Agricultural Geophysics Webinar Series
Webinar #1 – February 18, 2014
Application of Geophysical Methods to Agriculture: Methods Employed
Record of Online Questions and Comments

General Questions

John Tayntor: outside of a research setting, in your experience what has been the best means to approach a client to conduct these surveys?

Magnetic Susceptibility

Bereket m DErie 2: If you can relate iron content of a soil with productivity, magnetic susceptibility measurment will help.

Ryan E. North: There are a number of books on magnetic susceptiblity and agricultural capacity of soils. I read several of them, but I was under the impression that those theories were not very mainstream.

Larisa Golovko: Iron deposit/coloring of illuvial horizons of soils can be an indicator of poor productivity.

Bereket m DErie 2: Magnetic suscpt. can be measured with magnetometers which are readilty available for other applications.

Ryan E. North: The Geonics EM38 instruments can be used to measure either the IP response which is a relative measurement that changes every time the instrument is turned on or off. You can also make magnetic susceptibility measurements at individual points by performing a ground measurement and an air measurement at each point and then applying a formula to the two values.

Ryan E. North: In-situ magnetic susceptibility measurements are quite easy to perform and a number of manufacturers make instruments for measurements on rock outcrops. For larger scale site mapping, the Bartington MS2D system is commonly used in archaeology.

Mike Catalano: Forest or field fires and extreme heat will cause a magnetic susceptibility response from these soils to be different as well. Has been mapped in archaeology for some time but could be of use in Precision Ag.

Ryan E. North: The Phil Callahan Soil Meter (PCSM) manufactured by Pike AGri Lab Supplies is suggested for measurements of soil magnetic susceptibility in agriculture. The basis of this sensor is work by a Dr. Callahan.

Electrical Methods

Bereket m DErie 2: It is assumed that in most applications, resistivity is used to map relative changes in values over the same field over similar temperature ranges....in this case, temperature change will not affect the result...If absolute resistivity values of a particular site is needed, either the temperature during measurement must be included or the necessary corrections need to be made using some empirical values.

Ryan E. North: I think a big improvement will be arrays integrated with all of the agricultural system. There are several companies which are using each blade on a tiller as a resistivity electrode so that they can collect continuous electrical resistivity tomography data across entire fields.

Leak Detection and Mapping

Ryan E. North: In reference to the leak detection question, look in the Applied Geophysics book by Reynolds in the chapter on electrical resistivity for numerous case studies on leak detection through artificial membranes.

Bereket m DErie 2: We can monitor continuous electrical imaging method to monitor the plume propagation.

Bereket m DErie 2: We can use Em-38 or similar instrument to map the conductive plume.

Bereket m DErie 2: I recommend a wheel under the EMI sensor.

Ground Penetrating Radar

David Redman: Are there any GPR technology improvements that you think are important for soil characterization applications?

Bereket m DErie 2: For David, the new developments in GPR technology are multi frequency multi depth GPR equipments integrating GPR with GPS.

Bereket m DErie 2: GSSI just has a new multi-frequency GPR.

Bereket m DErie 2: It is called Utility Scan DF.

Ryan E. North: I've been using my 3D-RADAR Geoscope system for high density mapping of large areas. The system is 2.1 m wide with 25 channels at 7.5 cm spacing between channels. It is a continuous wave stepped frequency GPR.

Bereket m DErie 2: As for the GPR suitability map, is it possible to make it an open source data base where practicing geophysicists can put their feedbacks?

Jim Doolittle: "As for the GPR suitability maps, is it possible to make it an open source database where practicing geophysicists can put their feedbacks?"
GPR soil suitability maps can be accessed on the web at
http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/use/?cid=nrcs142p2_053622
The soil attributes and methodology used to prepare these maps are described at this portal, under "Methodology". A "Contact the Author" tabs is available to provide feedback. As noted in the Methodology section, these maps will be periodically updated as new information becomes available. Geophysical practitioner's comments will be taken into account in any revision that are made to these maps.

Sensor Drones

Ryan E. North: I'm flying some super cheap drones from Event38 over sites to see vegetation changes due to levee under seepage. We can fly with visible imagery or near infrared (NIR) cameras which really help identify vegetation. This platform can generate 5 cm pixel resolution orthophotography with minimal effort.

Bereket m DErie 2: Drones are interesting applications with due consideration for public safety and other regulatory issues.

Bereket m DErie 2: They have unlimited potentials in terms of efficiency and their capacity to carry several measurements.