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Long term seismic hazard information from intact, vulnerable stalagmites in Domica cave, O:rdo:glik Hall, Slovakia

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Long-term information can be gained from intact and vulnerable stalagmites in natural caves. These formations survived all earthquakes that have occurred, over thousands of years - depending on the age of the stalagmite. Their “survival” requires that the horizontal ground acceleration has never exceeded a certain critical value within that time period.

Here we present such a stalagmite-based case study from the Gömör-Torna karst region, Slovakia. A candlestick shaped, intact and vulnerable 4.51 m tall stalagmite in Domica cave, Ördöglik Hall has been examined in situ many times since 2012. The examination of candlestick shaped, intact and vulnerable (IVSTM) in Domica cave, Ördöglik Hall (southeastern Slovakia) is the continuation of our previous examination of intact, vulnerable stalagmites in other caves in Hungary, Bulgaria, Slovakia and Austria. The aim of our investigation is to estimate the upper limit for horizontal peak ground acceleration generated by paleoearthquakes.

The method of our investigation is the same as before: the density, the Young’s modulus and the tensile failure stress of broken stalagmite samples have been measured in mechanical laboratory, whereas the dimensions and the natural frequency of IVSTM were determined by in situ observations. The value of horizontal ground acceleration resulting in failure and the theoretical natural frequency of IVSTM were assessed by theoretical calculations.

New results of age determination of drilled core samples from Ördöglik Hall, Domica cave are available. The age has been determined by Multi Collector – Inductively Coupled Plasma Mass Spectrometry analysis (MC-ICPMS). Our measurements show, that the base part of the IVSTM is not older than 10 kyears.

The critical horizontal ground acceleration values as a function of time going back into the past determined from stalagmite, that we investigated (IVSTM), are presented. This result have to be

taken into account when calculating the seismic potential of faults near to Domica cave (e.g. Darnó and Rozsnyó lines).