The Influx and Stability of Biogenic Phosphorus in Wetlands

A.W. Cheesman (Univ. of Florida, Soil and Water Science Dept.); B.L. Turner (Smithsonian Tropical Research Institute, Soils Lab.)

Introduction

Current research at the AMRIS laboratory has been utilizing solution ^{31}P NMR spectroscopy to determine the chemical nature of phosphorus found in the various components of wetlands systems. The resulting information will enable a greater understanding of phosphorus dynamics within specific components of wetland ecosystems. This detailed knowledge is required to make informed management decisions aimed at both improving water quality from constructed and the preservation of natural systems.

Our studies at AMRIS are part of the first comprehensive effort to study organic phosphorus in wetlands using solution ^{31}P NMR spectroscopy. To date this has yielded a number of important results, including the fact that in direct contrast to upland systems, a large proportion of the phosphorus in wetlands is to be found in forms that are considered to be unstable in the environment, including phosphate diesters (DNA, phospholipids) and polyphosphates [1]. This has significance for efforts to sequester phosphorus in stable forms in constructed wetlands.

Experimental

Current work is progressing on a number of fronts; (1) the expansion of previous work to encompass 'ground data' from a range of wetland types and environmental gradients; (2) the use of mesoscale manipulations to investigate the stability of phosphorus compounds under wetland like conditions (3) the tracking of biogenic material through its decomposition continuum within a wetland.

Spectra have been acquired at the McKnight Brain Institute's AMRIS facility. Specifically we have used the Bruker Avance 500 Console, Magnex 11.75 T/54mm magnet, deploying both the 10 and 5 mm BBO Probe. Briefly, lyophilized extracts are dissolved in 3.6 ml of 1 M NaOH plus 0.1 M EDTA, with 0.4ml D2O for signal lock. Due to the low concentrations of phosphorus present as well as the nature of the re-suspended soil extracts, acquisition is carried out at a stabilized 25°C with a calibrated (~30°) pulse length and a 2.00 sec recycle delay

Conclusions

As well as achieving a greater appreciation for the applicability of patterns observed in the Everglades to other wetland systems and the comparison of work between research groups [2]. Our work has begun to elucidate the dynamic process at work that result in the observed pools. Specifically, we have established the rates and functional nature of phosphorus sequestered during the process of organic matter accretion in wetlands, the stability of compounds when exposed to anaerobic/aerobic environments and the processes affecting functional forms of phosphorus across the upland/wetland interface.

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References

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[2] Turner, B.L. *et al.*, Soil Science Society of America Journal, **71**, 1538-1546 (2007)