

SOIL MICROBIAL CONTRIBUTION TO GREENHOUSE GAS EFFLUX FROM A SECONDARY FOREST IN CENTRAL MISSOURI

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ABSTRACT

Greenhouse gas emissions (GHG) vary with the interactions among physical, chemical, and biological characteristics of soil and microclimate. Soil microorganisms are involved in almost all soil processes, and are also involved in GHG dynamics between the soil and atmosphere. The objective of this study was to examine the relationship between GHG efflux and soil microbial community and activity across a forested landscape. Soil samples were incubated at different temperature and moisture over a 30 days period. Microbial activity and diversity were assessed using enzyme activity, phospholipid lipid fatty acid profiles (PLFA), and soil microbial diversity, based on polymerase chain reaction (PCR), denaturing gradient gel electrophoresis (DGGE) and real-time PCR analysis. Our research revealed temporal differences in microbial population and GHG efflux, indicating that time of year when samples were collected is an important factor. Temperature and moisture significantly affected soil microbial population and GHG efflux. In addition, correlation between GHG and measured biological properties and GHG and soil temperature and moisture in the incubated soils implied that microbial properties as well as soil temperature and moisture may affect GHG efflux from these forest soils. However, the low correlation coefficient (r values) and the lack of correlation within some sampling periods indicated that the relationship among soil microorganisms, soil conditions and GHG efflux is highly complex and cannot be fully explained by direct correlations among the measured properties and GHG efflux.