Geophysical Research Abstracts
Vol. 20, EGU2018-8149, 2018
EGU General Assembly 2018

Using vis-NIR predicted hydraulic properties to simulate water flow dynamics in a tile-drained agricultural field

Ioannis Varvaris (1), Zampela Pittaki-Chrysodonta (1), Per Moldrup (2), Lis Wollesen de Jonge (1), Maria Knadel (1), and Bo Vangso Iversen (1)

(1) Aarhus University, Department of Agroecology, Tjele, Denmark, (2) Aalborg University, Department of Civil Engineering, Aalborg, Denmark

Estimation of soil hydraulic parameters is essential for generating a hydrogeological model in order to simulate the water flow dynamics in an agricultural field. Estimation of them through direct measurements is time-consuming and costly, while the spatial and temporal variability subjoin an additional uncertainty to the model. Over the last decades, the rapid estimation of the soil hydraulic properties as input for the models had been based on experimental studies and pedotransfer functions as an alternative method. However, there are several studies that shown the possibility to extract basic soil properties using the visible near-infrared (vis–NIR) spectroscopy. Determination of water release characteristics and water movement through saturated porous medium can be protracted and a method to accurately predict the soil-water retention curve and the saturated hydraulic conductivity (Ks) indirectly from vis–NIR spectroscopy may provide a fast and inexpensive alternative. In this study, the vis-NIR predicted Campbell retention model was converted to van Genuchten model for estimating the parameters α and n. The difference between the predicted soil-water contents at -10 and -1000 cm H_2O soil-water matric potential (pF 1 and pF 3, respectively) defined as effective porosity (φ). The Campbell b and φ were both used to predict the Ks. The resulting soil-water retention curve and Ks compared closely to the measured data. The Hydrus 2D software package was used to simulate the water flow dynamics in a clayey subsurface tile-drained agricultural field in Denmark using as input the indirectly vis-NIR predicted values for the hydraulic parameters. The model was evaluated comparing the simulated drainage dynamics with the observed drainage data. The used approach simulated the main attributes of the flow hydrograph with a desired degree of accuracy and successfully represented the examined flow domain. The output of this work in conjunction with the planned experimental work will be used as the foundation for developing a solute transport model and simultaneously, it will be a valuable tool with respect to the water resources management.