# Monitoring cave drips in a (partly) controlled hydrological system, Milandre cave, Switzerland

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Understanding the hydrological response of cave drips to external environmental forcing is critical to decipher speleothem archives during the Holocene. However, the spatially heterogeneous permeability of a typical karst system is often responsible for transient responses at the investigated drip sites. Depending on flow routes and associated reservoir effects drip discharge and hydrochemical signatures may vary within a few meters only.
The Milandre underground laboratory offers a unique opportunity to study hydrological transport processes under (partly) controlled boundary conditions. Here we present preliminary results from three drip sites being monitored at 30 min intervals since March 2009. Following the construction of a motorway above the cave passage, two of the monitoring sites showed a distinctive change in their hydraulic response whereas a third measurement point responded only moderately. Since October 13 2011, artificial watering with $CO_2$ enriched $H_2O$ (i.e. Q= $\sim$1 l/min, ca. 3% dissolved $CO_2$) progressively reactivated the drips to reach a steady regime on the 26th of December. Knowing the volume of water injected it becomes possible to assess the permeability of the karst volume feeding the individual drips and thus reconstruct the hydrological balance of the system. Moreover, natural and artificial tracing experiments are being used to quantify the hydrological mixing and average residence time in the low permeable volumes. This experimental setup therefore opens promising perspectives to quantify transport processes of organics and adsorbed trace elements and their partitioning into actively growing speleothems.