Torrential Watershed Monitoring

Introduction

Ever since the first settlements in the Alpine region, natural hazards and torrents have presented a serious threat to the population. Increasing conflicts between "natural", geophysical processes and rising demands by man need improved strategies for the implementation of protection measures. A number of measuring devices for data collection are used to gain a better understanding of the processes intervening in torrential watersheds.

Description

For more than 30 years the Unit of Torrents and Erosion of the Department of Natural Hazards and Alpine Timberline has been operating various monitoring sites (torrent research areas) in which precipitation and runoff, as well as air temperature, air humidity, radiation, wind, snow parameters, perched water levels, landslides and spring discharge have been recorded.

These data are used to increase the scientific knowledge base on natural hazard processes, mud flows and landslides. The results of the analyses provide the basis for decision-making in the field of preventive measures (bioengineering and area planning) and for proposals to optimise the design and construction of protective works. They are to be used increasingly by the Austrian Forest Technical Service for Torrent and Avalanche Control (WLV) for the implementation of protection measures.

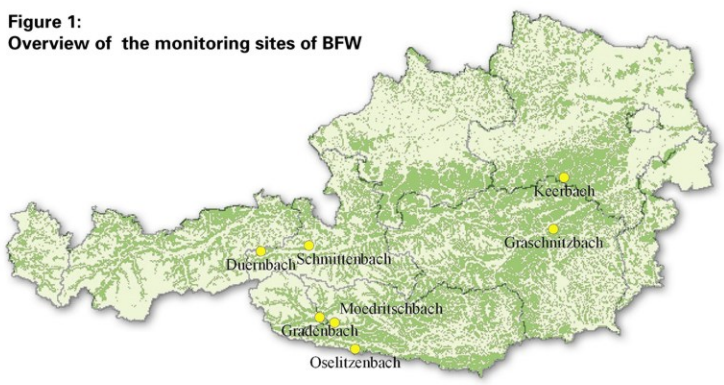


Figure 1:
Overview of the monitoring sites of BFW

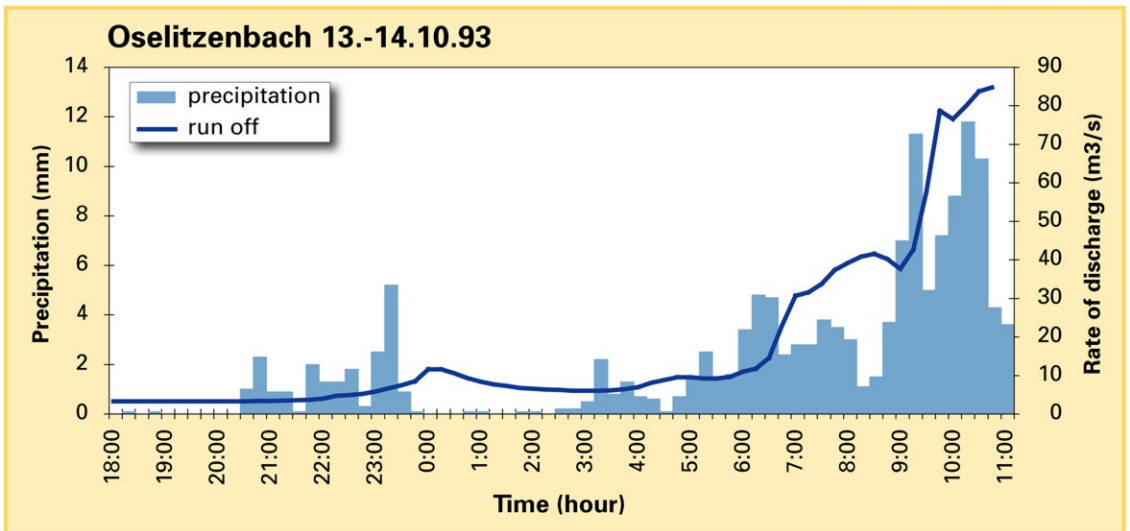
Example

These sites are also used to get supporting documentation (measurement of precipitation, run-off, etc.) of small and large flood episodes. The analysis of such records can explain why "just now" a catastrophic event has occurred and at another time, nothing has happened. Thus, daily rainfall of 130 mm in 1993 in the watershed of Oselitzenbach caused a runoff event occurring statistically every 100 years, whereas, three years later, 212 mm of rainfall within 24 hours caused a runoff event occurring statistically only 10 years.

For the planning and implementation of effective, low-cost protection measures it is important to understand the cause-effect relationship and interactions of the different parameters such as precipitation intensities, irrigation in advance, air temperature, soil water storage capacity, functions of the forest and erosion.

Summary

Measuring series over many years provide valuable information for the development of procedures for the determination of flood peaks. Monitoring sites are particularly suited for testing the adequate approaches (formula, models) for fitness under the extreme conditions which prevail in alpine torrential watersheds. Risk assessment models can be calibrated on the basis of current measuring data, thus improving considerably the quality of the results. Finally, data records of monitoring sites provide valuable indications on themes not directly related to torrents. They range from issues concerning water supply over the quantification of the protection and production functions of the forest to the potential effects of climate change at the local level.



