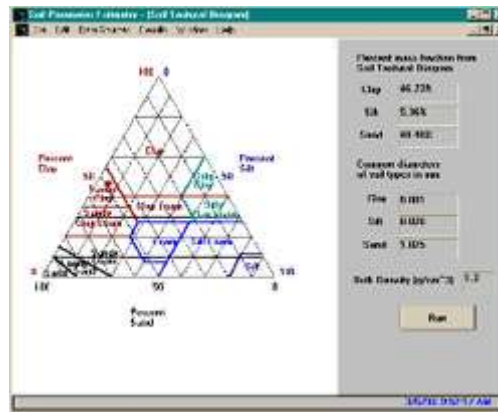


SOILPARA



INTRODUCTION TO SOILPARA

SOIL PARAMETER Estimator is based on statistical pore/particle size distribution models and can be used to estimate hydraulic parameters in the van Genuchten constitutive model (Brooks-Corey parameters can be estimated from these) for variably-saturated soils.

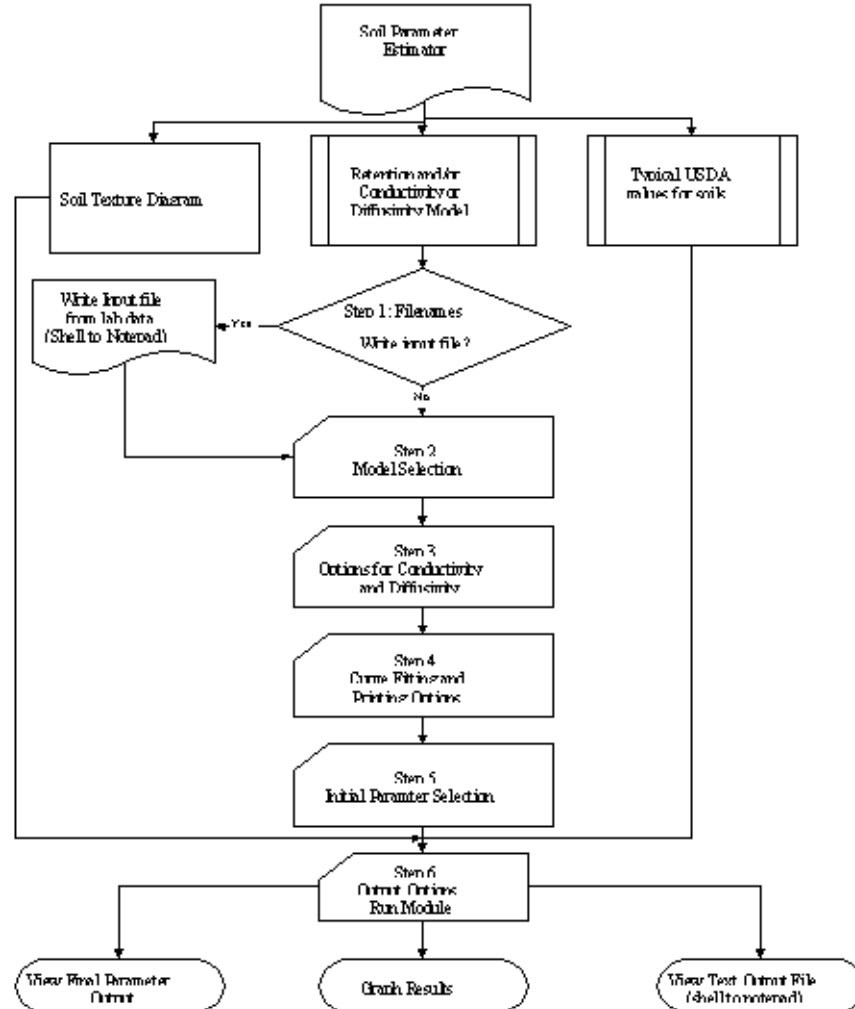
SOILPARA allows estimation of the unsaturated zone parameters (1) from retention data and/or conductivity or diffusivity data (K or D vs. soil water content/pressure) based on the public domain RETC model by M. Th. van Genuchten et al., 1991) with a Windows native preprocessor that is easy to use and offers graphical output and extensive on-screen help; (2) from soil texture (based on the work of Shirazi and Boersma, 1984, and Campbell, 1985) by clicking on a soil texture diagram to return percentage sand, silt and clay within the pre-processor; or (3) by selection of USDA-recommended typical parameter values for various texture classes available in the SOILPARA database.

SOILPARA INPUT

- Select soil texture from a diagram in SOILPARA for easy estimation of vadose zone hydraulic properties and generation of a water content vs. suction (retention) curve.
- Direct input from laboratory particle size analysis.
- Choose typical USDA parameter values from either Rawls et al., 1982, or Carsel and Parrish, 1988, in the SOILPARA database.
- Input laboratory retention and/or conductivity or diffusivity data with an option to estimate up to seven parameters by the Marquardt method.

