

The Interreg IV project MassMove -Rockfall susceptibility assessment in the Upper Moelltal (Carinthia, Austria)-

Sandra Melzner*, Luuk Dorren°, Arben Kociu* and Richard Baek°°

*Geological Survey of Austria, °Federal Office for the Environment (FOEN), Switzerland/ecorisQ, °°Federal State Government of Carinthia, Austria



Introduction

Many regions in Austria and Italy are recurrently affected by rockfall processes which pose a significant hazard to settlements and infrastructure. Decision makers in the Federal State Governments/Local authorities are strongly dependent on methods/techniques and adequate data in order to delineate potentially endangered areas to plan more detailed investigations. As part of the INTERREG IVA Project MASSMOVE (Project Code 1381-08-1) an area of approximately 120 km² in the Upper Moelltal (Carinthia, Austria) was investigated concerning potential rockfall susceptibility. Spatially continuous field mapping for such a large study area (regional study) is expensive and time-consuming. Hence the project applied and evaluated various methods at regional scale to identify potential conflict areas within the study region (Dorren et al. 2011B, Melzner et al. 2011A). For the selected regions a comprehensive, detailed assessment at local extent was carried out subsequently (Melzner et al. 2011A, Melzner et al. 2011C).

Study area

Size: ca. 120 km²

Location: Upper Carinthia, "Goldberggruppe"

Dimension:

- * orogr. left slopes of the Upper Moelltal valley
- * tributaries Zirknitz, Asten und Kolmitzen

Communities:

- * Großkirchheim
- * Moertschach
- * Winklern

Challenges of assessment

Large study area: impassible terrain conditions and remote areas
Tectonic and lithologic complexity: large variety of areas with different lithological and structural anisotropies
Large variety of potential source areas: cliffs, deep seated slope deformations, scree and glacial deposits
Available data: high quality data (e.g. Laserscan) versus low quality data in terms of scale (e.g. Geological map 1:50.000) and erroneous content (e.g. landuse map)

