OPTIMETH – CONTRIBUTION TO AN OPTIMAL USAGE OF METHODS FOR DESCRIBING TORRENTIAL PROCESSES

(BEITRAG ZUR OPTIMALEN ANWENDUNG VON METHODEN ZUR BESCHREIBUNG VON WILDBACHPROZESSEN)

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BACKGROUND

The estimation of material transport, whether that of woody debris or debris flows, relies primarily on expert assessments. Event documentations are an important tool to support such assessments. It is an ongoing aim to obtain the most reliable data possible regarding design events and return periods, which is also important for public issues and discussions (e.g. determining local hazard zones).
It has been reported by our contacts throughout the Alps that such estimations pose problems in the neighbouring alpine countries as well. The international research society Interpraevent therefore initiated an international working group, "OPTIMETH", under the direction of representatives in Bavaria. Five workshops have been offered since January 2010 in Munich and Salzburg and first results are available. The output of this group is expected to be completed in 2012.

GOALS

The main goal of the working group was to identify the "state-of-the-art" in estimating natural hazards in the Alps. All currently applied methods and models were to be collected and evaluated. This kind of collective evaluation allowed the participating parties to compare their current knowledge and recognise potential areas of improvement.
The end result of this work should be the definition of a collectively agreed upon standard of quality, as well as the outlining of possibilities and limitations of current methods and models and upcoming needs in research and development. The final recommendations are expected to both facilitate and improve the work of practitioners in the field.

PARTICIPATING COUNTRIES

The working group OPTIMETH is comprised of participants from Switzerland, Austria and Germany (Bavaria). Representatives from France, Slovenia and South Tyrol were invited on a cooperative basis and all expressed interest in the matter. Due to time limitations, however, active participation by these representatives was not possible. They were kept informed of discussions and general progress and were encouraged to send feedback or input in written form.

TIME FRAME AND WORKING PLAN

This work focused primarily on torrential processes (flooding and fluvial material transport, including woody debris, debris flood and debris flows) and considered only small catchments (<25 km^2), as this is a typical size for torrents.
The first step included the collection of current methods and models. Only those methods and models which are easily applicable in a practical setting and those which have been proved over time were

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considered. A further requirement was that the availability of the method or model could be guaranteed. A formula (i.e. characteristics sheet) was created to ensure a uniform assessment of the methods. Based on this description of the method, a primary evaluation of the applicability was conducted.

PRELIMINARY RESULTS

The methods for determining water discharge (hydrology) in torrents are afflicted by numerous uncertainties and large margins of tolerance. This can be attributed to inaccuracies in water gauges and measurement data in small catchments and, therefore, inaccuracies in model calibration.
Comparative calculations were made for hydrologic parameters for several catchments. Using uniform input data, maximal discharge was calculated with different methods/models. The results contained wide variations, which could be attributed to both the choice of the CN value and the consideration of sub-catchments.
Limitations in the area of hydraulics lie in the determination of the roughness parameter. The literature contains a wide variation of Strickler values used for planning and calculations. In addition, there are often differences between the planning, the execution of a project and the natural state of the channel bed.
In terms of bedload transport, there are two pressing questions: “How large is the sediment potential in the catchment?” and “How much of this potential volume can be transported by the torrent?”
The estimation of sediment volume available in the catchment for any one state of precipitation can only be roughly estimated (e.g. through scenarios), and such an estimation becomes the task of an expert with applied geomorphic knowledge. Calculation models do not currently exist for this kind of estimation, and based on the prediction of the OPTIMETH representatives, such a model is not to be expected in the near future.
Models exist for the estimation of bedload volume and hydrographs for sediment transport in gradual terrain (slope in the range of <3-5%), but the quality of results from such models is severely decreased for steeper terrain (e.g. gorges or ravines).

Keywords: torrential processes, method comparison, comparative calculations