

of its territory occupied by alluvial fans, has the highest potential hazard linked to debris flow processes in Piedmont. The case study concerns four creeks (Val Vigizzo), which have built up their coalescent alluvial fans onto the nearly level plain of the Vigizzo stream. These alluvial fans, that cover a total area of 8.1 km², were selected by taking into consideration the following criteria: 1) high rate of urbanization; 2) recently-occurred events and potential risk for residential areas located on the alluvial fan; 3) natural events well documented by historical data, aerial/satellite imagery and GIS metadata; 4) long-lasting rainfall records. One of the most important debris flows has occurred on 7-8 August 1978. All four above mentioned creeks have transported huge volumes of coarse-grained sediment that covered the fans with 5.5 km² of debris (with thickness between 0.5 m and up to 6 m). As consequence, several houses and bridges have been totally destroyed and other tens of buildings, road, rail network and many hectares of terrains have suffered considerable damages. In the subsequent years the local authorities have realized sediment control dams and canalization systems in order to mitigate future debris flows. Considering a series of data excerpted from written documents, historical maps and air photographs it was possible to reconstruct the timing and manner of urban development, in the last hundred years. It is comes out that the fastest grow rate occurred between 1950-1970. After the 1978 catastrophic event, urbanization rate has decreased especially within those areas severely affected by debris flow (i.e. apex zone and active channel). The 2006 up-to-date situation shows that alluvial fans represent 4.4% of the study area, but being the most suitable terrain for human settlements, an important percentage of residential areas and infrastructures are located on them. Currently in force, national and regional laws have included the Val Vigizzo debris-flow prone areas into elevate or moderate risk classes. It must be precised that after 1978 event till now no other debris flows have reached the same magnitude, so is hard to evaluate if the retention dams and laws provisions will successfully mitigate the risk for a potential high magnitude flow event with a several decades-long recurrence interval.

B4-6 Orale Falconi, Luca Maria

10.1474/Epitome.04.0154.Geoitalia2011

GEOMORPHOLOGICAL APPROACH TO INTENSITY AND RUN OUT EVALUATION OF POTENTIAL MUD-DEBRIS FLOW IN THE MESSINA MUNICIPALITY AREA (PELORITANI MOUNTAINS, SICILY)

FALCONI Luca Maria¹, CAMPOLO Danilo², LEONI Gabriele³, LUMACA Silvia², PUGLISI Claudio¹

1 - ENEA - Italian National Agency for new technologies, energy and sustainable economic development

2 - Consultant geologist

3 - Roma Tre University, Department of Geological Sciences

Presenter e-mail: luca.falconi@enea.it

Key terms: Debris flow; hazard; peloritani; sicilia

Peloritani Mountains (Messina province, Sicily) are a costal ridge along the Ionian coast, characterized by narrow and steep catchments of small size (5-10 km²) with a high relief energy (up to 1000 meters drop in about 5 km) and a short concentration time (few minutes). The morphology of the Peloritani has been especially influenced by metamorphic lithology, complex geostructural conditions related to the orogenic tectonics and recent tectonic uplift, active in the area since the late Miocene. All the steep slopes are covered by a few decimetres layer of debris, colluvium and soil.

During the night between 1 and 2 October 2009, this area has been affected by a sudden downpour, accompanied by strong winds and lightning. Sicilian Agrometeorological Informative Service estimated that more than 200 mm of rain fell in seven hours.

Lithological, morphological and hydrological conditions have meant that more than one thousand of mud-debris flows have been produced. Triggered by heavy rainfall, the flows have reached valley's bottom and alluvial fans in few minutes and with high energy. Urban areas located along the Ionian coast were overrun and affected by heavy damage and casualties. Giampilleri Superiore, Briga Superiore and Scaletta Zanclea, small villages 10 kilometres southward from the city of Messina, were the most injured areas.

An empirical geomorphological approach to evaluate run out and energy of potential mud-debris flows that affect the Peloritani Mountains is proposed in this paper.

An inventory map of more than 1000 mud-debris flows was the first task of the study, produced through geomorphological and morphometric survey and aerial photos analysis. The inventory was focused on identifying landslides parameters to obtain a susceptibility map of the area, following Enea-Roma Tre methodology.

Once localized source, transportation and run out areas of past mud-debris flows, velocity and intensity have been assessed. Velocity measurements with Johnson & Rondine (1984) method were realized in different points of occurred phenomena in order to determine the specific deceleration curves of the area. In the same points the kinetic energy released was calculated.

Subsequently source areas, run out, velocity and intensity of potential

scenarios for mountain source and transit areas as well as for urban areas prone to deposit of mud debris flows, indispensable basis for predisposing sustainable land planning actions and identify efficient risk mitigation measures.

