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Increasing erosion risk due to the climate change in a small forested catchment of Sopron Hills

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According to the climate predictions, hydro-meteorological conditions expected to change in the future, leading to the alteration of erosion dynamics. Based on regional climate projections, climatic extremes may become more frequent for the end of the 21^{st} century. Intensive rainfall events may increase soil loss on the sloping areas resulting in potentially significant on-site and off-site ecological and economical damages as well. The aim of our study was to determine the erosion impact of single rainfall events in a selected hydrologic year (2008-2009) for a 0.6 km^2 forested catchment in the Sopron Hills using the erosion model EROSION-3D. Furthermore the probability of intense and erosive rainfall events has been analyzed for the time period 2071-2100, applying the regional climate model REMO (developed at the Max Planck Institute for Meteorology, Hamburg).

Those rainfall events, where maximal 1-hour precipitation exceeded the 90^{th} percentile value (6 mm), have been classified as intensive rainfall events. The erosion-accumulation maps based on the EROSION-3D model demonstrate well, that higher 1-hour precipitation may cause higher rate of soil loss if every other influencing factor are fixed (e.g. land cover, relief and runoff conditions) and the extension of erosion threatened area increases.

Simulation results of the regional climate model REMO show no significant change of the yearly precipitation sum for the time period 2071-2100 compared to the reference period 1961-1990, but this tendency can differ on seasonal scale. The largest changes are expected for summer, both for the precipitation means and extremes. For the end of the 21^{st} century summer precipitation sum is projected to decrease by 18 %. The frequency of hourly precipitation sums exceeding 0.1 mm can decrease by up to 30 %. The 95^{th} percentile value may be higher, which refer to the increase of the rainfall intensity.

The projected change of the temporal distribution of precipitation, the expected increase of the probability of intense rainfall events can also influence the soil loss due to water erosion and the sediment rate available in the stream of the forested catchment. Land cover changes driven by climatic and anthropogenic effects can increase the severity of the consequences. Therefore the improvement of our methods and the adaptation of the results for further catchments can provide an important basis to the adaptation and mitigation strategies.

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