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Avalanche risk mapping: theory and practice

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Formal risk assessment is recognised to be the sound base for land use planning in avalanche prone areas. An important feature of an effective risk calculation procedure is its adaptability to territory changes, particularly the construction of defence works, both in the release zone and in the run-out area. In fact, the calculation of residual risk after the realisation of defence works and the possibility to compare different protection solutions in terms of risk reduction, give a substantial help in decision making processes. We present an avalanche risk estimation procedure that combines statistical analysis of snowfall record, iterative simulations of avalanche dynamics and empirically-based vulnerability relations. Our methods provides a risk estimate flexible to boundary and initial condition changes. We discuss in detail the theoretical background of the proposed method and apply it to a real case study, using a 1D dynamical simulation model and a GIS interface to visualise risk levels in the 2D run-out zone. An analysis of different protective countermeasures in a "cost-benefit" framework is provided as well.