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Damage and loss assessment for Central European earthquake regions – case study South-western Germany

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Due to absence of strong earthquakes, there is almost no data or experience available concerning the behavior and vulnerability of common buildings in the seismic zones of Germany. The consideration of their earthquake resistance or vulnerability is still outside the scope of official investigations. A scale is missing in order to calibrate the results of seismic risk assessment measures and to prove their reliability. In this context, an outstanding importance has to be attested to the September 03, 1978 earthquake in the Western Swabian Albs, the strongest event in Germany over the last 50 years. Furthermore, the 1978 Albstadt earthquake provides a realistic impression of the severity of design earthquakes (in the lower range of the highest seismic zone) as defined in the new German Seismic Code DIN 4149:2005.

The detailed survey and documentation of damage cases in the aftermath of the Albstadt earthquake 1978 provides the basis to test the applicability of the developed GIS-based seismic risk assessment technologies, developed at the Earthquake Damage Analysis Center Weimar (EDAC), to other seismic regions. For this purpose, the main damage zones and the distribution of mean damage grades in the town district Albstadt-Tailfingen are reconstructed, and the loss will be recalculated for the building stock and inventory at the time of the event in 1978.

The vulnerability of building types is evaluated on the basis of the European Macroseismic Scale EMS-98. A classification procedure of the EMS-98 is applied to transform existing damage observations into damage grades. The extent and distribution of building damage due to different model assumptions and due to the stepwise refine-

ment of input variables (GIS-layers) are compared to the documented ones.

In addition to the empirical approach, selected damage cases are examined by a recently developed evaluation tool for masonry structures, this combining experience and analysis in a hybrid way in order to detect weak points of structural layout, as well as the extent and the level of damage. All results indicate a remarkable agreement with the reported situation.

Summarizing the results of different research projects, it can be concluded that the developed GIS-based seismic risk and loss assessment technologies and tools are applicable to other regions. On the basis of different scenarios the scatter of uncertainty related to the variation of local site conditions, the vulnerability of the existing building stock and damage functions (relation between mean damage ratio and mean damage grade) will be quantified.