



Drivers of Dissolved Organic Matter in the Vent and Major Conduits of the World's Largest Freshwater Spring

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Results and Discussion

Wakulla Springs is the largest and deepest freshwater spring on Earth and has exhibited increased chromophoric dissolved organic matter (CDOM) inputs (i.e., browning) in recent decades. To examine the drivers of changing dissolved organic matter at the spring vent, we examined dissolved organic carbon concentrations and dissolved organic matter composition via optical parameters (i.e., absorbance and fluorescence) in the major conduits and a connecting spring over the course of 1 year. Sample sites separated clearly based on dissolved organic carbon concentration, CDOM absorbance, and optical parameters indicative of autochthonous (clear groundwater) versus allochthonous (terrestrial) dissolved organic matter. Seasonality was apparent in the allochthonous-dominated sites with increasing terrestrial contribution particularly with large precipitation events post dry periods. Principle component analysis highlights the ability of optical parameters to show the dominance of sample sites draining from the southwest (i.e., Apalachicola National Forest) as responsible for the CDOM-rich water at the vent, whereas water draining from the north was comparatively clear. Increasing CDOM-rich waters at the vent suggests that either input from conduits draining from the southwest has increased, or the relative dilution with clear groundwater has decreased in the conduit system prior to discharge from the vent. Sea level rise impacts in the region have been suggested to result in more blackwaters delivered to the vent, and ongoing extraction of clear groundwater reduces the dilution capacity on CDOM-rich waters. Thus, anthropogenic impacts in the region need to be addressed if the trend of increased CDOM inputs at Wakulla Springs is to be reversed.

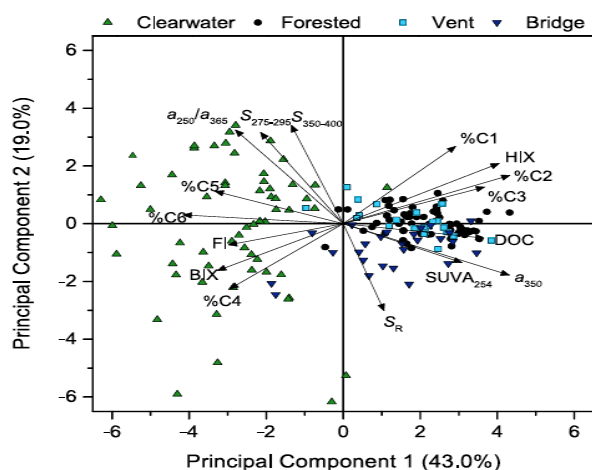


Figure 1. Principle component analysis of DOC concentrations and DOM compositional parameters for the Wakulla Springs conduit and vent ecosystem. DOC = dissolved organic carbon; DOM = dissolved organic matter

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References

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