Geophysical Research Abstracts
Vol. 15, EGU2013-5754-2, 2013
EGU General Assembly 2013

Analysis and reconstructed modelling of the debris flow event of the 21st of July 2012 of St. Lorenzen (Styria, Austira)

Stefan Janu (1), Susanne Mehlhorn (2), and Markus Moser (3)

(1) Austrian Service for Torrent and Avalanche Control, GBL Ennstal und Salzatal, 8940 Liezen, Austria (stefan.janu@die-wildbach.at), (2) Austrian Service for Torrent and Avalanche Control, BMLFUW Abt. IV/5, 1030 Wien, Austria (susanne.mehlhorn@die-wildbach.at), (3) Austrian Service for Torrent and Avalanche Control, GBL Lungau, 5580 Tamsweg, Austria (markus.moser@die-wildbach.at)

Analysis and reconstructed modelling of the debris flow event of the 21st of July 2012 of St. Lorenzen (Styria, Austria)

Authors: Stefan Janu, Susanne Mehlhorn, Markus Moser

The village of St. Lorenzen, in the Styrian Palten valley is situated on the banks of the Lorenz torrent, in which a debris flow event occurred in the early morning hours of the 21st of July 2012, causing catastrophic damage to residential buildings and other infrastructural facilities.
In the ministry-approved hazard zone map of 2009, the flood water discharge and bedload volume associated with a 150-year event was estimated at 34 m^3/s and 25,000 m^3 respectively for the 5.84 km^2 catchment area. The bedload transport capacity of the torrent was classified as ranging from 'heavy' to 'capable of producing debris flows'.
The dominant process type of the mass movement event may be described as a fine-grained debris flow. The damage in the residential area of St.Lorenzen was caused by a debris flow pulse in the lower reach of the Lorenz torrent. This debris flow pulse was in turn caused by numerous landslides along the middle reaches of the torrent, some of which caused blockages, ultimately leading to an outburst event in the main torrent.
Discharge cross-sections ranging from 65 – 90 m^2, and over 100 m^2 in a few instances, were measured upstream of the St. Lorenzen residential area.
Back-calculations of velocities yielded an average debris flow velocity along the middle reaches of the torrent between 11 and 16 m/s. An average velocity of 9 m/s was calculated for the debris flow at the neck of the alluvial fan directly behind the center of the village.
Due to both the high discharge values as well as to the height of the mass movement deposits, the natural hazard event of 21 July 2012 in St. Lorenzen is clearly to be described as having had an extreme intensity.
A total of 67 buildings were damaged along the Lorenz torrent, 7 of were completely destroyed.
According to the Austrian Service for Torrent and Avalanche Control, a great number of protection measures have in the past been realized in the Lorenz torrent, which with certainty contributed significantly to an even greater amount of damage in the St. Lorenz residential area having been prevented.
Attempts at reconstructing the event processes as well simulating the debris flow in 2D were undertaken in the course of the event documentation and analysis. The thus obtained discharge heights, flow velocities and impact pressure values corresponded with the well documented event. The two dimensional simulations were carried out with the program FLO-2D, which is capable of simulating debris flows. The rheological parameters of the debris flow material were determined with the aid of a viscometer and a debris rotation drum. The debris flow hydrograph, bedload and bedload ratio were reconstructed using data from the event documentation, such as difference models, geological mapping, wetted perimeters, witness's statements, etc.
The aim of the very detailed event documentation and analysis was to reconstruct the extreme process sequence along with the damaging effects that they had in the build-up area of St. Lorenzen. There was a large media interest in this event. The results should therefore serve to answer the multitude of questions about this event that lie in the public as well political interests. Additional and substantial protection measures were also planned for the village of St. Lorenzen on the basis of these event analysis results. These are comprised of two debris flow barriers in the lower gorge streches with a capacity of 15,000 m^3 each as well as a bedload retention basin directly above, with a capacity of 30,000 m^3. Construction of these technical protection measures has already begun.

Author′s adresses:
DI Stefan Janu
Fachbereich Wildbachprozesse
Austrian Service for Torrent and Avalanche Control, GBL Ennstal und Salzatal
Schönaustraße 50
8940 Liezen

Dipl.Geogr. Susanne Mehlhorn
Fachbereich Wildbachprozesse
Austrian Service for Torrent and Avalanche Control, BMLFUW Abt. IV/5
Marxergasse 2
1030 Wien

DI Markus Moser
Fachbereich Wildbachprozesse
Austrian Service for Torrent and Avalanche Control, GBL Lungau
Johann Löcker Str. 3
5580 Tamsweg