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Natural Hazards and Earth System Sciences

Preface

Assessing and mapping landslide hazards and risk

Landslides cause deaths, missing people, injuries and homelessness every year. They affect settlements, roads and other infrastructures, constituting a major problem worldwide. However, in many countries little is known on the actual extent of landslide hazard and risk. Man and nature combine in increasing landslide risk. Climate change has locally increased the intensity of rainfall, raising the frequency of fast moving, shallow landslides. The population growth and the expansion of settlements and life lines over potentially hazardous areas are increasing the impact of landslides. The new issue seems to be the development and utilisation of monitoring and warning systems combined with regulations aimed at minimizing the loss of lives and property damage without investing in long-term, costly projects of ground stabilisation.

On April 2001, within the framework of the XXVI European Geophysical Society General Assembly held in Nice, France, we convened a session on landslide risk assessment and mapping. The session aimed at reviewing the recent advancements in the techniques and methods for evaluating, avoiding or mitigating landslide hazards and risk, and comparing qualitative or quantitative risk estimates in different areas.

The current special issue of *Natural Hazards and Earth System Sciences* contains seven of the twenty one contributions presented at the session. One article (Ardizzone et al.) describes a quantitative comparison among three landslide inventories independently accomplished by three research teams. Innovative techniques are used for minimizing the large positional mismatches observed between these landslide maps. In a second paper (Dussauge-Peisser et al.) the authors, by statistically investigating three rock fall inventories, attempt to predict rock fall recurrence rates for future events. In a third article (DeVita and Piscopo) the factors that trigger debris-flows affecting the pyroclastic materials mantling carbonate bedrocks are investigated. In particular, the relations between rainfall intensity and duration and debris-flow occurrence are examined and empirical threshold values are suggested. The fourth paper (Parise) illustrates an empirical approach to rock fall hazard zonation. The technique is essentially based on detailed geomorphological mapping through aerial photo-interpretation, field surveys and collection of historical data. In the fifth article (Valadao et al.) the authors describe the production of a landslide inventory map using traditional aerial photo-interpretation and field surveys. In the sixth paper (Cardinali et al.) the authors describe an empirical method to evaluate landslide hazard and risk suitable for relatively small areas. The technique is based on multi-temporal landslide inventory maps integrated by site-specific and historical information on past slope-failures. In the last article (Zêzere) the author uses a statistical approach (the information value method) to assess landslide hazard for a small area where different types of slope-failures occur. The results of this investigation suggest that prediction models for each landslide type perform better than a single model of all landslides.

Since the goal of the session was fairly broad, the twenty one oral and poster contributions and the seven articles presented here cover a fairly large spectrum of topics. Confining the discussion to the articles, three papers concentrate on fast moving landslides, such as rock falls and debris-flows (Dussauge-Peisser et al., Parise, DeVita and Piscopo). This points to the increasing interest in fast moving slope-failures that may have a severe impact on man, frequently causing fatalities. Four papers discuss different techniques for landslide mapping and hazard assessment (Parise, Valadao et al., Cardinali et al., Zêzere) of which three relies on traditional empirical geomorphological techniques and one (Zêzere) on statistical methods. Of these geomorphological techniques, some use fairly traditional approaches; others apply innovative, rigorous procedures that are worth further investigation. Only one paper faces the issue of data reliability and quality (Ardizzone et al.): apparently, investigators are still not sufficiently aware of the fact that the collection of environmental data is invariably affected by large or very large errors and uncertainty, which may severely impact the reliability and usefulness of the landslide inventory maps and hazard models produced.

Although risk assessment was one of the main issues of the session, only one paper (Cardinali et al.) attempts to estimate landslide risk. This reflects the fact that in the research environment investigators are more inclined to face the somewhat more stimulating and simpler issue of hazard assessment than to invest in operations for risk evaluation, which would require interaction with local administrators (end-users) and specialists from other disciplines.

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