Assessing Soil Salinity Using a Geostatistical Approach

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Abstract. A new methodology is developed for generating accurate predicted soil salinity maps using remotely sensed data, field data, geographic information systems (GIS), and spatial modeling techniques. Soil salinity predictions derived from Ikonos and Landsat satellite images are compared with ground data collected from corn fields in a study area in Colorado's lower Arkansas River Basin. For each image, the combination of satellite imagery bands that has the best correlation with soil salinity is used. Three models are applied to predict soil salinity from remote sensing: the ordinary least squares model (OLS), the spatial autoregressive model (SAR), and a modified residual kriging model. A number of criteria are evaluated to select the best model. The results show that both the Ikonos and Landsat satellite images can be used to estimate soil salinity. The OLS model meets most of the model selection criteria, but in most cases, it involves some autocorrelation among the residuals. The SAR model is able to remove most of the autocorrelation among residuals but reduces the R^2. The modified kriging model, where the kriged residuals are combined with the results of the OLS model, significantly improved the R^2 and proved to be the best model for predicting soil salinity from remote sensing data.

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