Geophysical Research Abstracts
Vol. 19, EGU2017-9832-1, 2017
EGU General Assembly 2017

Field Scale Spatial Modelling of Surface Soil Quality Attributes in Controlled Traffic Farming

Kris Guenette and Guillermo Hernandez-Ramirez
Renewable Resources, University of Alberta, Edmonton, Canada

The employment of controlled traffic farming (CTF) can yield improvements to soil quality attributes through the confinement of equipment traffic to tramlines with the field. There is a need to quantify and explain the spatial heterogeneity of soil quality attributes affected by CTF to further improve our understanding and modelling ability of field scale soil dynamics. Soil properties such as available nitrogen (AN), pH, soil total nitrogen (STN), soil organic carbon (SOC), bulk density, macroporosity, soil quality S-Index, plant available water capacity (PAWC) and unsaturated hydraulic conductivity (Km) were analysed and compared among trafficked and un-trafficked areas. We contrasted standard geostatistical methods such as ordinary kriging (OK) and covariate kriging (COK) as well as the hybrid method of regression kriging (ROK) to predict the spatial distribution of soil properties across two annual cropland sites actively employing CTF in Alberta, Canada. Field scale variability was quantified more accurately through the inclusion of covariates; however, the use of ROK was shown to improve model accuracy despite the regression model composition limiting the robustness of the ROK method. The exclusion of traffic from the un-trafficked areas displayed significant improvements to bulk density, macroporosity and Km while subsequently enhancing AN, STN and SOC. The ability of the regression models and the ROK method to account for spatial trends led to the highest goodness-of-fit and lowest error achieved for the soil physical properties, as the rigid traffic regime of CTF altered their spatial distribution at the field scale. Conversely, the COK method produced the most optimal predictions for the soil nutrient properties and Km. The use of terrain covariates derived from light ranging and detection (LiDAR), such as of elevation and topographic position index (TPI), yielded the best models in the COK method at the field scale.