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An innovative type of rockfall protection fence on forested slopes specially designed for low energy events

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Forest management in mountainous regions implies sylvicultural interventions on slopes. But in such forested areas, engines, workers or falling trees can initiate rock falls and the site can temporarily turn to a potentially dangerous site. This presentation deals with a type of fence specifically developed for this context. In particular, this type of fence requires no heavy interventions neither than heavy engines such as for soil-moving or nailing. Moreover, it is a temporary structure, supposed to act for the duration of the interventions or as long as it is necessary to counterbalance the lack of protection within the growing period of the trees. The fence is composed of a wire mesh, three cables and two rigid rods. This fence is tightened between existing trees. The first real size experiments have been made during summer 2008. It consisted in impacting successively the fence in its centre with rocks of varying mass (from 30kg to 500kg) with the aim of evaluating its capacities. For this purpose, a cable was tightened between two trees. This cable allowed conveying a trolley supporting the rock. The rock was dropped just before the impact thanks to a snap shackle. The system allowed reaching a maximal rock velocity before impact of 17m/s. This velocity was calculated thanks to image analysis obtained with a numerical video camera and a numerical high speed camera. The main continuous measurement made was tension in the upper cable. In addition, an accelerometer was nailed on one of the fence supporting trees. A total of 17 impact experiments were performed on for different fences. The first results showed that (i) angular blocks can cut wires even for low mass rocks, (ii) the wire rupture hardly propagates in the mesh during another impact, (iii) supporting cables can be cut during the impact, (iv) the fence is not perforated by the direct impact even for rocks 500kg in mass, and (v) a reparation of a perforated mesh consisting in placing a patch is perfectly efficient. In parallel to these experiments, numerical simulations were performed based on the discrete element model developed by Bertrand (2008). It has allowed the estimation of the relevance of some technical options. The results obtained are encouraging and should lead to the development of efficient low energy fences to be used on forested slopes.