B4-7 Orale Quaranta, Nicola

10.1474/Epitome.04.0155.Geoitalia2011

EVALUATION OF HYDRAULIC RISK IN MOUNTAIN BASINS AND ALLUVIAL FAN: THE CASE OF T.BUTHIER, VALPELLINE (AO)

QUARANTA Nicola¹, MARENCO Luigi¹, COGO Elena¹, MAGLIANO Marco², CRETON Joel²

1 - GEO engineering s.r.l. - Turin

2 - engineering consultant

Presenter e-mail: quaranta@geoengineering.torino.it

Key terms: Debris potential; Hydrology hydraulic models; Alluvial fan risk

The basin of T.Buthier di Valpelline is placed in the central Aosta valley, with an extension of about 60 square km, and due to high elevation it includes several glaciers and one small artificial reservoir.

According to standard methodological guidelines edited by Regione Valle d'Aosta, the approach of the study is dedicated to evaluation of current debris-flood risk analysis and design of mitigation solutions at a preliminary stage.

Geological analysis took place from aerial photointerpretation, field survey and data sampling and organization in a pre-defined GIS format. Historical analysis based on archive research has been performed.

Specific care has been dedicated to evaluation of debris potential along minor steep torrents and in the mountain slope, especially in the recent morain loose formations and from landslides, referring to different methods (Agostino, 2006 and Hungr et alii, 1984).

The available volume of debris were distributed referring to a discretization of the main basin in sub-catchments, taking in account the local slope reduction effects allowing intermediate deposition of the solid transport.

Detailed hydrological analysis, considering snowmelt contribution to flood formation, was developed throughout intensive rain analysis and referring to Curve Number (U.S Soil Conservation Service) into HEC-HMS 3.3 environment.

Clark Unit Hydrograph and SCS Unit Hydrograph methods have been applied in order to transform inflow into flows.

Keeping into account the results of Hydrological analysis, the evaluation of the channel functionality in the alluvial fan has been computed with HEC-RAS 4.0, assigning solid transport as a component of the liquid discharge from Smart - Jaeggly formula.

Assessment of risk flood on the alluvial fan considered intrinsic hazard and return-time of the flood as a probability and a parametric attribution of values to the exposed human activities.

Design of mitigation structures along the channel was supported by scenarios simulation with HEC-RAS 4.0, performing the reduction of the risk stage on the alluvial fan.

B4-8 Orale Luino, Fabio

10.1474/Epitome.04.0156.Geoitalia2011

MULTIDISCIPLINARY ANALYSIS TO IDENTIFY FLOOD-PRONE AREAS FOR THE REVISION OF TOWN PLANNING IN THE ITALIAN CENTRAL ALPS

LUINO Fabio¹, BELLONI Antonella², FASSI Paolo²

1 - CNR IRPI UOS Torino

2 - REGIONE LOMBARDIA - D.G. Protezione Civile, Polizia Locale e Sicurezza

Presenter e-mail: fabio.luino@irpi.cnr.it

Key terms: historical investigations; geomorphological analysis; flood-prone areas; town planning; Italian Alps

This study has examined more than 30 municipal areas of three different valley bottoms in Lombardy (Northern Italy). The research was carried out from historical and geomorphological points of view, and was aimed at identifying flood-prone areas. The result has been used to verify the present land-use planning, and to start a review process of the existing urban plans and/or their general changes.

The study was developed in three steps: a) collection of historical flooding data from several public bodies; b) geomorphological analysis by field surveys and aerial photographs; c) analysis of urban planning.

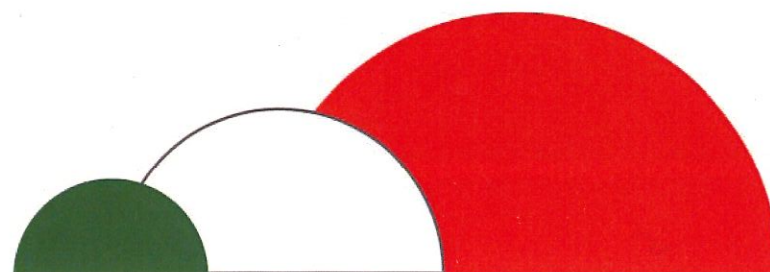
The historical investigation included the identification of the information sources, the collection of the historical report and old maps, and the selection and validation of the data. The aim of this investigation was to map the damaged sites in the past.

The geomorphological analysis was developed with aerial photographs and field surveys, and was aimed at verifying the reliability of the historical data, verifying the planform changes of the river-beds, collecting information from inhabitants and identifying the most critical

ISSN 1972-1552

Epitome

Volume 4, 2011



Geoitalia 2011

**VIII Forum Italiano di Scienze della Terra
Torino, 19-23 settembre 2011**



REGIONE
PIEMONTE



MUSEO REGIONALE
DI SCIENZE NATURALI