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The effect of natural disturbances on the risk from hydrogeomorphic hazards under climate change

Christian Scheidl (1), Thomas Thaler (1), Rupert Seidl (2), Werner Rammer (2), Bernhard Kohl (3), and Gerhard Markart (3)

(1) Institut of Mountain Risk Engineering, University of Natural Resources and Life Sciences (BOKU) Vienna, Vienna, Austria (christian.scheidl@boku.ac.at), (2) Institute of Silviculture, University of Natural Resources and Life Sciences (BOKU) Vienna, Vienna, Austria , (3) Austrian Research Center for Forests, Department of Natural Hazards (BFW), Innsbruck, Austria

Recent storm events in Austria show once more how floods, sediment transport processes and debris flows constitute a major threat in alpine regions with a high density of population and an increasing spatial development. As protection forests have a major control function on runoff and erosion, they directly affect the risk from such hydrogeomorphic processes. However, research on future climate conditions, with an expected increase of the global average surface temperature of 3-5°C by 2100, compared to the first decade of the 20th century, raises a number of open questions for a sustainable and improved hazard management in mountain forests. For Europe, for instance, a climate-induced increase in forest disturbances like wildfire, wind, and insect's outbreaks is highly likely for the coming decades. Especially in protection forests, future scenarios of such climate induced natural disturbances and their impact on the protective effect remain an unresolved issue.
Combining methods from forestry, hydrology and geotechnical engineering our project uses an integral approach to simulate possible effects of natural disturbances on hydrogeomorphic hazards in the perspective of future protection forest developments. With the individual-based forest landscape and disturbance model (iLand) we conduct an ensemble of forest landscape simulations, assessing the impact of future changes in natural disturbance regimes in four selected torrential catchments. These catchments are situated in two different forest growth areas. Drainage rate simulations are based on the conceptual hydrological model (ZEMOKOST), whereas simulations of the effect of forest disturbances on hillslope erosion processes are conducted by the Distributed Hydrology Soil Vegetation Model (DHSVM). Beside process based simulations, we also emphasis to identify the risk perception and adaptive capacity to mitigate a probable loss of protection functions in forests. For this reason, a postal survey among forestry actors will be performed to assess forest managers concern and willingness to engage in natural hazards management in contrast to the roles of their social network and the roles of political/administrative representatives. We will compare these perceived roles along the dimensions efficacy, attribution of responsibility and trust. This theory-driven approach highlights the motivational structure underlying the willingness to participate in natural hazards initiatives, and allows to tailor policy implications to the needs and capacities of distinct target groups.
The outcomes of the investigations shall contribute to the development of adaptive management strategies for forestry administrations at all political levels to mitigate negative effects of climate change in protection forests.