

Radon and CH₄ Tracing of Groundwater Flow and Surface Water Interactions at Wakulla Springs

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Wakulla Springs is a spring fed by a natural underground cave system and surface water. In order to accurately assess the variability in source inputs, we performed continuous monitoring of ²²²Rn activity and methane concentration at one of the main spring conduits (B-tunnel) and at the main vent of Wakulla Springs.

This monitoring spanned a dry period and a rainier one. It has been suggested that the water flowing through B-tunnel represents true (older) groundwater while the main vent represents more of a mixture including a recent surface water component. We hypothesized that a longer residence time in the subsurface would result in higher groundwater tracers, relative to waters that had only been in the subsurface a shorter time.

Hypothesis 1: B-tunnel will have higher Rn activity and methane concentration than the main vent waters and that these measurements will yield the Rn activity and methane concentration of the pure groundwater end member. The Rn activity and methane concentration of the main vent would have a significantly lower Rn activity due to dilution by recent surface waters.

Hypothesis 2: Variations in rainfall will be reflected in variations in the groundwater tracer content of the main vent which would exhibit decreased tracer contents during rainfall events. B-tunnel will not change.

We monitored the spring system from the end of April until September 2007. The overall average ²²²Rn for B-tunnel and the main vent were 322±3 dpm/L and 274±3 dpm/L respectively, consistent with hypothesis 1. However, there was no trend at either site with precipitation. Methane concentrations were not significantly different between the two sites and did not vary with precipitation either. We found little evidence for variations in the ratio of recent surface water to groundwater at either site. This may be because the monitoring period was during a prolonged drought.

Keywords: total maximum daily load (TMDL), groundwater, radon, methane, spring water system

Issues: To improve the water quality of the Wakulla Springs by understanding the sources of the nutrients and water to the spring system.