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Modelling speleogenesis in soluble rocks: A case study from the Permian Zechstein sequences exposed along the southern Harz Mountains, Germany

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Soluble rocks such as limestone, dolomite, gypsum, anhydrite, and salt can be dissolved by water flowing through voids in the rocks. The removal of the dissolved material from fissures and bedding partings by physical and/or chemical dissolution enlarges the permeability of the soluble rocks within geologically short periods of time, ranging from 100,000 years down to decades.

We will describe cave features in the rock sequence exposed along the southern part of the Harz Mountains in Germany, where limestone/dolomite and anhydrite/gypsum are exposed along a kilometer-wide strip following the foothills of the Harz Mountains. The rocks have been deposited during the Permian Zechstein period, buried, and exposed later through tectonic uplift. The exposed part of this soluble sequence is dominated by karst features. But there are also substantial cave voids deeper in the rock, with no obvious entrance to the surface, which have been discovered by chance through mining activities.

We explore the evolution of such a system composed of limestone and anhydrite by numerical means, describing flow and transport in a rock mass composed of soluble and insoluble rock sequences, with limestone and anhydrite responsible for the evolution of secondary porosity.