

Comparison of Regression Kriging and Co-Kriging Techniques to Estimate Soil Salinity Using Landsat Images

Ahmed Eldeiry¹ and Luis Garcia²

Department of Civil and Environmental Engineering, Colorado State University, Fort Collins

Abstract. The objectives of this study are: to compare regression kriging and Co-kriging techniques when applied to LANDSAT images to generate accurate soil salinity maps; to compare the performance of different crop types: alfalfa, cantaloupe, corn, and wheat as indicators of soil salinity; and to evaluate the best band combinations to estimate soil salinity with each crop type. This study was conducted in an area in the southern part of the Arkansas River Basin in Colorado. Six LANDSAT images acquired during the years: 1999, 2001, 2003, 2004, 2005, and 2006 in conjunction with field data were used to estimate soil salinity in the study area. The optimal subset of band combinations from LANDSAT images that correlates best with the soil salinity data was selected. Regression kriging and Co-kriging were applied to 2,915 soil salinity data points collected in alfalfa, cantaloupe, corn, and wheat fields in conjunction with the selected subset band combinations from the LANDSAT images. Ordinary Least Squares (OLS) was used to regress the correlated band combinations to generate a soil salinity surface. The same LANDSAT band combinations used with the regression kriging technique were used as secondary data variables with the Co-kriging technique, while soil salinity data was used as a primary variable. The results show that the regression kriging technique performed better than the Co-kriging technique since it was able to capture most of the small variations in soil salinity. Corn and cantaloupe are better indicators of soil salinity than wheat and alfalfa. The best band combinations for estimating soil salinity with different crops are as follows: alfalfa (red, near infrared, and NDVI); cantaloupe (blue, green, and near infrared); corn (red, near, and NDVI); and wheat (blue, near infrared, and thermal).

¹ Tel: (970) 491-7620

e-mail: aeldeiry@rams.colostate.edu

² Tel: (970) 491-5049

e-mail: Luis.Garcia@colostate.edu