



## **Monitoring of cave air temperature and humidity in the Niedźwiedzia Cave system (Sudetes, Poland) – a key to understanding tourists activity impact to cave environment**

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The Niedźwiedzia Cave is located in Śnieżnik Massif (the Easter Sudetes, SW Poland) at 800 m a.s.l. The length of known passages is  $\sim$ 3000 m and denivellation is 69 m. The system is composed of 3 levels of passages and chambers. It is a show cave with  $\sim$ 80,000 visitors every year.

In 2010 we started monitoring program of cave air temperature and humidity, drip rate, stable isotopes and Uranium and Polonium content in water in selected sites inside the cave and in its vicinity. Changes in dropping rate in upper level are well correlated with precipitation. However, a response of dripping to rainfall depends on former precipitation frequency and intensity – during the humid period the dripping reacts immediately and after long dry period dripping responses with two-weeks delay. There is not so direct correlation between precipitation and dripping in lower level of the system.

Air temperature inside the cave is almost stable in lower level (mean annual  $\sim$ 5.3 °C, and annual variation up to 0.7 °C) and more dynamic in the middle level (mean annual  $\sim$ 6.4 °C, and mean annual amplitude up to 4 °C). Daily and weekly measured changes of cave air temperature demonstrate extremely well correlation with number of visitors. In show cave passages (the middle level of the system) temperature increase 0.1-0.2 °C during every day when the cave is open for tourists and such changes is not observed during days without visitors and in lower level of the system closed for tourists. But even short visits of 3-4 cavers are recorded by temperature sensors exposed in the lower level ( $\sim$ 0.02 °C increase). It proves very high sensitivity of cave environment to human activity.

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