RE: Appalachian Energy Summit abstract submittal

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Title:

Organic Rich Deposits From a Southern Appalachian Wetland Indicate Carbon Sequestration Potential and Site Stability Over the Last Millennium

Introduction:

Organic-rich sediments from wetlands in the southern Appalachian Mountains have been used to record Holocene (past 10,000 years) climate variability. Wetlands make up 5-8% of terrestrial land surfaces but account for storage of 20-30% of the Earth's carbon (Mitsch et al. 2013). This demonstrates the efficiency of wetland systems to sequester carbon and to partially offset the historical increase in carbon dioxide (CO_2) due to fossil fuel combustion. Study sites in the southern Blue Ridge region that describe prehistoric climate variability are lacking (Tanner et al. 2015). An unstudied wetland has been recently discovered within the Mills River Watershed area in North Carolina. A core obtained and dated from Pilot Cove Wetland provides a multi-proxy, paleo-environmental record, and provides insight into carbon sequestration potential for the last 1,300 yrs BP.

Approach/Methods:

An organic-rich soil core was collected using a Dutch auger. The core was sub-sampled at 5-cm intervals for analysis of bulk carbon, nitrogen, and stable carbon isotope ratios. Additionally, three samples were submitted for radiocarbon age determinations. Environmental proxies [bulk density, soil carbon sequestration (SCAR), carbon percentage (C%), carbon to nitrogen ratio (C/N), and stable carbon isotope ratios ($\delta^{13}C$)] were examined graphically for trends concurrent with climate variability over the past millennium (Medieval Warming and The Little Ice Age) (Crowley, 2000).

Results/Evaluation:

Environmental proxy indicators examined from the Pilot Cove core indicate stable conditions during the historically documented Medieval Warming and Little Ice Age climatic events. C% experienced a spike, which most likely is attributed to a decrease in inorganic sedimentation in the wetland at that time. C/N and $\delta^{13}C$ show very little fluctuation and their average values indicate a stable system for what is thought to be the wetlands current lifespan (1,300 yrs). Carbon sequestration (SCAR) values indicate the

potential for storage of carbon in the wetland of approximately 2.6 tons/yr, or a total storage capacity over 3,000 metric tons.

Pilot Cove's SCARs demonstrate the wetland's carbon storage potential in light of current global warming. Considering that 53% of the wetlands in the United States were destroyed by the 1980s (Dahl, 1990), and that 83% of wetlands in western North Carolina have been lost (Weakley and Schafale, 1994), it is paramount that these effective carbon sinks be protected, mitigated, and, or constructed. The stable proxy signal for the wetland is unique, and suggests that the southern Appalachians may have not experienced the Medieval Warm or Little Ice Age climatic events. Alternately, it may suggest that the wetland may have been buffered in some way if these climatic events did indeed affect the region (i.e. beaver activity?). Additional cores should be collected, and organic-rich proxy indicators should be integrated with other techniques (pollen fossil or fire history studies) in order to ground-truth the results found in this report.

References:

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