

LONG-TERM EVALUATION OF THE PEDOSTRUCTURE MODEL AND ITS PARAMETERS

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Goals: Brief description

- Perform an analysis of variability on KamelSoil® to determine how changes in user-defined inputs affect estimated pedostructure parameters.
- Compare Kamel® output to HYDRUS 2-D output and field measurements.
- Determine long-term effects of tillage on soil physical properties.
- Quantify effects and add as modifiers to pedotransfer functions in KamelSoil®

Statement of Problem: The pedostructure model is a new model that predicts the behavior of soil-water media. By using soil structure as the basis for soil characterization, the pedostructure model represents a more complete method of predicting soil-water relationships at all scales by modeling all scales simultaneously and incorporating the effects of one level of soil aggregation on another. An individual soil can be uniquely characterized by 15 pedostructure parameters that are common to every soil. A computer model, Kamel®, has been developed to use these parameters, along with climatic and temporal data, to predict a variety of soil-water interactions. The 15 parameters are experimentally determined using four continuously and concurrently measured curves: shrinkage curve, swelling curve, conductivity curve, and tensiometric curve. However, the experimental procedures to obtain these curves are long and require equipment most researchers do not have. Therefore, the pedostructure parameters can be estimated using pedotransfer functions that use soil physical properties available through many soil databases: soil texture, bulk density, organic matter content, etc. KamelSoil® has been developed using Microsoft Excel to quickly input the soil physical properties into the pedotransfer functions to produce the 15 pedostructure parameters necessary to run the Kamel® model.

The pedostructure model can be improved from its present level. A detailed analysis of which and to what degree the pedostructure parameters in KamelSoil® change with changing soil data will be undertaken. Up to this point, the pedostructure model only characterizes soil that is static in terms of the biogeochemical and temporal processes that can possibly occur. The purpose of this work is to take the present knowledge of soil physical properties changes due to tillage over time (both short-term and long-term) and combine it into the pedostructure model to more accurately predict how soil and water will interact in the soil profile.

Current Activities: Research on existing studies of long-term tillage effects on soil physical properties is currently underway. Field sites are being researched, with the assistance of the National Soil Erosion Research Laboratory to determine the most suitable site to use for model simulations. Detailed data on bulk density, infiltration, hydraulic conductivity, and other soil physical properties over a long period of time (i.e. several years) under continuous tillage conditions is desired from the chosen field site.