Assessment scales

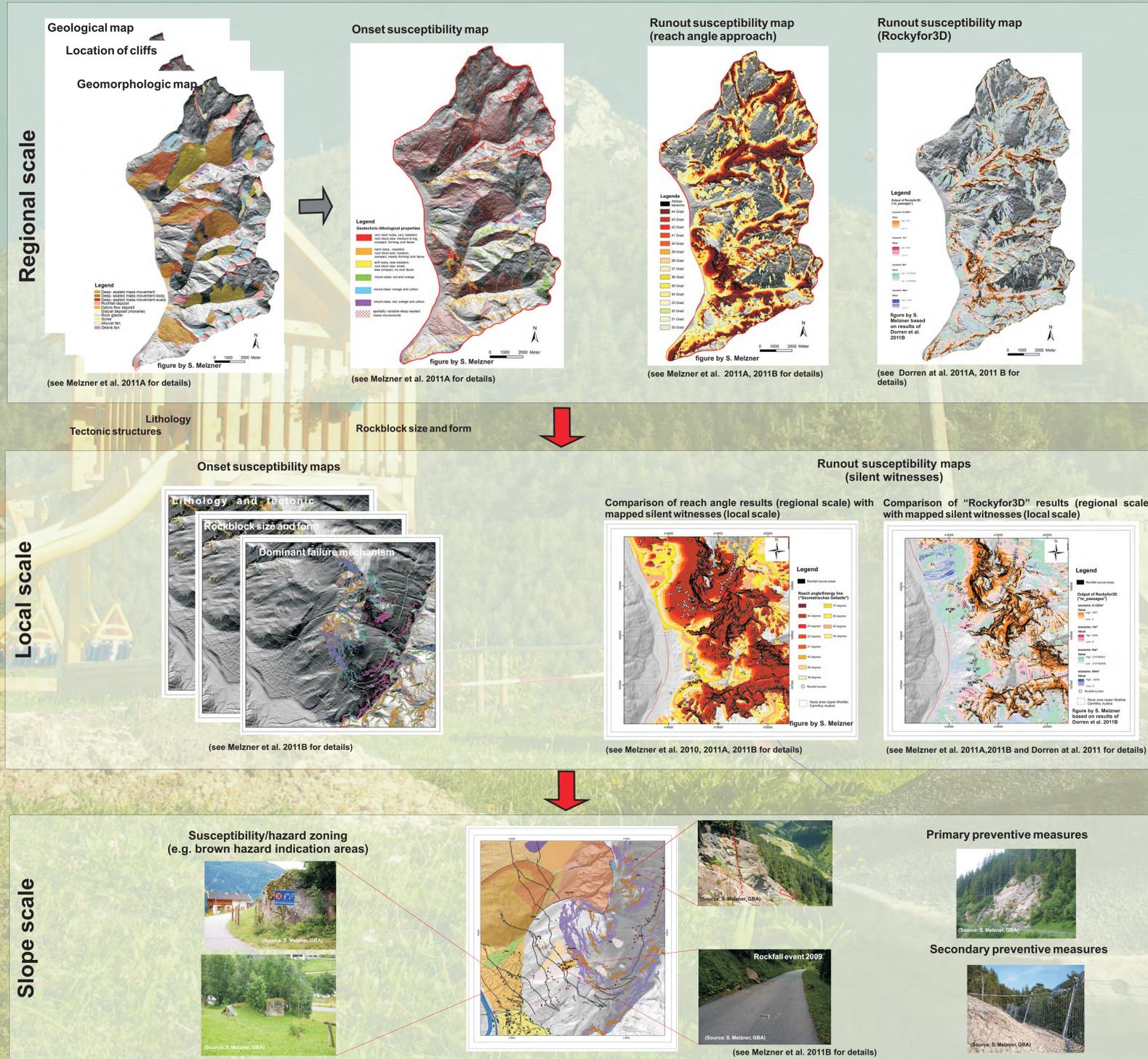
Source: MassMove handbook for rockfall

Analysis Scale	Scope	Type of maps	Indicative Map scale	Cell size
R: Regional	Recognition of potentially endangered areas	Inventory maps/ Susceptibility maps	1:50 000 - 1:10 000	<=30 m
L: Local (e.g. municipality)	Land use planning	Rockfall susceptibility maps /hazard map/hazard zone maps	1:10 000 - 1:5 000	<=5 m
S: Specific areas or slope-scale (site specific study)	Hazard and risk analysis, design of countermeasures	Hazard map/hazard zone maps	1:5 000 - 1:500	<=2m

Acknowledgments

- * Italian project partners and rockfall experts
- * A. Kociu, M. Lotter, I. Baron, M. Linner, G. Pestal, R. Schuster, N. Tilch & J. Reitner (GBA, Vienna)
- * Austrian Torrent and Avalanche Control (WLV), Section Upper Drautal und Moelltal, Villach
- * B. Hoelsle (Umweltbüro Klagenfurt, Klagenfurt)
- * M. Moelk (Austrian Service for Torrent and Avalanche Control, Geological Service, Innsbruck)
- * communities Großkirchheim, Moertschach & Winklern

Results



Assessment strategy

Project phase 1: The identification of potential endangered areas within the whole study region (regional scale)

The initial stage of the project collected all existing datasets for the study region. The acquired data were incorporated into preliminary field investigations in order to define potential rockfall source areas. The lithological units were categorized according to their geotechnical behaviour. The main morphostructural features such as lineaments, deep-seated slope deformations, talus slopes etc. were manually mapped using the ALS data and verified in the field. Potential rockfall distances were determined by applying a simple empirical model and by undertaking a 3D simulation using Rockyfor3D. Overlaying these results with areas of habitations and infrastructure could identify potential endangered areas.

Goal: Definition of areas for detailed assessments at local scale

Project phase 2: The specification of rockfall susceptibility (local scale)

The second phase of the project used the areas identified as potentially endangered in order to undertake detailed investigations of existing rockfall susceptibility. In effect, this phase of the project examines the extent to which rockfall processes occurred in the past and, thus, may reoccur in the future, thereby endangering settlements. This required on the one hand, an evaluation and analysis of the dominant lithological-structural geological characteristics and, on the other hand, the mapping of the location of silent witnesses. Partially mapped information were interpolated to spatially-continuous parameter maps which were used for the susceptibility analysis.

Goal: Generation of data as basis for the planning of detailed investigations at slope scale

Project phase 3: The evaluation of rockfall susceptibility at local scale as basis for planning site-specific studies (slope scale)

Results at local scale were used to define areas that should be subject to further investigations at the slope scale. These site-specific studies should incorporate detailed spatially-continuous mapping (>1:5000) and the application of more quantitative assessment methods. Within the MassMove Project, the Austrian rockfall study area is much larger (120 km²) than the Italian study sites (a few km²). Consequently, site-specific studies at slope scale were undertaken by the colleagues in Italy.

References

- DORREN, L. (2011A): Rockyfor3D revealed. Description of the complete 3D rockfall model. Ecorisq publication, pp. 21 (<http://www.ecorisq.org/en/publications.html>).
- DORREN, L., LIENER, S. & B. HÖSLE (2011B): Producing hazard indication maps using 3D rockfall simulation and shallow landslide modelling in the Moelltal and Auental (Carinthia, Austria). Massmove Report 2011 (publ. oct./nov. 2011 at www.massmove.at).
- MELZNER, S., LOTTER, M., TILCH, N. & A. KOCIU (2011A): Rockfall susceptibility assessment at the regional and local scale as a basis for planning site-specific studies in the Upper Moelltal (Carinthia, Austria). Massmove Report 2011 (publ. oct./nov. 2011 at www.massmove.at).
- MELZNER, S., MÖLK, M., DORREN, L., REICHENBACH, P. & F. GUZZETTI (2011B): Rockfall runoff modelling for susceptibility evaluation: a multi-scale comparison at different sites. Rocexs workshop 2011. Innsbruck, Austria (www.rocexs2011.at).