility map built from model ensembles?

Questions about the geofactors used: About the spatial units, i.e. pixels, on which the geofactors are calculated, did the authors try to measure the effects of radius size on the geofactors extraction. Of course 1m DEMs show micro-topography, but why has the particular 5m resolution been chosen for resampling purpose? Why were roughness

and curvature geofactors calculated based on various moving window sizes (5 and 10) ? Another geofactors which could have been used to measure the convergence flow of water instead of plan curvature, is the convergence index. This has been used in some hydrological studies and could perhaps be less collinear with other geofactors. Indeed the plan curvature coefficients have been proved very variable depending on the sample and its size. Moreover this geofactor has been selected in only 20% of the models species, it shows a stronger autocorrelation compared to other geofactors, and is also collinear with some of them. Did the authors try to measure the spatial autocorrelation of geofactors with other indicators? On the figure 4, is the first geofactor falling within its autocorrelation range, encountered for the smallest sample size, often the same one?

p2745, L26 is "DHM5" used instead of "DEM5" ? p2749, L10 "of" instead of "or" p2759, L5 "previous chapter" = "previous section" ?