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Improvement of landslide thresholds at regional scale by using a new pre-processing algorithm. Application to Central Norway.

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The existing landslide early warning system (LEWS) in Norway uses a combination of simulated soil water saturation degree and water supply normalized by the annual average over a 30-year period to issue warnings at regional scale. The aim of this study has been to improve the thresholds for Møre and Romsdal, a mountainous region of central Norway. This particular regional domain has been selected for evaluation based on the experience that this domain is more sensitive to landslides than the predictions from past thresholds. This has led to several warnings issued at a too low level, i.e. missed events.

The statistical relation between landslides, rainfall duration and intensity was first studied almost four decades ago (Caine, 1980). The studies have since evolved into using other better suited parameters, which may vary based on the region. This study analyzed several hydrometeorological variables, simulated by a conceptual hydrological model (Beldring et al., 2003). The model uses daily average values of temperature and accumulated precipitation for each square km of Norway as input data.

The aim of this work has been to generate a script for downloading hydrometeorological data directly from the open source national database by using a list of the necessary coordinates and dates of landslide events. An extensive research was performed by a joint group to find enough landslide events with sufficient spatial and temporal accuracy. The script was used to download data and perform classification tree analyses to find the best combination of variables. The combinations that were tested consisted of pairs, one long term and one short term variable. A new approach for selecting no-landslide days was also implemented in an attempt to acquire a more representative selection of the no-landslide days. The approach consisted of randomly choosing no-landslide days and discarding observations with too low values of a certain parameter. In theory, removing less important no-landslide days and keeping those with higher values, should make the gradual transition between warning levels easier to distinguish. This approach was also performed by not excluding any no-landslide days.

The optimal variable combination for both methods was the same as the one currently used in the area. The models yielded similar results, but the filtered model gave a more intricate tree which had a more gradual increase in the ability to predict an event. From the results, it is suggested that the LEWS in the region should have a lower threshold of the next highest warning level, separating yellow and orange warnings.

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