Geophysical Research Abstracts
Vol. 17, EGU2015-2958, 2015
EGU General Assembly 2015

Structure and evolution of collapse sinkholes: Combined interpretation from physico-chemical modelling and geophysical field work

Georg Kaufmann and Douchko Romanov
Freie Universität Berlin, Dept. of Geological Sciences, Geophysics Section, Berlin, Germany (georg.kaufmann@fu-berlin.de)

In karst rocks (limestone, anhydrite, gypsum, . . .), water flowing through fissures and bedding partings can enlarge voids either by physical and/or chemical dissolution. Within a geologically short period of time, the increase in void space creates a large secondary porosity typical for soluble rocks, which is responsible for preferential flow through the karst rock, often through cave systems with passages reaching the meter-scale and more. This large-scale voids in the sub-surface can initiate collapse of the overburden, either through wall or roof breakdown, and the initial void created by dissolution can migrate upwards and finally cause a surface collapse and create a collapse sinkhole. While the dissolution part of this evolution is in the order of 10,000-100,000 years, the final mechanical collapse can occur on time scales of days.

We have studied the initiation of sub-surface voids with our numerical tool KARSTAQUIFER, a 3D karst evolution model describing flow and dissolution in karst rocks. We apply this numerical model to a typical collapse sinkhole site in the southern Harz Mountains in Germany, with anhydrite as soluble rock in the sub-surface. We then discuss geophysical measurements (gravity, electrical resistivity tomography, self potential, magnetics) from the location to identify the local collapse sinkhole signal and the possibility to separate the collapse sinkhole signal from the broader geological signal of the study site.