SOILPARA TECHNICAL INFORMATION

Program Flow Chart



SOILPARA USER INTERFACE

- SOILPARA presents three screens for model preprocessing with spreadsheet-like tabs for easy movement between sections. Flip between input and output screens for a quick view of model results.
- Full on-line help, handy cue cards and pop-up on-screen help to make navigation easier.
- SOILPARA supports full-featured graphing of output data. Print graphs directly or export them as .wmf files for reports or slide show presentations.
- View output data side-by-side with the graph and final output parameters.

SOILPARA PROGRAM INPUT Soil Texture Diagram

Data Sources|Soil Texture Diagram

The user clicks on the soil type closest to the observed site soils. The fraction of sand, silt and clay will be run through a texture model based on the work of Shirazi and Boersma, 1985, to determine pressure (cm) vs. water content (- negative). The average grain diameter in the second column can be changed, but these are typical representative values. The user needs to enter a dry bulk density for the soil in the Dry Bulk Density text box. The dry bulk density must be less than 2.65 g/cm^3 (2.65 g/cm^3 being the density of solid rock material). This is needed to determine saturated conductivity for the soil using the method of Campbell, 1985. When satisfied with the percentages of sand, silt and clay and the bulk density, click on [Run]. After running the soil texture diagram, the generated input file is used in the Retention and/or K or D model to determine the van Genuchten hydraulic parameters.

The different colored soil zones are guideposts to average soil types. After clicking on a soil type, the user can drag the soil marker through the triangle to obtain the desired percentages for sand, silt and clay. The text boxes can be edited directly but the sum of all three must equal 100%.

USDA Typical Soil Values

Data Sources|USDA Typical Values

- There are up to 12 different soil types included.
- The user can select the parameter for the soil of his/her interest.
- After selecting the soil type, the retention curve model will run a direct problem (parameters are not changed) and generate the retention curve data.
- Use this form to pick typical USDA values according to Rawls et al., 1982, or Carsel and Parrish, 1988. Select the soil type to run through the retention curve model and press [Accept and Run]. Some run parameters can be set on the Run Options screen. [Run] opens the Soil Parameter Estimator Graphing module. To go back to the USDA values, select Window from the main menu. Select another soil type, press [Accept and Run] and the Soil Parameter Estimator graphs the new data. A list of the tables represented here are included along with further discussion of typical USDA values.
- Flip between Rawls et al. values and Carsel and Parrish values.

SOILPARA's USDA typical values allows the user to select:

Average values for soil-water retention parameters and saturated hydraulic conductivity for major soil textural groups according to Rawls et al., 1982, or Carsel and Parrish, 1988.

Values returned by this soil selection include:

- (L) A pore-connectivity parameter
- M parameter ($= 1 - 1/n$)
- WCR
- WCS
- Alpha
- N parameter
- Conds

Retention Curve Program

Data Sources|Retention and/or K or D Data

The retention and/or conductivity (K) or diffusivity (D) model is based on the EPA model RETC by M. Th. van Genuchten, F. J. Leij and S. R. Yates. Appendix A in the Soil Parameter Estimator User's Guide has the full theoretical background of RETC. The user can create and save new project files for retention and/or K or D options, or open old files. All data entry boxes are set to default values or recommended values at startup. Double-click on any box to receive a brief description of each variable.

The retention curve program can be used to run a direct problem (given parameters in the constitutive model, the retention curve showing moisture content vs. suction can be graphed). When moisture content vs. suction and/or K vs. moisture content or suction, or D vs. moisture content, is available, the retention curve program can be used to estimate up to seven parameters in the soil moisture constitutive model. To use laboratory data, the user needs to write an input file. There are six steps to the retention curve pre-processor.

SOILPARA GRAPHING

Results|Graphing and Final Parameters

Graph output data from any of the Data Sources methods by opening the output file desired. Click on [Read Data] to open a graph file for a retention curve (.rtn), conductivity, or diffusivity (.con). The graphing module will not open the soil parameter output file .spo, but all necessary data in the output file is contained in the .rtn and .con files. Print directly from this graphing package or output a Windows metafile for use in reports.

There is a tool bar available for customizing the graph. Hold the mouse cursor over the tool bar and a pop-up help box will describe the button action. While there are a number of options in the style gallery, only line graph is appropriate for SOILPARA. All options of the graphing menu are available for users wishing to use the flow and transport models that incorporate SOILPARA to estimate soil hydraulic parameters. The data being displayed in the graph can be viewed by clicking on [View Data].

Final Parameter Values

Results|Graphing and Final Parameters (tab Final Parameter Output)

During the retention curve program run, fitted parameter values will be output to the .spo file, which can be viewed in the output file or on the SOILPARA output page. Select Results, then Graphing and Final Parameters from the main menu. Click on the tab, Final Parameter Output at the bottom of the page, and then click on [Open File]. Parameters estimated in the last run will be displayed.

SOILPARA REFERENCES

The RETC Code for Quantifying the Hydraulic Functions of Unsaturated Soils by M. Th. van Genuchten, F. J. Leij and S. R. Yates, U.S. Salinity Laboratory, U.S. Department of Agriculture, Agricultural Research Service.

Joseph R. Williams, Extramural Activities and Assistance Division, Robert S. Kerr Environmental Research Laboratory.

SOILPARA Requirements

Windows 95/98/2000/NT and 8 MB RAM.