Using Deterministic and Geostatistical Techniques to Estimate Soil Salinity at The Sub-Basin and Field Scale

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Abstract. Two different techniques are evaluated in this study to estimate soil salinity in the lower Arkansas Valley River area for both the sub-basin and field scales. Inverse Distance Weight (IDW) and Ordinary Kriging (OK) are evaluated as deterministic and geostatistical techniques respectively. Deterministic techniques depend on the assumption that the interpolating surface should be influenced most by the nearby points and less by the more distant points. Kriging techniques rely on the notion of autocorrelation and assume that the data are from a stationary stochastic process. The objectives of this study are: 1) compare the performance of the deterministic versus the geostatistical kriging techniques; and 2) evaluate the accuracy of both the deterministic and the geostatistical kriging techniques at the sub-basin and field scales. Different data sets for both the sub-basin and field scales were collected from two study areas in a project conducted in the southeastern part of the Arkansas River Basin in Colorado where soil salinity impacts the crop productivity. Since each study area, the upstream and downstream areas, are about 20 miles long and 10 miles wide this makes it very costly and time consuming to cover the whole area with closely spaced field samples (samples collected at 50 meter to 100 meter apart). Therefore, the mean values of the collected points (50 meters to 100 meters apart) in some selected fields were considered to represent the sub-basin scale. However, the data collected at 50 meter to 100 meter apart were considered for the field scale. The results of this study indicate that geostatistical techniques perform better when the data shows significant autocorrelation. However, in some cases there was no significant difference in the performance of both deterministic and geostatistical techniques when the autocorrelation among the collected data is not significant or weak.