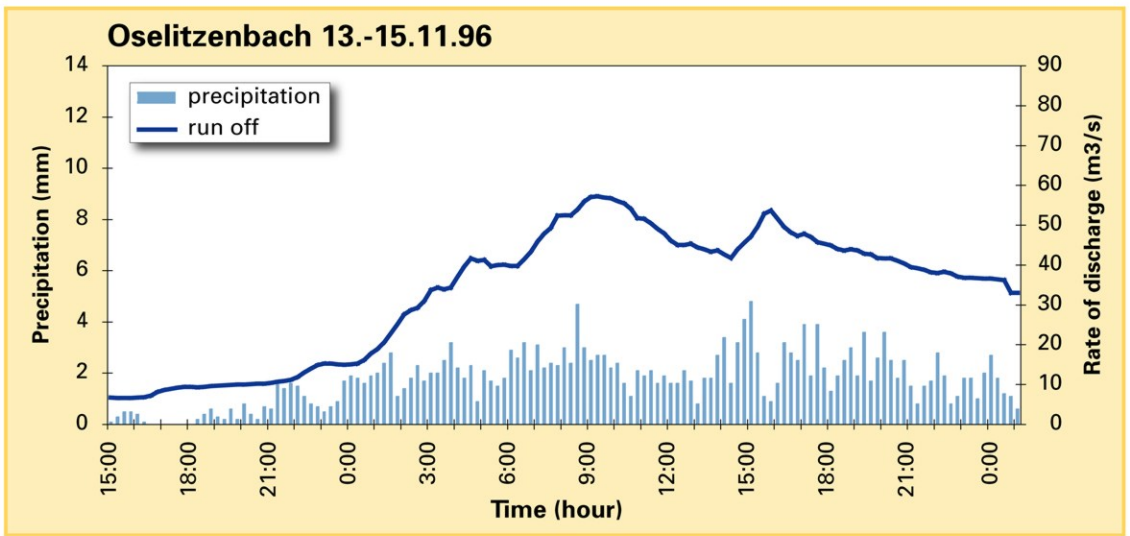


Figure 3 and 4:
Precipitation and rate of discharge of a 100 years resp. 10 years event in the watershed of the Oselitzenbach

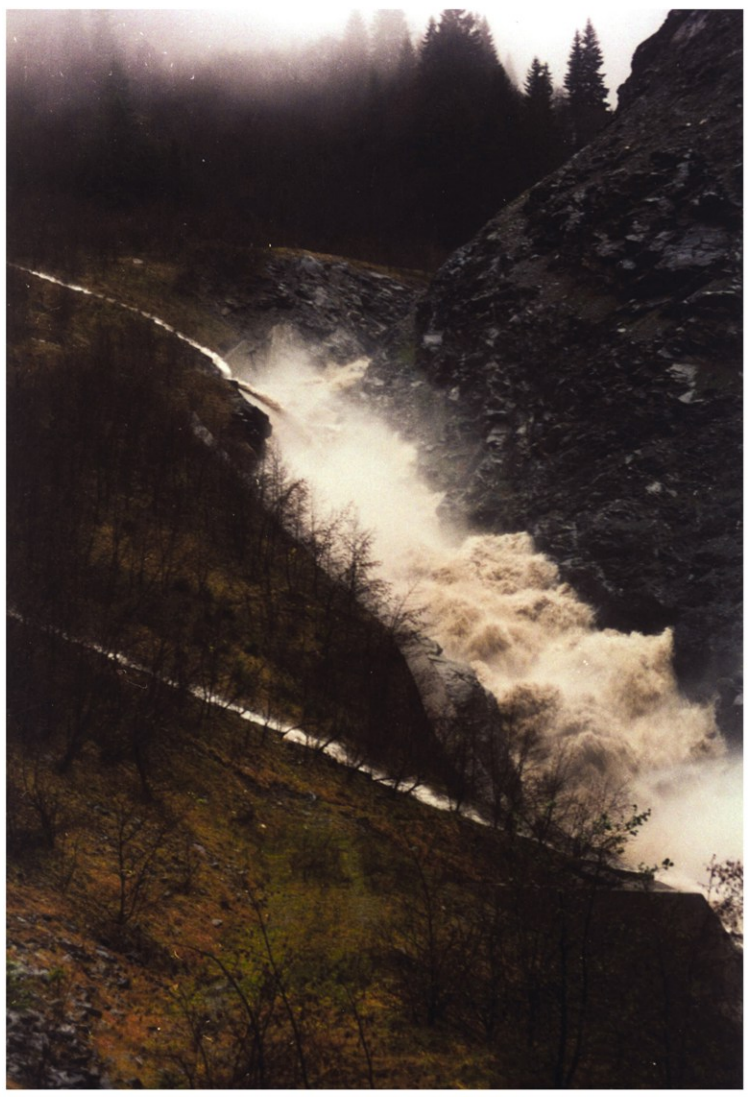


Figure 2:
Oselitzenbach during the ten years flood (occurring statistically every 10 years) on 14 November 1996

Reference

Lang E., Stary U., Kohl B., Markart G., Proske H., Trinkhaus P., Andrecs P., Gottschling H. , 1997: Beiträge zur Wildbachforschung. FBVA-Berichte, Wien, (96): 51 S.

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