Inversion of Soil Conductivity Profiles from Noninvasive Electromagnetic Induction Measurements. (S01-hendrickx182348-Oral)

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Abstract:

Non-invasive electromagnetic (EM) induction techniques are used for salinity monitoring of agricultural lands and contaminant detection in soils and shallow aquifers. This study has four objectives. The first objective is to summarize an earlier linear model of the response of the EM38 ground conductivity meter and to discuss a more accurate nonlinear response model. The second objective is to verify experimentally whether the linear and nonlinear models derived for homogeneous media are valid in heterogeneous soil profiles. The third objective is to present an inverse procedure that combines the nonlinear model with Tikhonov regularization. The fourth objective is the experimental verification of inverse procedures with the linear and nonlinear models for inversion of soil conductivity profiles using above-ground electromagnetic induction measurements on fourteen saline Californian soil profiles. The linear and nonlinear models derived for homogeneous media are indeed valid in heterogeneous soil profiles. However, since the errors of the linear model are approximately double those of the nonlinear model, the latter is the preferred one. A small difference was found in the errors of the inverse procedures between the linear and nonlinear models. In this study, the inverse procedures with the linear model and with the nonlinear model produce equally good solutions at EM38 measurements below 100 mS/m, while at higher electrical conductivities the inverse procedure with the nonlinear model appears to yield slightly better results. The inverse procedure with the linear model is preferred for all conductivities since it needs considerably less computer resources.

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Presentation Information:

Presentation Date: Monday, November 11, 2002
Presentation Time: 4:30 pm

Keywords:

apparent electrical conductivity, noninvasive electromagnetic, EM