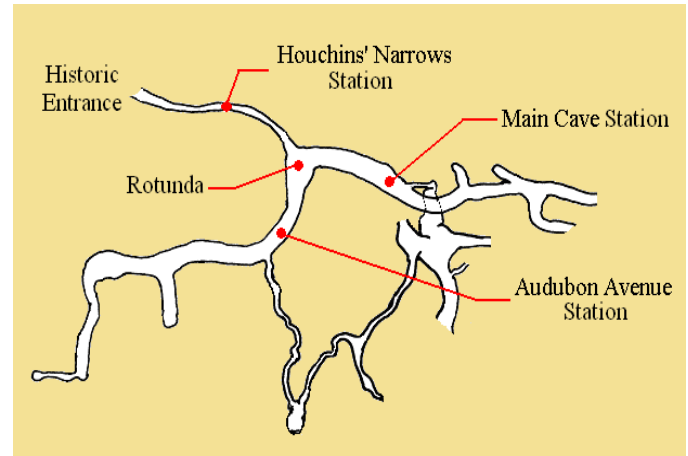




Airflow Distribution Study at the Rotunda in Mammoth Cave

Importance: *Impacts on cave resources*

Air velocity is an influential atmospheric parameter within the Mammoth Cave (MACA) system. Altering (through management actions, for example) the rate of air movement within caves can impact geological processes, thermal gradients, trace gas presence/absence, and the condition of biotic and cultural cave resources. It is important to understand the dynamics of air movement within the Historic Section of MACA because this area is replete with cultural resources, natural resources and natural processes that are impacted by cave airflow dynamics. Further, airflow throughout this area is easily affected through modifications to the gating systems at the Historic Entrance. So, if gating systems are not carefully designed, damage to the resources could result.

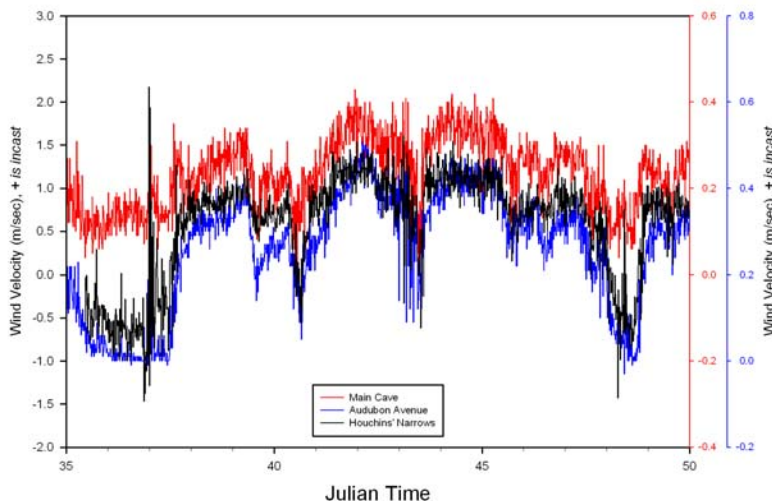


Data Collection Sites in Historic Section of Mammoth Cave

Investigators collected and analyzed data from December 2006 to April 2008. During the cold months of that time, continuous air velocity data were collected at three sites in the Historic Section of Mammoth Cave. Ultrasonic anemometers were placed approximately one meter above the floor and data were stored on dataloggers.

Results

When air moving down a passage comes to an intersection with other passages, the air mass may divide and enter the adjoining passages. An ideal model of the airflow distribution at the Rotunda intersection is that both Main Cave and Audubon Avenue receive some portion of the air that comes into the cave through Houchins' Narrows. If this model is correct, the behavior of the Houchins' Narrows data will closely match that of the Main Cave and Audubon Avenue data. That is, if airflow increases or decreases in Houchins' Narrows, it will increase or decrease, respectively, at both Audubon Avenue and Main Cave. Shown below are typical data (these data were collected from February 5 through 19, 2008). The plot shows clearly that data from each of the three sites behave similarly.



All airflow data are showing similar patterns over the sampling period (February 5 through 19, 2008).

Management Applications

1. It should be possible to affect airflow at farther-in-cave sites by influencing airflow in Houchins' Narrows.
2. Other studies have suggested that airflow is directly related to air temperatures in Historic MACA. So, by affecting airflow, it should also be possible to affect air temperature at sites in Historic MACA.

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