Conference: 2013 Society of Wetland Scientists Annual Meeting in Duluth, MN

Invited Symposia: Altered Cycles – Biogeochemical Responses to Anthropogenic and Natural Stressors

Title: Using soil isotopes as an indicator of site-specific to national-scale denitrification in wetlands

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Abstract (1500 characters or less, including spaces):

Denitrification is an anaerobic, microbial process that converts nitrate to inert dinitrogen (N_2) gas and nitrous oxide (N_2O), a potent greenhouse and ozone depleting gas. High rates of denitrification can be found in wetlands, resulting in the removal of large quantities of nitrate from land-based sources, thereby potentially reducing nutrient pollution of sensitive freshwater and coastal marine ecosystems. Currently, most direct measurements of denitrification are expensive, time-intensive, and limited by several important methodological artifacts. Abundance of the ^{15}N isotope in wetland soil organic matter ($\delta^{15}N_{soils}$) might offer an inexpensive and rapid alternative to direct denitrification measures. In addition, $\delta^{15}N_{soils}$ represent an integrated signal of denitrification over time, rather than the highly-fluctuating, instantaneous measures. However, a quantitative relationship between $\delta^{15}N_{soils}$ and wetland denitrification rates has yet to be established in the literature.

Pilot studies to develop a $\delta^{15}N_{soils}$ indicator of denitrification were conducted in several different Ohio wetlands. Preliminary results show that $\delta^{15}N_{soils}$ are positively correlated to in-situ denitrification measurements collected within the same wetland. We will present details of this analysis. Our results suggest the potential for this method to be used as an estimate of denitrification across a broad array of wetland types. As such, we are currently evaluating $\delta^{15}N_{soil}$ collected from approximately 1000 wetland sites from across the conterminous United States that were sampled for the National Wetland Condition Assessment. $\delta^{15}N_{soils}$ range from -3.7 to 13.2‰, which represents an extremely wide range of N processing. By mapping $\delta^{15}N_{soils}$ across the US landscape, we suggest that it will be possible to identify areas important for reducing nitrate loading to the nation's water resources.