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The Use of Electromagnetic Induction Techniques for Soil Mapping

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Soils have high natural spatial variability. This has been recognized for a long time, and many methods of mapping that spatial variability have been investigated. One technique that has received considerable attention over the last ~30 years is electromagnetic induction (EMI). Particularly when coupled with modern GPS and GIS systems, EMI techniques have allowed the rapid and relatively inexpensive collection of large spatially-related data sets that can be correlated to soil properties that either directly or indirectly influence electrical conductance in the soil. Soil electrical conductivity is directly controlled by soil water content, soluble salt content, clay content and mineralogy, and temperature. A wide range of indirect controls have been identified, such as soil organic matter content and bulk density; both influence water relationships in the soil. EMI techniques work best in areas where there are large changes in one soil property that influences soil electrical conductance, and don't work as well when soil properties that influence electrical conductance are largely homogenous. This presentation will present examples of situations where EMI techniques were successful as well as a couple of examples of situations where EMI was not so useful in mapping the spatial variability of soil properties. Reasons for both the successes and failures will be discussed.