Linking Flux Footprint Analysis with Soil Spatial Heterogeneity. (S01-baker080715-Oral)

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Abstract:

When making flux measurements it is assumed that the surface is homogeneous. Soils research suggests that such surfaces are rare. Indeed the whole field of precision agriculture is premised on spatial, non-random variation in plant growth, and by extension, surface atmosphere exchange. Footprint analysis, a subject to which George Thurtell has been a key contributor, provides a means to estimate the relative contribution of different points on the landscape to a measured flux. Soil dielectric measurements, for which Clarke Topp is best known, allow charaterization of landscape variation in soil properties that can lead to variation in surface fluxes. We used both technologies to interpret eddy covariance measurements above a corn field. We found that variations in surface horizon thickness are consistent with variations in cumulative carbon exchange rate, as manifested in yield. When yield variations are weighted by footprint to produce a cumulative flux for each direction from a central mast, the resultant varies by a factor of two, raising questions about the interpretation of long-term cumulative flux data at sites where there is spatial variation in source strength.

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Presentation Information:

Presentation Date: Monday, November 11, 2002 Presentation Time: 3:15 pm

Keywords:

flux measurements, footprint analysis, soil heterogeneity, dielectric measurements