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Debris-flow hazard assessment in Slovenia

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Among different natural hazards (i.e. snow avalanches, landslides, rock falls, floods), debris-flow hazard in Slovenia has been relatively not well investigated till now. The conditions in Slovenia (cases such as the Stože debris flow with over 1 million m^3 in 2000 in the village of Log pod Mangartom, over 20 small debris flows in 2002 in the village of Koseč, and debris disaster in 2004 in the village of Ukve-Uggovizza close to Slovenian-Italian border) as well as in the Alpine environment in last years are evidence that there is enough indication that hazard of these events is raising. In Slovenia, in last years we successfully used 1- and 2-D mathematical modelling of debris flows to produce local hazard maps in devastated areas (Log pod Mangartom, Koseč) and to help planning structural mitigation measures. Two main problems associated with such a modelling is the assessment of a realistic debris-flow scenario (i.e. magnitude, density), and the validation of the model using field data. In Slovenia, debris-flow cadaster does not exist and not many historical studies have been done so far. For this reason, selected methods for estimation of debris flow magnitudes have been applied in selected torrential watersheds (Sodnik & Mikoš, 2006). Some of the methods gave reasonable estimations for few known field situations (i.e. Koseč or Log pod Mangartom). In order to assess debris-flow hazard in Slovenia, we started a three-year targeted research project “Debris flow risk assessment” with a field study in the headwaters of the Upper Sava River valley between Rateče (border to Italy) and Jesenice in NW Slovenia. This region was chosen due to its high potential for debris flow

generation. In the Upper Sava River valley, out of many torrential fans, 4 fans have been selected for the study (Trebiža, Suhelj, Presušnik, and Koroška Bela). Since December 2006, one or two sedimentological trenches reaching over 5 m in depth were excavated in the distal or/and in the proximal part of each of the selected fans. For each trench we assured qualitative geological (sedimentological) inventory and description of lithological structure, and we defined age of the sediments. High probability of one or more sequences of sediment mass movements was defined in most of the trenches. The excavated sediment in the Trebiža torrential fan was estimated to be 10.000 to 12.000 (the last bigger deglaciation) or even 18.000 to 20.000 years old (deglaciation after the last glacial summit). Furthermore, the torrential watersheds were geologically mapped and investigated. The active sediment sources and potentially instable areas were defined during field mapping. The obtained results will enable us to develop possible (real) debris-flow scenarios in investigated torrential watersheds to be used with a two-dimensional mathematical modelling in order to prepare hazard maps for torrential fans under investigation, as well as to develop a debris-flow susceptability map of Slovenia in scale 1:250,000 on the basis of influence of selected spatial indicators. Similar approach has been already successfully applied for the landslide hazard prediction in Slovenia (Komac, 2003).