Large scale mapping of forests with a protection function against rockfall and avalanches

David Toe (1) and Fréderic Berger (2)

(1) IRSTEA, UR EMGR, Saint-Martin-d'Hères, France (david.toe@irstea.fr), (2) IRSTEA, UR EMGR, Saint-Martin-d'Hères, France (frederic.berger@irstea.fr)

On mountain slopes, forest can play an important role to protect human lives and facilities against natural hazards. Silvicultural strategies and interventions to maintain or improve protection forest structures are of first interest. Up to now no large scale mapping of forest with a protection function against rockfalls and snow avalanches exist in France. The objectives of the study is to develop decision support tools for rockfall protection forest management.

Two Geographic Information System based models which automatically map forests with a protection function against rockfalls and snow avalanches have been developed. These devices have been used to map forest with protection function in the French Alps. The first model, RollFree, calculates the maximum rockfall run out zone using the energy line principle. Forest with protection function are mapped crossing data on rockfall hazard, the forest cover and the socio-economical issues of a county. The second model, AvaLine, mapped the maximum run out zones of snow avalanches. Forests located in a departure zone of an avalanche that endangered an issue are mapped as protection forests.

Results showed that forests with a protection function against rockfall can represent up to 30 percents of the forest cover in a county. In addition, forests with a protection function against avalanches can represent up to 7 percents of the total forested area.

The two models developed present the advantages of a fast computational time and need only few input parameters such as a DEM, a map of the issues and a map of the forest cover. However it remain difficult to estimate precisely the error on the area mapped as protection forest on the all county. A first campaign of validation was done in the Vercor Regional natural park for forest with a protection function against rockfall. The study show that the model can overestimate the protection forest mapping up to 12 percent. Up to now no similar study was done for protection forest against avalanches.

Despite uncertainty on the mapping illustrated in the Vercor Regional natural park, protection forests mapped by these models can be used as decisional tools by practitioners to develop adapted forest management strategies for large scale study.