



## **Actualistic approaches for the interpretation of clastic deposits of the Mühlbach Cave, Germany**

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The Mühlbach Cave was discovered in 2001 by speleologists after intense digging activities. With a length of more than 7 km today it is among the longest caves in Germany. The cave is located in the South Franconian Alb, a karstic area showing limestones and dolomites of Jurassic Age. Most cave passages show active subsurface streams discharging 300 l/s and transporting gravels and sandy-silty sediments. Because of lacking of a natural cave entrance there is the opportunity to study undisturbed fluvial cave sediments in relation to the hydrological conditions.

Main focus was set on sampling of different sedimentary environments of clastic cave deposits to characterise a broad spectrum of cave sediments. These samples act as reference material for the interpretation of samples which did not show any relation to fluvial or other facies (actualistic approach). Especially fine sand to silt outcrops at the cave walls or similar successions drilled by a manual auger at the bottom of abandoned passages had to be identified.

A rough distinction between channel-fill, channel and point bar, natural levee and overbank deposits was made along the active cave streams. Referring to the distinct hydrological conditions a detailed morphological and geological mapping was performed for a few localities. Streambed samples show often rounded gravels of medium size or sandy gravels. Lithologically they comprise mainly cherts and quartzites derived from the karst surface. Although only minor fragments of carbonate rocks occur (strongly corroded limestones, speleotheme fragments) higher portions of dolomite grains are observed within the sand fractions. It can be concluded that these grains result from a granular disintegration of dolomitic rocks at higher levels of the cave. They were displaced through vertical shafts into the active streams. Grain size data from point bars, natural levees and marginal overbank deposits exhibit clear sorting of the unimodal sediments and a gradual shift of cumulative grain size curves to finer material.

Abandoned passages behind natural levees show a continuous grain size decrease with increasing distance to the levees. In case of flooding the natural levee deposits are highly affected by the dynamics of the adjacent cave stream (proximate facies). More distant areas display finer grain sizes due to the reduced current velocities (distal facies). Often the sedimentary environment changes to lacustrine conditions which are disturbed by fluvial input only in a few episodic cases. Mostly the connections to the main passage are interrupted and water supply is fed mainly by drip water. The limnic cave sediments are often fine laminated and consist of fine silt and minor clay. The discrimination between different sedimentary environments was also performed by facies diagrams using sorting and grain size parameters.

Except of silt and fine sand transported as suspension load no important dislocation of sedimentary material was observed within the Mühlbach Cave. Although larger floods were documented for historic times the depositional setting of this cave has to be interpreted as a calm fluvial environment. Due to its lower hydrological dynamics it is different from the typical Fluviokarst.