Geophysical Research Abstracts
Vol. 12, EGU2010-2306, 2010
EGU General Assembly 2010

Karstification beneath dam sites: From conceptual models to realistic scenarios

Thomas Hiller, Georg Kaufmann, and Douchko Romanov

Free University of Berlin, Institute of Geological Sciences, Geophysics Section, Malteserstr. 74-100, Haus D, 12249 Berlin, Germany (georg.kaufmann@fu-berlin.de, +49 (0)30 838-70729)

Dam sites located above soluble rock such as limestone or gypsum can leak in relatively short times (tenths of years), when compared to the natural time scale of karstification (10.000-100.000 years). The reason for this leakage is the high hydraulic gradient imposed by the reservoir that drives aggressive water through the fracture and fissure system of the bedrock and this aggressive water dissolves the rock and increases permeability fairly fast. Thus, on the one hand water losses through enlarged fractures can become a problem for the reservoir. On the other hand, the void space itself can be a risk for the dam structure above. This may have unpredictable ecological and economical consequences.

We present a three-dimensional conceptual model study of karstification in dam-site areas on limestone bedrock. We compare our three-dimensional model to a standard two-dimensional dam site model to verify the results of our code. We further carry out a sensitivity analysis on the physical and chemical parameters driving the karstification to derive an empirical formulation of the breakthrough time T_B. In a next step we implement a statistical fracture network and topography to approach a more realistic scenario. Finally we show the results of a three dimensional model based on a real dam site.