Stochastic Analysis of Crop Yield Uncertainty, Field Scale Study

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Abstract. Spatial heterogeneity of soil properties and uncertainty in root uptake model parameters make the numerical prediction of crop yield prone to a high degree of uncertainty. In this study, the spatial soil parameters were treated as multivariate correlated regionalized random parameters. Sequential indicator simulation was used to generate three-dimensional dependant realizations for hydraulic conductivity, porosity, van Genuchten parameters and dispersivity. Other semi empirical parameters that control crop water uptake and subsurface drainage conductance where also randomized. Four hundred realizations for each of the soil parameters were generated and processed in the variably saturated flow and transport model (CSUID) to obtain the spatial statistical moments of the relative crop yield, root zone salinity and salt leaching fraction. The statistical distributions of drainage flow and salinity hydrographs were also calculated. Results show that parameter uncertainty significantly impacts in-field relative crop yield variability and drainage flow and salinity effluent.