



Cave air temperature response to climate and solar and geomagnetic activity

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The atmosphere of caves is generally included in the processes that happen in the external atmosphere. Circulation of the air in caves is a fragment of the most general circulation of the air in the atmosphere. Even such conservative media as the air volumes of karst caves response to the variations of climate and solar and geomagnetic activity.

Karst systems are composed from three main zones: heterothermic zone near the surface, unsaturated transitional zone and zone of the constant temperatures (ZCT), which secure the heat and humidity transport from and towards the cave atmosphere. Air, water and rock temperature tend to equilibrium in each zone. Therefore, heat exchange between air, water and walls is the dominant process acting in all three zones. The yearly mean air temperatures in the zone of constant temperatures of four show caves in Bulgaria have been studied for a period of 36 years (1968 – 2003). Everyday noon measurements in Ledenika, Saeva dupka, Snezhanka and Uhlovitsa cave have been used for the investigation. Caves are situated at different altitude and geographic latitude.

As the air movement is the most significant agent for transmission of external climate influence inside the caves, we compare the results obtained with data for the air temperature and humidity, wind velocity and direction, and for atmospheric pressure from meteorological stations situated near about the caves.

Two caves - Cave Junction, Oregon and Timpanogos Cave, Utah, USA – have been also examined for the same time period, for comparison. They are situated at nearly the same geographic latitude.

Cave air temperature response to solar and geomagnetic activity represented by the Sunspot number and Apmx indices respectively has been discussed.

This work can contribute to studying the mechanisms of heat transport in the subsurface and calibration of long period climatic data read from speleothems and deposits in caves.