



## Analyzing the influence of forests on rockfall events

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Mountain forests play an important role in the protection against rockfall events. Within the Interreg Alpine Space project RockTheAlps we focus on how the protection effect can be quantified, allowing to establish a rockfall risk reduction (RRR) index for mountain forests. This index equals a dimensionless reduction factor of the total travel angle, defined by the energy line of the rockfall event. The final objective of this study is therefore to develop a toolbox called TORRID that allows i) to identify and map forests that contribute to RRR in the Alpine space ii), to define optimal forest characteristics for an efficient RRR and iii), to be easily combined with existing runout simulations models of rockfall events based on a simple 1d energyline approach. First of all, the most significant forest parameters were compiled through literature research and could be defined as mean stand density [ $N/ha$ ], basal area of living trunks [ $m^2/ha$ ], basal area of dead trunks [ $m^2/ha$ ], ratio of coniferous/broadleaved trees [-], proportion of shrub forest originating from coppice (only if broadleaved) [%], proportion of shrub forest (also *Pinus mugo*) [%], proportion of coppice with standards [%], proportion of high forest [%] and amount of lying tree (alive or dead) [ $m^3/ha$ ]. The primary aim was to create a short list of parameters, which is easy employable for practitioners recording rockfall data. Another perspective was to get the maximum of possible data with the most meaningful information output to analyze. In a first step we compiled observation data of historic rockfall events in Austria as well as the corresponding forest parameters. The resulting database was further extended by spatial information about homogenous sectors (L [ $m$ ]) of different land covers (forest, bare rock, pasture, ...) whereas, to this end, the emphasis lays on the forest related land cover sections, which differ in their characteristic parameters. The impact of the various forest parameters as well as various forest stands on rockfall runout is finally statistically analysed. To this end, TORRID is an advancement of existing thresholds and studies (e.g.: RockforNet) and is based on the empirical findings of the compiled rockfall database.