Analysis of Soil CO2 Efflux Data. Theoretical Considerations and Comparison of Two Measurement Approaches. (6254)

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Abstract:
Soil CO2 flux is an important component of ecosystem carbon balance. Instruments for measuring it have been available, but they have focused on point-in-time measurements. But continuous diurnal records are also important to develop a more complete understanding of physical and biological processes in the soil system and to obtain reliable estimates of soil carbon balance. A new instrument, the LI-COR LI-8100, will be discussed that is designed for both long-term deployment and point-in-time survey measurements. It is not desirable to use chemical scrubbers in an instrument designed for long-term deployment, so a CO2 draw down method cannot be used; but CO2 efflux is also sensitive to CO2 concentration in the measurement chamber. Linear regressions that ignore this can under-estimate CO2 flux rates. A method based on mass balance and an integrated diffusion equation will be presented that allows estimation of the flux rate at the ambient CO2 concentration, avoiding this underestimation. It provides a simpler and more complete method for computing soil CO2 flux in the presence of soil moisture evaporation than has been used in the past. Data will be shown comparing results from the LI-6400 with those obtained from the LI-8100. We will also show data from continuous deployment of the LI-8100 and discuss how wind can affect CO2 movement into the chamber.

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Session Information: Wednesday, November 3, 2004, 9:25 AM-12:00 PM
Presentation Start: 10:00 AM

Keywords: Soil; CO2; LI-8100; instrument